جاممة قطر
QATAR UNIVERSITY

دار نشر جامعة قطر
Qatar University Press

Book of Abstracts

Building Resilience at Universities:
Role of Innovation and Entrepreneurship

Qatar University Annual Research Forum & Exhibition

20 October 2021

كتيب ملخصات وقائع المنتدى

بناء المرونة في الجامعات:
دور الابتكار وريادة الأعمال

المنتدى والمعرض البحثي السنوي لجامعة قطر

٢٠ أكتوبر ٢٠٢١

Book of Abstracts

Qatar University
Annual Research Forum & Exhibition

(QUARFE-2021)

المنتدى والمعرض البحثي السنوي

لجامعة قطر (2021)

Building Resilience at Universities:

Role of Innovation and Entrepreneurship

بناء المرونة في الجامعات:

دور الابتكار وريادة الأعمال

20 October 2021

Doha: 2021AD/1443AH

دار نشر جامعة قطر
Qatar University Press

هذا الكتاب لا يعبر بالضرورة عن رأي دار نشر جامعة قطر.

This book does not necessarily reflect the opinion of QU Press.

About the Forum

Qatar University (QU) Annual Research Forum and Exhibition (QUARFE) is a crucial event that brings together students, researchers and academics from the University's colleges, research centers and institutions, in addition to partners and stakeholders, to assess, review and discuss QU's research outputs and activities.

QUARFE aims to highlight QU's approach in addressing the community's issues and challenges. This approach relies on research anchored on a vibrant partnership with industry and various other stakeholders, including institutions and research centers. Indeed, QU aims to achieve research-driven learning, discovery and entrepreneurship.

This year's high-profile event will be held under the theme: "Building Resilience at Universities: Role of Innovation and Entrepreneurship".

QUARFE also helps QU faculty, researchers and students to take advantage of the opportunities offered by respective partners. It will also focus on QU significant and award-winning research that promote the University's vision, and supports Qatar's research priorities of and the goals of the Qatar National Vision 2030.

نبذة عن المنتدى

المنتدى والمعرض البحثي السنوي لجامعة قطر حدث مهم، يجتمع فيه الطلاب والباحثون والأكاديميون التابعون لكليات الجامعة العشر، والمراكز البحثية، والمؤسسات، وشركاء المصلحة؛ لتقييم ومراجعة النتاج البحثي للمؤسسة.

يهدف هذا المنتدى إلى عرض الآلية التي تتبعها جامعة قطر في معالجة القضايا والتحديات التي تواجه المجتمع. وتعتمد هذه المعالجة على البحث القائم على الشراكات النشطة والتفاعلية مع الصناعة وشركاء المصلحة المختلفين، بما في ذلك المؤسسات والمراكز البحثية؛ حيث تهدف الجامعة من خلاله إلى تحقيق التعلم القائم على البحث والاكتشاف وريادة الأعمال.

يتناول المنتدى هذا العام موضوع «بناءُ المرونة في الجامعات: دورُ الابتكار وريادة الأعمال». وتقوم دار نشر جامعة قطر بإصدار كتيب وقائع ملخصات الملصقات البحثية المشاركة في المنتدى.

يساعد المنتدى الباحثين والطلاب في الجامعة على الاستفادة من الفرص المتاحة من قبل الشركاء المعنيين. كما يسلط الضوء على الأبحاث المهمة التي تجرى في جامعة قطر، والحائزة على مجموعة من الجوائز؛ بما يعزز رؤية الجامعة، ويدعم الأولويات البحثية لدولة قطر وأهداف رؤية قطر الوطنية 2030.

Foreword

Dr. Hassan Al-Derham
Qatar University President

I am pleased to welcome you all and thank you for participating in the Qatar University's Annual Research Forum and Exhibition 2021.

This year, the forum evolves around the theme: "Building Resilience at Universities: Role of Innovation and Entrepreneurship". This confirms that resilience is crucial for the development of higher education institutions everywhere.

This topic has a vital importance in the era of globalization, competition, and the unprecedented escalation of challenges and crises. The explosion of knowledge that humanity is witnessing requires universities to accelerate in order to keep pace with this progress and to be at the forefront of their societies.

The theme of the forum corresponds to Qatar's National Vision 2030, which is relevant to the country's economic and social development projects. Building resilience also occupies a special place in the educational and research strategic plans of Qatar University, which adopts theoretical and practical policies and programs that help to prepare graduates who can adapt to the changes and invent successful solutions to meet the needs and requirements of society.

The pandemic was an examination of resilience at Qatar University and an opportunity to reduce reliance on some traditional working methods. It favored the application of modern technology to develop adaptive skills, virtual academic and administrative performances, and to continue implementing plans and projects, as well as providing services and maintaining the health and safety of the University's cadres and students.

We recognize that resilience at universities is not an instantaneous process, nor is it just an idea to be discussed or a topic to be taught, but is rather a

continuous effort, an adapted strategy, and a cornerstone in the organization of universities and their governance. We emphasize the need to protect resilience through greater flexibility in laws and legislations, and to include it within programs in schools and institution from the earliest stages of education while maintaining the highest quality standards.

We are proud that this global forum is being held at Qatar University, and we are pleased with its topics and the fact that it has attracted many researchers, partners, and decision-makers. We will continue to support and develop it as a platform of partnership and cooperation among higher education institutions from different parts of the world.

Today's forum is the result of the sincere efforts of the Research and Graduate Studies Sector in Qatar University. To them and to the participants, I extend my gratitude and best wishes.

افتتاحية
د. حسن الدرهم
رئيس جامعة قطر

يطيب لي الترحيب بكم ومشاركتكم المنتدى والمعرض البحثي السنوي لجامعة قطر 2021.

يعقد المنتدى السنوي هذا العام تحت عنوان: «بناءُ المرونة في الجامعات: دورُ الابتكار وريادة الأعمال»، وفي هذا تؤكدون على أن المرونة وسيلة مهمّة لتطوير مؤسسات التعليم العالي في كل مكان.

يكتسب هذا الموضوع أهمية حياتية خاصة في عصر العولمة والمنافسة والتصاعد غير المسبوق للتحديات والأزمات؛ ذلك أن الثورة المعرفية التي تشهدها البشرية تتطلب من الجامعات أن تسارع خطاها لتواكب هذا التقدم، ولتكون في طليعة مجتمعاتها.

يتوافق موضوع المنتدى مع رؤية قطر الوطنية 2030، ذات الصلة بمشاريع التنمية الاقتصادية والاجتماعية للدولة. كما ويحتل بناء المرونة مكانة خاصة في الخطط الاستراتيجية التعليمية والبحثية لجامعة قطر، التي تتبنّى سياساتٍ وبرامجَ نظريةً وعمليةً تساعد في إعداد خريجين قادرين على التكيّف والمواكبة الواعية للتغيرات وابتكار الحلول الناجحة لتلبية حاجات المجتمع ومتطلباته.

كانت الجائحة امتحانًا للمرونة في جامعة قطر وفرصة لتقليص الاعتماد على طرق العمل التقليدية، وتوظيف التكنولوجيا الحديثة في تطوير مهارات التكيف والأداء الأكاديمي والإداري الافتراضي، ومواصلة تنفيذ الخطط والمشاريع، إلى جانب استمرار الخدمات والحفاظ على صحة وسلامة كوادر الجامعة وطلابها.

ندرك أن المرونة في الجامعات ليست عملية آنية، ولا مجرد فكرة تناقش، أو موضوعًا يدرّس؛ وإنما هي جهدُ مستمرُ، واستراتيجيةُ تُعْتَمَد، وركنُ أساسُ في تنظيم الجامعات وحسن

تسييرها. ونؤكد على ضرورة حماية المرونة؛ عبر المزيد من المرونة في القوانين والتشريعات، وإدراجها في برامج المدارس والمعاهد، ومنذ أبكر مراحل التعليم، مع الحفاظ على أقصى معايير الجودة والاستدامة.

نفخر بانعقاد هذا المنتدى السنوي في جامعة قطر وتسرّنا مواضيعه واستقطابه للعديد من الباحثين والشركاء وصناع القرار. وسوف نستمر في دعمه وتطويره كمنصّة شراكة وتعاون بين مؤسسات التعليم العالي من مختلف الأرجاء.

منتدى اليوم ثمرة جهود مخلصة لقطاع البحث والدراسات العليا بجامعة قطر، فلهم جميعًا وللمشاركين أطيب التمنيات مع جزيل الشكر والعرفان.

Foreword

Prof. Mariam Al-Maadeed

Qatar University Vice-President for Research & Graduate Studies

Welcome to the Qatar University Annual Research Forum 2021, held under the title of Resilience at Universities: The Role of Innovation and Entrepreneurship. We have chosen this topic this year for its close association with creativity and innovation, and for how it is considered a condition for adapting to variables, and the key to invent solutions for problems and challenges, while encouraging development and quality simultaneously.

Resilience is the most important in times of disasters and crisis. It is a lifeline and guarantee of the safety of society and institutions. History has taught us how disasters produce creators who turn crises into successful entrepreneurial opportunities. Universities, which are required to produce knowledge and lead societies, are at the forefront of institutions who embrace flexibility as a strategy that develops them according to time and its developments.

The Research and Graduate Studies Sector at Qatar University is paying increasing attention to resilience and innovation in research and education, to enhance the capabilities of confronting emergencies and current needs, and to prepare for the future and its emergencies in light of the lessons learned from the pandemic. In this context, we have launched the Core and Transformational Research Priorities Plan that is consistent with the country's national development strategy. We periodically review programs and policies to help localize technologies, develop societies, support patents, as well as develop grants, finance, marketing, internal and external partnerships, and other practices that support the contribution of research centers and researchers in building a knowledge-based economy and

sustainability. We also support graduate students and provide them with opportunities and conditions for their graduation as successful cadres and leaders in the workforce who are innovative in investment and entrepreneurship.

We are pleased that this year's forum is the result of the cooperation between the University and prominent local and international partners, to group together an elite group of researchers, stakeholders, and decision-makers to discuss the role of universities in building creative and innovative resilience in the field of research, education, entrepreneurship, and in achieving the sustainable development goals. In addition, it protect society's identity and values, while keeping pace with this era and contributing to building the future of the upcoming generations.

Thank you and I wish you productive and pleasant discussions.

افتتاحية

أ. د. مريم المعاضيد
نائب رئيس جامعة قطر للبحث والدراسات العليا

أرحب بكم ضيوفًا ومشاركين في المنتدى البحثي السنوي لجامعة قطر 2021، الذي يعقد تحت عنوان: «بناءُ المرونة في الجامعات: دورُ الابتكار وريادة الأعمال».

اخترنا المرونة موضوعًا لهذا المنتدى؛ لارتباطها الوثيق مع الإبداع والابتكار، ولكونها شرط التكيف مع المتغيرات، ومفتاح الحلول الناجعة للمشاكل والتحديات، ولقدرتها على التطوير وعلى ضمان الجودة وإدارتها.

تكتسب المرونة في زمن الكوارث والأزمات، كما هو اليوم، أهميةً متزايدةً؛ فهي طوق النجاة وصمّام أمان المجتمع والمؤسسات. وقد علّمنا التاريخ أن الكوارث تنتج المبدعين الذين يحوّلون الأزمات إلى فرص ريادية ناجحة.

تقف الجامعات، المطلوب منها إنتاج المعرفة وقيادة المجتمع، على رأس الجهات التي تتبنّى المرونة استراتيجيةً؛ لتطوّرها حسب الزمن والمستجدات.

يولي قطاع البحث والدراسات العليا في جامعة قطر اهتمامًا متصاعدًا بموضوع المرونة والابتكار في البحث والتعليم؛ تعزيزًا لقدرات مواجهة الطوارئ والحاجات الراهنة، وإعدادًا للمستقبل والمفاجآت؛ على ضوء الدروس المستفادة من الجائحة.

وفي هذا السياق أطلقنا خطة الأولويات البحثية الأساسية والتحوّليّة المتماشية مع استراتيجية التنمية الوطنية للدولة. ونقوم بمراجعة دورية للبرامج والسياسات؛ بما يساعد على توطين التكنولوجيا، وتطوير المجتمع، ودعم براءات الاختراع، إلى جانب تطوير المنح والتمويل والتسويق والشراكات الداخلية والخارجية، وغير ذلك من الممارسات التي ترفد مساهمة المراكز البحثية والباحثين في بناء اقتصاد المعرفة والاستدامة. كما ندعم طلبة

الدراسات العليا، ونوفّر لهم الفرص وشروط التخرج؛ ككوادر ناجحة وقائدة في سوق العمل وقادرة على الابتكار في الاستثمار وريادة الأعمال.

يسعدنا أن يأتي منتدى اليوم ثمرة تعاون بين الجامعة وشركاء محليين وعالميين مرموقين، ويجمع نخبة من الباحثين وأصحاب المصلحة والقرار، يناقشون دور الجامعات في بناء المرونة الإبداعية والابتكارية في حقول البحث والتعليم وريادة الأعمال، وفي تحقيق أهداف التنمية المستدامة، إضافة إلى حماية قيم المجتمع وهويته، مع مواكبة العصر والمساهمة في صنع مستقبل الأجيال القادمة.

Organizing Committee

- Dr. Nasser Al-Nuaimi, Associate VP for Research & Graduate Studies, Office of VP for Research & Graduate Studies, Qatar University

- Mrs. Nathalie Younan, Research Projects Manager, Office of VP for Research & Graduate Studies, Qatar University

- Ms. Amani Othman, Acting Manager of Engagement and Communication, Office of VP for Research & Graduate Studies, Qatar University

- Dr. Nabil Darwish, Section Head of Production, Qatar University Press

- Dr. Mohamed Kharbeche, Research Associate, College of Engineering, Qatar University

- Dr. Sandy Rahme, Senior Graduate Programs Review Specialist, Graduate Studies Office, Qatar University

- Mrs. Arwa Elghabeish, Senior Pre-Award Specialist, Office of Research Support, Qatar University

- Mr. Kareem Shosha, Senior ITS Specialist, Office of VP for Research & Graduate Studies, Qatar University

اللجنة المنظّمة

- **د. ناصر النعيمي**، مساعد نائب رئيس الجامعة للبحث والدراسات العليا، مكتب نائب الرئيس للبحث والدراسات العليا، جامعة قطر

- **السيدة ناتالي يونان**، مدير مشاريع البحوث، مكتب نائب الرئيس للبحث والدراسات العليا، جامعة قطر

- **السيدة أماني عثمان**، مدير قسم التواصل والمشاركة، مكتب نائب الرئيس للبحث والدراسات العليا، جامعة قطر

- **د. نبيل درويش**، رئيس قسم الإنتاج بدار نشر جامعة قطر

- **د. محمد الخرباش**، باحث مشارك، كلية الهندسة، جامعة قطر

- **د. ساندي رحمة**، أخصائي أول مراجعة برامج الدراسات العليا بمكتب الدراسات العليا، جامعة قطر

- **السيدة أروى الغبيش**، أخصائي أول شؤون ما قبل المنح، إدارة شؤون دعم البحث العلمي، جامعة قطر

- **السيد كريم شوشه**، أخصائي أول خدمات تكنولوجيا المعلومات، مكتب نائب الرئيس للبحث والدراسات العليا، جامعة قطر

Index

Research Posters Abstracts

XXI

Research Posters Abstracts

ملخصات الملصقات البحثية

Energy and Environment
(Faculty and Postdoc)

The Separation of Emulsified Water/Oil Mixtures through Adsorption on Plasma-Treated Polyethylene Powder

Asma Abdulkareem, Anton Popelka, Patrik Sobolciak, Igor Krupa
Qatar University, Qatar
asma.alkareem@qu.edu.qa

Abstract

This work addresses the preparation and characterization of efficient adsorbents for tertiary treatment (oil content below 100 ppm) of oil/water emulsions. Powdered low-density polyethylene (LDPE) was modified by radio-frequency plasma discharge and then used as a medium for the treatment of emulsified diesel oil/water mixtures in the concentration range from 75 ppm to 200 ppm. Plasma treatment significantly increased the wettability of the LDPE powder, which resulted in enhanced sorption capability of the oil component from emulsions in comparison to untreated powder. Emulsions formed from distilled water and commercial diesel oil (DO) with concentrations below 200 ppm were used as a model of oily polluted water. The emulsions were prepared using ultrasonication without surfactant. The droplet size was directly proportional to sonication time and ranged from 135 nm to 185 nm. A sonication time of 20 min was found to be sufficient to prepare stable emulsions with an average droplet size of approximately 150 nm. The sorption tests were realized in a batch system. The effect of contact time and initial oil concentrations were studied under standard atmospheric conditions at a stirring speed of 340 rpm with an adsorbent particle size of 500 microns. The efficiency of the plasma-treated LDPE powder in oil removal was found to be dependent on the initial oil concentration. It decreased from 96.7% to 79.5% as the initial oil concentration increased from 75 ppm to 200 ppm. The amount of adsorbed oil increased with the increasing contact time. The fastest adsorption was observed during the first 30 min of treatment. The adsorption kinetics for emulsified oils onto sorbent followed a pseudo-second-order kinetic model.

Keywords: Water; Treatment; Adsorption; Polyethylene; Plasma.

Energy and Environment
(Faculty and Postdoc)

Spectrophotometric Determination of the Honey Bee Quality

Mohammed H. Alsafran[1,2], Mohammed Akkbik[1], Ahmad A. Ahmadi[1],
Mohammad I. Ahmad[1]

[1]Central Laboratories Unit (QUCLU), Qatar University, Qatar
[2]Agricultural Research Station (QUARC), Qatar University, Qatar
mohammad.ibrahim@qu.edu.qa

Abstract

Honey produced by bees from nectar in flowers and plants, is an aqueous supersaturated sugar solution, mainly monosaccharide (fructose and glucose) (70%−80%) and water (10%−20%). 5-Hydroxymethylfurfural (5-HMF) content in honey bee is an indicator of the purity. High concentration of 5-HMF in honey bee indicates overheating and poor storage conditions (The chemical properties of honey, free acids and total acids) significantly in correlation with the HMF content and provides parameters that are used to make quick assessments of honey quality (Khalil et al., 2010). The recommended value of 5-HMF (Alinorm 01/25, 2000) and the European Union (Directive 110/2001) in honey usually should not exceed 80 or 40 mg/kg, respectively. This work aims to examine the concentration of 5-Hydroxymethylfurfural (5-HMF) content in different Qatari honey bee samples as an indicator of the honey bee quality by using the reference White Method.

Keywords: Honey; Hydroxymethylfurfural; White Method; Spectrophotometer

Energy and Environment
(Faculty and Postdoc)

Digital Twin for Power Plants, Energy Savings and other Complex Engineering Systems

Ahmad K. Sleiti[1], Jayanta S. Kapat[2], Ladislav Vesely[2], Mohammed Al-Khawaja[1]
[1]Qatar University, Qatar
[2]University of Central Florida, USA
asleiti@qu.edu.qa

Abstract

Digital Twin (DT) is a digital representation of a machine, service, or production system that consists of models, information, and data used to characterize properties, conditions, and behavior of the system. Renewable energy integration will make future power plants more complex with addition of varieties of Power-to-X technologies, Electrolysis to green hydrogen, onsite storage and transport of hydrogen, and use of pure or blended hydrogen, etc. These future power plants need robust DT architecture to achieve high Reliability, Availability and Maintainability at lower cost.

In this research work, a comprehensive and robust DT architecture for power plants is proposed that also can be implemented in other similar complex capital-intensive large engineering systems. The novelty and advantages of the proposed DT is asserted by reviewing the state-of-the-art of DT in energy industries and its potential to transform these industries. Then the proposed DT architecture and its five components are explained and discussed. More specifically, the main contributions of the present work include:

1. Overview of DT key research and development for energy savings applications to consider important findings, research gaps and the needed future development for the proposed DT for power plants.
2. Overview of DT key research for power plants including applications, frameworks and architectures to consider important findings and to confirm the novelty and robustness of the proposed DT.
3. Proposing and demonstrating new robust DT architecture for power plants and other similar complex capital-intensive large engineering systems.

Keywords: Digital twin; Power plant; Dynamic system model (DSM); Anomaly detection and deep Learning (ADL); Sensor network; Energy cyber-physical systems

Energy and Environment
(Faculty and Postdoc)

Double layered Polymeric Coatings for Corrosion Protection of Steel

Amani Hassanein[1], Adnan Khan[1], R.A. Shakoor[1], Ramazan Kahraman[2]
[1]Center of Advanced Materials, Qatar University
[2]Department of Chemical Engineering, Qatar University
amani.hassanein@qu.edu.qa

Abstract

Corrosion is one of the challenging issues faced by many industries, causing substantial economic losses every year due to the degradation of metallic parts, raising many safety concerns. Therefore, it is of utmost relevance to developing strategies that can repair the damaged part of the coatings to protect the base metal and restrict the initiation of corrosion. Towards this direction, the concept of double-layered polymeric coatings (DLPCs) for corrosion protection is introduced as a novel strategy to bring different healing functionalities into coating matrices. The developed DLPCs are composed of a top layer containing 5wt. % of melamine urea-formaldehyde microcapsules (MUFMC) encapsulating boiled linseed oil (self-healing agent), and bottom layer having 3wt. % benzotriazole (corrosion inhibitor) loaded into halloysite nanotubes (HNTs). The DLPCs were developed on mild steel substrate employing a doctor blade technique. The electrochemical analyses indicates that the DLPCs demonstrate improved corrosion resistant properties. This improved performance can be ascribed to the efficient triggering of the individual carriers in the quarantined matrix, resulting in enhanced corrosion efficiency of the DLPCs. The promising characteristics of DLPCs make them suitable for many potential industrial applications.

Keywords: Double-layered polymeric coatings; Self-healing; Melamine urea-formaldehyde microcapsules; Halloysite nanotubes; Corrosion inhibition

Energy and Environment
(Faculty and Postdoc)

Experimental Investigation of Innovative Thermal Mechanical Refrigeration System

Ahmad K. Sleiti, Wahib A. Al-Ammari, Mohammed Al-Khawaja
Qatar University, Qatar
wahib.alammari@qu.edu.qa

Abstract

The current electrical refrigeration and air condition systems are considered as one of the major sources for ozone depletion and global warming problems. Furthermore, they consume a large percentage of the worldwide gross production of electricity (around 17%). Therefore, developing new refrigeration systems that might be able to work using renewable sources (solar, geothermal, etc.) and waste heat sources is necessary to address these problems. In this paper, the experimental investigation of an innovative thermal-mechanical refrigeration (TMR) system is presented. The TMR system replaces the electric compressor of the conventional refrigeration systems with an innovative expander-compressor unit (two connected double-acting cylinders). The proposed ECU can be driven by ultra-low heat temperature sources, has simple configuration, and high flexibility for the operating conditions. A hybrid electric-compressor and ECU refrigeration setup was developed to investigate the performance of the ECU and compare it to that of an electric compressor. The experiment was conducted using R134a as a working fluid at different masses. The results show that a maximum COP of 0.57 is obtained at a refrigerant mass of 30g (in electric mode) and a maximum COP of 0.41 is obtained at a refrigerant mass of 60g (in ECU mode).

Keywords: Innovative Thermal Mechanical Refrigeration System; Experimental investigation; Hybrid setup; Waste heat

Energy and Environment
(Faculty and Postdoc)

Gearless Powertrain for Electric Vehicles

Atif Iqbal, Prathap Reddy, Mohammad Meraj
Qatar University, Qatar
atif.iqbal@qu.edu.qa

Abstract

Electrical Machines are driving the modern world in one way or the other. The modern world is moving towards the sustainability of ecological systems and greener modes of transportation to stabilize the environmental conditions for future generations. For this, the multiphase machines have risen as efficient solutions over traditional 3-phase electrical machines. In this project, a Pole Phase Modulated (PPM) multiphase induction motor drive is developed for gearless electric vehicle applications. With the help of conventional pole changing techniques (like using multiple auxiliary windings or dual stator windings) variable speed and torques can be achieved but the poor copper utilization, de-energization of the windings, and multiple auxiliary windings are the major limitations. In this project, a novel single stator winding multiphase induction motor is developed that is capable of delivering variable speed-torques by varying the number of phases as well as poles simultaneously using novel multiphase power converter topologies. Moreover, the proposed drive offers high fault-tolerant capability, the ability to handle high power with reduced voltage ratings of power electronic devices, better torque/power distribution, and improved efficiency with a lesser magnitude of space harmonics, etc. The proposed drive gives similar speed torque characteristics of conventional IC-based conventional vehicles, which helps in the elimination of the gearbox system in the EVs. This minimizes the cost, size, weight, and volume of the vehicle. Two-level inverters and multilevel inverters with carrier phase shifted space vector PWM are developed for achieving the better performance of the PPM-based MIM drive w.r.t. efficiency, torque ripple and DC link utilization. Fault-tolerant operation of the drive with respect to inverter switch or source failures is also developed as a part of the project and presented. To operate the PPM-based MIM drive smoothly in different pole phase combinations, the indirect field-oriented vector control is developed and presented.

Keywords: Electric vehicles; Motor drives; Green energy; Energy conservation; Multiphase motor drives

Energy and Environment
(Faculty and Postdoc)

Multiple Output Contactless Inductive Power Transfer System for Electric Vehicle Battery Charging Station

Atif Iqbal, Mohammed Al-Hitmi, Kiran Pandav
Qatar University, Qatar
Atif.iqbal@qu.edu.qa

Abstract

The proposed fast-charging system is capable of simultaneously charging the three different duty electric vehicles (small, medium, heavy) at the same time. The size and weight of the proposed system are reduced by operating at a higher switching frequency. The load (battery) dependency and system efficiency are eliminated and improved, respectively, by adopting the series-series compensation network in the proposed system. The CC-CV charging algorithm is adopted to charge the battery and PI controller, and the additional controlling loop is developed to remove the overshoot of the current during the CC to CV transition.

Keywords: Electric vehicles; Wireless charging; Battery charging; Charging stations; Inductive power transfer

Energy and Environment
(Faculty and Postdoc)

Off – Grid Power Supply Solution for Portable Cabins using Solar PV System for Qatar

Atif Iqbal, Marif Daula

Qatar University

atif.iqbal@qu.edu.qa

Abstract

In this project, a new system for power supply for remote areas has been proposed. In the proposed system, solar PV based system with battery storage for stand-along application has been discussed. In addition, the use of a multilevel inverter and high-gain DC/DC converter has been proposed. The proposed multilevel inverter generates a nine-level output voltage waveform with quadruple voltage gain. The proposed DC/DC converter is based on the concept of a switched-inductor with voltage lift switched-capacitor and has been verified for a voltage gain of 20. The experimental results confirmation the satisfactory performance for stand-alone applications of the proposed converters.

Keywords: Solar PV; Inverter; Multilevel inverter; Dc/DC converter; Maximum power point tracking

Energy and Environment
(Faculty and Postdoc)

Simultaneous CO₂ treatment and blue energy generation from wasted industrial streams

Tasneem Elmakki[1], Sifani Zavahir[1], Mona Gulied[1], Reem Azam[1], Peter Kasak[1],
Anton Popelka[1], Dong Suk Han[1, 2]

[1]Center for Advanced Materials, Qatar University, Qatar
[2]Department of Chemical Engineering, College of Engineering, Qatar University, Qatar
ts1302844@qu.edu.qa

Abstract

In the last decade, there has been an increased global need for finding bright solutions to tackle industrial wastes and emissions release. Herein, this work explores the utilization of a compact Reverse Electrodialysis (RED) system that transforms the chemical potential energy of mixing an ammonia based purified industrial wastewater stream (low concentration stream - LC), with an effluent high salinity RO brine stream (High concentration-HC) into viable electrical energy. The LC and HC streams are directed from ammonia production plants and seawater reverse osmosis desalination plants, respectively. The acquired electrical energy from this RED process is simultaneously used to power an Electrochemical (EC) system. The electrochemical system utilizes two critical waste streams produced from ammonia production plants. One being a wastewater stream that is purified in the anode chamber of the cell via the use of active chlorine species, and the other being the huge amount of emitted CO_2 that is directed into the cathode chamber and there converted to value added chemicals. The purified wastewater stream coming out of the EC system is used as the aforementioned LC stream in the RED process, hence, forming an integrated RED-EC system that manages industrial waste streams, minimizes liquid discharge & CO_2 emissions, and employs a sustainable internal energy production process. In this study, the RED system is first optimized to attain the maximum power density through exploring the influence of concentrate and dilute stream concentrations, compositions and flowrates. In addition, to the number of membrane pairs needed to produce desired voltages. The RED cell gave a maximum power density of 3.25 Wm^{-2} with 20 membrane pairs and a salinity gradient of 0.98M between a concentrated brine stream and a mixed $NaCl/(NH_4)_2SO_4$ stream. Furthermore, around 15 cell pairs were needed to provide -1.5 V of energy to drive CO_2 conversion to formate.

Keywords: Reverse electrodialysis; Ammonia; CO_2 conversion; Sustainability; Wastewater management

Energy and Environment
(Faculty and Postdoc)

Membrane distillation crystallization hybrid process for zero liquid discharge in QAFCO plant

Mona Gulied[1], Sifani Zavahir[1], Tasneem Elmakki[1], Hazim Qiblawey[2], Bassim Hameed[2], Dong Suk Han[1,2]

[1]Center for Advanced Materials, Qatar University, Qatar
[2]Department of Chemical Engineering, College of Engineering, Qatar University, Qatar
mgulied@qu.edu.qa

Abstract

Qatar fertilizer company (QAFCO) is one of the world's largest single site producer of ammonia and urea with production capacity of 12,900 metric tons per day. Currently, QAFCO faces major challenges in terms of water streams management that is generated from many processes such as wastewater from Harbor-Bosch process and brine solution from multi-stage flash (MSF) desalination process. To protect the environment; QAFCO has been making an effort to minimize the disposal of all types of water disposed into the sea. Here, this project proposes to develop a viable and economically effective process that can reach zero-liquid discharge (ZLD) of all processed water or wastewater from QAFCO facilities. The best method for ZLD is membrane distillation crystallization (MDC) hybrid process that concentrates and minimizes the volume of wastewater/brine streams to form solid through crystallizer. Membrane distillation (MD) is a thermally driven membrane process. It applies low-grade energy to create a thermal gradient across a microporous hydrophobic to vaporize water in the feed stream and condense the permeated vapor in the cold side. This research work aims to evaluate the performance of MDC for ZLD using commercial/fabricated electrospun nanofiber membrane (ENM) PVDF –base membranes at different type water streams. A general observation, higher water vapor flux and water recovery were exhibited at higher feed conductivity at 70°C. Moreover, the fabricated hydrophobic PVDF ENMs results confirmed the formation of nanofiber at the membrane surface using scanning electron microscopy (SEM). In addition, the water contact angle values of PVDF ENMs were greater than 100° and have stable mechanical and chemical properties. The ongoing research work will conduct a comparison between the optimum PVDF ENMs and the commercial MD membranes in terms of water recovery, salt rejection%, fouling/scaling, amount of collected solid and energy consumption at optimum operating conditions in MDC. In addition, it will perform a techno- economic feasibility assessment of the MDC hybrid process.

Keywords: Membrane distillation; Superhydrophobic membrane; Electrospun; Crystallization; Zero liquid discharge

Energy and Environment
(Faculty and Postdoc)

A Design-led FEWW Nexus Approach for Qatar University

Theodora Karanisa[1], Ahmed Ouammi[1], Helmi Hamdi[1], Imen Saadaoui[1], Noora Fetais[2], Sami Sayadi[1]

[1]Center for Sustainable Development, Qatar University, Qatar
[2]Computer Science and Engineering Center, College of Engineering, Qatar University, Qatar

tkaranisa@gmail.com

Abstract

Demographic explosion, climate change, urbanization, change of life quality, and food demand have put extra pressure on Food, Energy, Water, and Waste (FEWW) resources. A special focus has been placed on university campuses as they are representative urban communities with a substantial need for food, energy, and water and they generate waste. Furthermore, universities can be models for the community as they can apply and disseminate new ideas.

The case study of the Qatar University via the Doha Living Lab (DLL) generates ideas and gives solutions to the FEWW Nexus through urban agriculture practices adopted to the climatic conditions of Qatar. The DLL follows the M-NEX Design method consisting of three steps: Design Development, Design Evaluation, and Implementation by engaging stakeholders and the local community. The areas of the DLL increase food production on the campus while minimizing the use of energy and water, enhance biodiversity as well as soil quality by valorizing food waste. The carbon footprint of DLL is reduced by 2% when the same quantity of food is produced locally than imported. This applies when 75% of the energy needs come from renewable sources, 75% of the needed animal feed comes from bio waste, and finally, when novel greenhouse technologies are utilized with low energy consumption.

According to the research results, the FEWW Nexus and food production on campus can be sustainable in terms of low carbon footprint with minimal resource use, use of renewable energy sources, and food waste valorization.

Keywords: FEW Nexus; Urban agriculture; Design; Renewable energy; Sustainability

Energy and Environment
(Faculty and Postdoc)

Liquid exfoliated MoS2 Sheet coupled with Conductive Polyaniline for Gas Sensor

Hemalatha Parangusan, Jolly Bhadra, Razen Al-Qudah, Hibballa Elgurashi, Marwa Abdelhakem,
Ebtihal Mohaned
Qatar University, Qatar
hemalatha@qu.edu.qa

Abstract

Polyaniline (PANI)/MoS_2 composites with porous microspheres were prepared by a hydrothermal and in situ polymerization method. The structural, optical, and morphological properties were characterized by X-ray powder diffraction, FTIR, scanning electron microscope, transmission electron microscope. The XRD results confirmed that the PANI/MoS_2 composite was formed. Morphological characterization reveals that the successful formation of few to multilayered MoS_2 nanosheet intercalated with the PANI nanoparticles.

Keywords: PANI; MoS2 nanosheet; CO_2; Liquid phase exfoliation

Energy and Environment
(Faculty and Postdoc)

Lithium capture in seawater reverse osmosis (SWRO) brine using membrane-based capacitive deionization (MCDI) system

Reem Azam[1], Tasneem ElMakki[1], Sifani Zavahir[1], Zubair Ahmad[2], Gago Guillermo Hijós[3],
Dong Suk Han[1, 4]

[1]Center for Advanced Materials, Qatar University, Qatar
[2]Young Scientists Center, Qatar University, Qatar
[3]Acciona O&M Desalination Middle East, Qatar
[4]Department of Chemical Engineering, College of Engineering, Qatar University
ra1203108@qu.edu.qa

Abstract

Lithium-battery based industries including vehicles, electronics, fusion and thermonuclear, consume lithium rapidly, which raises the need for developing a lithium recovery system. Lithium global market consumption in 2016 was reported to be 35% in batteries manufacturing. The total content of lithium in seawater and oceans is estimated at 2.5×10^{14} kg, with an average concentration of 0.17 mg/L. Salt lakes contain 1,000–3,000 mg/L of lithium, while geothermal water up to 15 mg/L. In 2020, the US Geological Survey (USGS) reported that the total Li resource is about 80 million ton. In nature, lithium does not exist as pure metal owing to its high reactivity with water, air, and nitrogen. Commonly lithium is mined from metallic minerals from earth or brine salt marsh and used in various fields in the form of lithium carbonate (60%), lithium hydroxide (23%), lithium metal (5%), lithium chloride (3%), and butyl lithium (4%). The extraction of 1 kg of lithium needs around 5.3 kg of lithium carbonate. The amount required to produce lithium-ion batteries (LIB) for cell phones or electric cars is estimated to be 0.8 kg/s of lithium metal, which is equivalent to 25,000 tons per year. As we use this much of LIB, this will end up having significant amounts of lithium battery waste, thus recovering LIBS and using it as cathode electrode in MCDI is an excellent way with benefit. This work proposes to efficiently utilize seawater reverse osmosis (SWRO) brine as a medium to recover lithium from seawater followed by its selective capture of lithium element using SLIB as MCDI cathode electrode material. Thus, these attempts could be closer to an improved and more effective loop of lithium targeted capture-reuse system.

Keywords: Lithium recovery; Membrane capacitive deionization (MCDI); Spent lithium ion battery (SLiB); Electric double layer (EDL)

Building Resilience at Universities:
Role of Innovation and Entrepreneurship

Energy and Environment
(Faculty and Postdoc)

Modelling and Analysis of Power Electronic Converters for EV Charging/Discharging for G2V, V2G and V2X Operations

Atif Iqbal, Shirazul Islam, Mohammad Meraj
Qatar University, Qatar
atif.iqbal@qu.edu.qa

Abstract

The research work deals with the implementation of various chargers used for electric vehicles in the context of Qatar. These chargers are categorized as slow, fast, and super-fast chargers. The electric vehicles not only lead to a reduction in carbon footprint, but the V2X mode of operation of EVs implemented with the help of a bidirectional converter is used to provide ancillary services in the system such as shaving peak and valley in load demand, frequency, and voltage regulation, balance the supply and demand for active power and reactive power, compensate grid current harmonics, improve power quality, provide reactive power compensation and improve system stability. Due to the above-mentioned advantages, V2X mode of operation will be explored in this research work.

Keywords: Electric vehicles; Power converters; Battery charging; Charging stations

Energy and Environment
(Faculty and Postdoc)

Ecological and Health Risks Assessment of Potentially Toxic Metals and Metalloids Contaminants

Mohammed Alsafran[1], Kamal Usman[1], Hareb Al Jabri[2], Muhammad Rizwan[3]

[1]Agricultural Research Station (ARS), Office of VP - Research & Graduate Studies, Qatar University, Qatar
[2]Department of Biological & Environmental Science, College of Arts & Sciences, Qatar University, Qatar
[3]College of Resources and Environment, Huazhong Agricultural University, Wuhan, China
kusman@qu.edu.qa

Abstract

Potentially toxic environmental contaminants, including metals and metalloids, are commonly found in emerging economies. At high concentrations, elements such as As, Cr, and Ni can be hazardous and may lead to various health problems in humans, including cancer. The current study measured As, Cd, Cr, Cu, Ni, Pb, V, and Zn concentrations in agricultural soils. Pollution levels and potential negative impacts on human and environmental health were determined using the United States Environmental Protection Agency (USEPA) standard methodologies. According to the study's findings, the studied element concentrations descended in the following order: Zn > Cr > V > Ni > As > Cu > Pb > Cd. Of these, As (27.6 mg/kg), Cr (85.7 mg/kg), Ni (61.9 mg/kg), and Zn (92.3 mg/kg) concentrations were higher than average world background levels. Each of these elements also had an enrichment factor (EF > 1), indicating their anthropogenic origin. The combined pollution load index (PLI > 1) and geo-accumulation index (Igeo) range values of −0.2–2.5 further indicated that the soil was polluted up to 58%. However, the ecological risk factor (Er ≤ 40.6) and potential ecological risk index (PERI = 79.6) suggested low ecological risk. A human health risk evaluation showed that only As, with a hazard index (HI) of 1.3, posed a non-carcinogenic risk to infants. Additionally, As, Cr, and Ni, with total carcinogenic risk (TCR) values of 1.18×10^{-4} and 2.06×10^{-4} for adults and children, respectively, proved carcinogenic to both age groups. The elements' carcinogenic risk (CR) potential descended in the following order: Ni > As > Cr. Additionally, for both adults and children, oral ingestion is the most likely exposure pathway. Our findings support the need for closer monitoring of potentially toxic metals and metalloids levels in cultivated soils and farm produce in Qatar.

Keywords: Toxic metals; Arsenic (As); Carcinogenic risk; Agricultural soil

Energy and Environment
(Faculty and Postdoc)

Effect of UV/Ozone treatment on surface hydrophilicity and humidity sensing properties of PVDF-BaTiO3 composite films

Jibril Al-Metairi, Ruba Ali, Shoaib Mallic, Zubair Ahmed, Noora Al-Thani

Qatar University, Qatar

ruba.ali@qu.edu.qa

Abstract

In this research work, we have studied the impact of UV/ozone treatment on the hydrophilicity of the PVDF-BaTiO3 nanocomposite film. We have prepared the nanocomposite solution by mixing PVDF (2.5 wt% kept constant) and BaTiO3 nanoparticles (0.25 wt%, 0.5 wt%, and 1 wt% varied concentration). The spin coating technique has been used to deposit the nanocomposite film on the Interdigitated ITO electrode.

Keywords: Nanocomposite; Humidity sensor; PVDF; Films

Energy and Environment
(Faculty and Postdoc)

Development of organic–inorganic Halide Perovskites (OHPs) based Memristors

Rana Abdou, Mohamed alHor, Zubair Ahmed, Noora Althani

Qatar University

rana.abdou@qu.edu.qa

Abstract

Organic – inorganic halide perovskite (OHP) has drawn researchers' attention working in the field of optoelectronics from last ten years due to its remarkable optical properties such as adjustable band gap, ambipolar charge transport, high optical absorption coefficients, and extended carrier diffusion lengths. OHP based memristors (memory + resistors) are a newly introduced passive two-terminal, nonlinear device used for information storage. In this work we have fabricated methyl ammonium lead iodide ($MAPbI3$) crystals-based device from $MAPbI3$ crystals. The crystals have been developed by simple solution process-based method. Developed crystals have shown highly porous geometry and trap charges across these pores facilitates higher conductivity. The fabricated device exhibits ~2.7 milli second response recovery time, which enabled elevated speed and showed hysteresis in the I-V characteristics thus demonstrating superior storage capacities. Hence, the developed device has been potential tool for next-generation non-volatile memories.

Keywords: OHP perovskites; Nonvolatile memristors; One-dimensional microrods; Charge conduction; Hysteresis

Energy and Environment
(Faculty and Postdoc)

Mercury levels in Tarmat Contaminated Beaches and its Marine Organisms living along the Qatari Coasts

Ahmed Helmy Hassan Abouelezz
Qatar University
a.hassan@qu.edu.qa

Abstract

One of the pollutants that affects the coastal environment of Qatar is the vast expanse of oil residue 'tarmats' deposited on its beaches. The current study is aimed at gauging the concentration levels of total mercury (THg) in tarmat contaminated sediments and test their presence in selected coastal species. Three biota classes (Gastropoda, Bivalvia, and Crustacea) have been found on the tarmat of Ras Rakan and Umm Tais islands. Layers of hard asphalt-like tarmats and sediments samples were collected from 34 sites, along the coast of Qatar. Moreover, the Biota Sediment Accumulation Factor (BSAF) was calculated for THg through sentinel species. The mean concentrations of THg is 0.089 ± 0.02 µg.g^{-1}. Compared to earlier studies, a relatively higher concentration of THg (0.463 µg.g^{-1}) had been observed.

Keywords: Qatar coast; Tarmat; Total mercury; Accumulation; BSAF

Energy and Environment
(Faculty and Postdoc)

The Influence of Qatari Dust on the Element Composition of Marine Plankton

[1]Oguz Yigiterhan, [1]Jassem Abdulaziz Al-Thani, [1]Samah Dib, [1]Hamood Abdulla Alsaadi,
[1]Ebrahim Mohd Al-Ansari, [2]James W. Murray
[1]Environmental Science Center, Qatar University, Qatar
[2]School of Oceanography, University of Washington, USA
oguz@qu.edu.qa

Abstract

The Exclusive Economic Zone (EEZ) of Qatar is affected by extreme dust and extensive industrialization, making it an ideal location to examine influences of coastal processes on biological activity, which greatly affects marine biogeochemical cycling. In this study, the influence of dust on the trace element composition of plankton and how distance from shore effects elemental concentrations in marine plankton was investigated. Samples were collected using net tows with mesh sizes of 50 (bulkplankton) and 200 (zooplankton) mm size-fractions in 2012 and 2014 to examine temporal and spatial variabilities. The samples were strong acid digested and analyzed using ICP-OES. Trace metal clean techniques were used. The biogenic concentrations of trace metals were determined by correcting the bulk analyses for the lithogenic contribution using aluminum content of Qatari dust as a lithogenic tracer. The relative trace metal composition of plankton from EEZ of Qatar is Fe > Zn ≈ Cu > V ≈ Ni ≈ Cr ≈ As ≈ Mo > Cd ≈ Co. Small and large size planktonic compositions were similar, except for Ba, Mn, Pb, Mo which were higher in zooplankton than bulkplankton. It was not clear if the variability was due to differences in biology, proximity to the coast or interannual effects. The geochemical and statistical analysis suggested that the concentrations of Al, Fe, Cr, Co, Mn, Ni, Pb, Li in net-tow plankton samples were mostly of lithogenic (dust) and Cd, Cu, Mo, Zn, Ca are most likely of biogenic/anthropogenic origin. The excess concentrations relative to average dust from Qatar for most elements (except Cd) decreased with distance from shore. This may be due to contamination or uncertainties with the lithogenic correction or due to our sampling locations in a marginal sea, dominated by dust input. This is an aspect of this study that warrants more research.

Keywords: Trace element composition; Marine plankton; Qatari aeolian dust; Qatar Exclusive Economic Zone; Arabian Gulf.

Energy and Environment
(Faculty and Postdoc)

Oil Spill Index (OSI) to Sentinel-2 Satellite Data: QU in International Contribution

Rajendran S[1], Fahad A.S.[1], Sadooni F.N.[1], Al-Kuwari H.A.S.[1], Vethamony P.[1], Anisimov O.[2],
Nasir S.[3], Al-Khayat J.[1], Govil H.[4], Seegobin V.O.[5]
[1]Environmental Science Center, Qatar University;
[2]Department of Climate Change, State Hydrological Institute, St. Petersburg, Russia;
[3]UNESCO Chair for Ophiolite Studies, Sultan Qaboos University, Al-Khod, Muscat, Oman;
[4]Department of Applied Geology, National Institute of Technology, Raipur, India;
[5]Department of Biosciences and Ocean Studies, University of Mauritius, Le Reduit, Mauritius
srajendran@qu.edu.qa

Abstract

An Oil Spill Index (OSI = (B3+B4)/B2) was developed and applied to Sentinel-2 optical satellite data of the European Space Agency (ESA) to map marine oil spills using spectral absorption characters of spectral bands of the Sentinel-2. The potential application of OSI and derived indices [i. (5+6)/7, (3+4)/2, (11+12)/8 and ii. 3/2, (3+4)/2, (6+7)/5] were demonstrated to the oil spills that occurred off Mauritius, Indian Ocean, on August 06, 2020, and Norilsk region, Russia on May 29, 2020, and the results were published in the peer-reviewed research journals. Recently (August 19, 2021), our methodology was recognized by the Sentinel-Hub (a repository of custom scripts) https://custom-scripts.sentinel-hub.com/sentinel-2/oil-spill-index/ for OSI calculation. We validated the remote sensing results with the drone images taken during the incident. Our OSI index is the first to be applied to Sentinel-2 optical data to map oil spills. We proved the potential of indices and the capability of Sentinel sensors to detect, map, monitor, and assess the oil spill, which can be used for emergency preparedness of oil spills.

Keywords: Oil Spill Index (OSI); Sentinel-2; Satellite data; Sentinel-Hub; Custom scripts

Energy and Environment
(Faculty and Postdoc)

Understanding the electrochemical performance of LiNi0. 5Mn1.5O4 coated with Yttria and distributed over graphene nanosheets as cathode in li-ion batteries

Hanan Abdurehman Tariq[1], Zawar Alam Qureshi[2], Jeffin James Abraham[1],
Abdul Shakoor[1], Siham Alqaradawi[3], Ramazan Kahraman[2]
[1]Center for Advanced Materials, Qatar University
[2]College of Engineering, Qatar University;
[3]College of Arts and Sciences, Qatar University
hanan.tariq@qu.edu.qa

Abstract

$LiNi_{0.5}Mn_{1.5}O_4$ is a promising cathode material for lithium-ion batteries with a high-voltage spinel structure. A microwave-assisted chemical co-precipitation method was used to synthesize Y_2O_3 coated quasi-spheres of $LiNi_{0.5}Mn_{1.5}O_4$. The coating of Y_2O_3 and subsequent wrapping of quasi-spheres in graphene nanosheets does not alter the volume or promote the formation of unwanted phases. TGA analysis shows high thermal stability in the material. The material has an initial capacity of 133 mAh g^{-1} at C/10 with a retention of 98% after 100 cycles. In addition, cathode samples show a good capacity of 132 g^{-1} after 20 cycles at higher temperatures (55 °C). Oxide coatings protect the particles from ionic leaching but limit the electrical conductivity of the materials. However, graphene enhances the conductivity of the synthesized material and wraps active particles in a conductive channel. Due to the synergistic design of the material and the robust manufacturing technique, parasitic reactions are suppressed without affecting the electrical conductivity. To increase their cyclic performance, the suggested material synthesis approach may successfully be applied to various electrode materials.

Keywords: Cathode; Rate capability; Batteries; Graphene; EIS

Energy and Environment
(Faculty and Postdoc)

Origin of TPHs and PAHs in Marine Sediment nearby Oil and Gas Extraction Sites on the West Coast of Qatar

Maryam Abdulali Abdulla, Azenith Castillo
Qatar University, Qatar
m.abdulla @qu.edu.qa

Abstract

Total Petroleum Hydrocarbons (TPHs) and Polycyclic Aromatic Hydrocarbons (PAHs) are priority pollutants, which are known to be associated with petroleum products. They are released into the marine environment via accidental spillage, exploration and transportation. The present study aims to investigate the type, origin and weathering of petroleum in the coastal marine sediment of the western coastline of Qatar. Sixty-six surface sediment samples were collected along the western coastal area. The concentrations of organic hydrocarbons (TPHs and PAHs) were determined using GC-FID and GC-MS, respectively. Sediment characteristics including pH, temperature, TOC and particle size were also measured. The results indicated low concentrations of TPH (<0.001-0.246 µg/g dry weight sediment) and PAHs (<0.001-0.044 µg/g dry weight sediment). The concentrations for both organic pollutants were lower compared to the previous studies done within Qatar and in the Arabian Gulf and also indicated below the available permissible limit set by the Ministry of Municipality and Environment of Qatar and other Sediment Quality Guidelines (SQGs) used worldwide (NOAA). Pollution concentration profile is site specific where concentrations are high within the proximity of the source and derived from both direct inputs of petrogenic and pyrogenic contribution.

Keywords: PAHs; TPH; Coastal sediment; Pollution

Energy and Environment
(Faculty and Postdoc)

The Efficacy of Two Household Cleaning and Disinfecting Agents on Lentil (Lens culinaris Medik) and Faba bean (Vicia faba) Seed Germination

Ahmed Helmy Hassan Abouelezz, Talaat Ahmed

Qatar University-ESC

a.hassan@qu.edu.qa

Abstract

A germination test of Vicia faba and Lens culinaris seeds under the effect of bleach and vinegar was conducted for seven days, and the observations were recorded daily. The completely randomized design (CRD) was used to examine the germination with three replicates at the lab conditions. Six germination parameters were measured, including germination percentage (GP), germination index (GI), mean germination time (MGT), mean germination rate (MGR), vigour index (VI), plus the fresh weight (FW) and dry weight (DW) of Vicia faba and Lens culinaris seeds. As a legume crop seeds model, the efficacy of four treatment levels from 0.005% to 0.5% of bleach and vinegar on the germination was tested. A chemical analysis was performed using the ion chromatography (IC) to evaluate the effect of chloride and acetate anions up-take on the seedling germination in addition to other essential nutrients. A significant inhibition in seedling growth was observed with increasing the treatment concentration. The maximum inhibition was recorded for both seeds at 0.5%, followed by 0.1% levels, while a positive effect was represented with the lower concentrations. The chemical analysis of the up-taking active ingredients was corroborated by the germination outputs.

Keywords: Sodium hypochlorite; Vinegar; Seed germination; Legume crop; Seeds inhibition

Energy and Environment
(Faculty and Postdoc)

Lithologic Characterization and Micropore Structures of Gas Shale Strata: An example from the Midra Shale of Western Qatar

Fadhil N. Sadooni[1], Hamad Al-Saad Al-Kuwari[1], Ahmad Sakhaee-Pour[2],
Wael S. Matter[1], Indra Gunawan[1]
[1]Environmental Science Center, Qatar University, Qatar
[2]Department of Petroleum Engineering, University of Houston, USA
fsadooni@qu.edu.qa

Abstract

Gas shale is the future hydrocarbon reservoir of Qatar. The Qatari geologic section has had important successions of gas shale at different geologic times including the Eocene Midra shale, the Cretaceous Ratawi and Nahr Umr, and the Paleozoic Qusaibah and Unayzah formations. Shale samples were collected from the outcrops of the Midra Shale in Dukhan and Umm Bab areas. Samples were subjected to geochemical analyses using XRD and RXF. Selected samples were examined under SEM and TEM microscopes. All the studied samples contain palygorskite as the main mineral and, in some cases, the only mineral present, as indicated by X-ray diffraction patterns. XRF analysis shows palygorskite range from ideal palygorskite (equal aluminum and magnesium content) to aluminous palygorskite where no magnesium is recorded. The most common other minor minerals are halite, quartz, calcite, and other clay minerals: illite, smectite and sepiolite. The palygorskite chain phyllo silicates results in a fibrous habit with channels running parallel to the fiber length. Images from Transmission Electron Microscopy (TEM) clearly show the presence of bundled lath-like crystals of palygorskite 5 to 20 nm in width and several micrometers in length. The Midra Shale was deposited in a shallow marine shelf that was subjected to clastic influx from the nearby land. Although, the Midra contains many elements that support deposition under marine conditions such as large foraminifera and shark teeth, the presence of fully developed shale horizons indicate a mixed marine-continental depositional setting. Most of the micropores are channels associated with the palygorskite laths as can be seen from the TEM images or some dissolution pores that resulted from halite and gypsum dissolution by meteoric water.

Keywords: Gas; Shale; Qatar; Midra

Energy and Environment
(Faculty and Postdoc)

Feminization of Hawksbill Turtle hatchlings in the Twenty-first Century at an important Regional Nesting Aggregation

Mark Chatting[1], Shafeeq Hamza[1], Jassim Al-Khayat[1], David Smyth[2],
Sinan Husrevoglu[3], Christopher Marshall[4]

[1]Environmental Science Centre; Qatar University, [2]School of Ocean Sciences, Bangor University, UK; [3]Institute of Marine Sciences, Middle East Technical University, Turkey; [4]Department of Marine Biology, Department of Wildlife and Fisheries Sciences, Gulf Center for Sea Turtle Research, USA
mchatting@qu.edu.qa

Abstract

Projected climate change is forecasted to have significant effects on biological systems worldwide. Marine turtles in particular may be vulnerable, as the sex of their offspring is determined by their incubating temperature. This study is aimed to estimate historical and forecast future, primary sex ratios of hawksbill turtle hatchlings, *Eretmochelys imbricata*, in Qatar. Incubation temperatures were measured over two nesting seasons. Climate data from same period was regressed with nest temperatures to estimate incubation temperatures and hatchling sex ratios for the site from 1993 to 2100. Historical climate data showed female-biased sex ratios of 73.2 ±12.1% from 1993 to 2017. Female biases from 2018 to 2100 averaged 85.7% ±6.7%. In addition, predicted female hatchling production was >90% from 2054. These results show that hawksbill primary sex ratios in Qatar are at risk of significant feminization by the year 2100.

Keywords: Hawksbill turtles; Climate change; Sex ratios; Marine turtle; Feminization

Energy and Environment
(Faculty and Postdoc)

Satellite Mapping and Stabilization of the Aeolian deposits of QAFCO site 5/6

Rajendran S[1], Sadooni FN[1], Zouari N[2], Dimassi SN[2], Al-Jabri A[3], Al-Kuwari Al-Saad H[1]

[1]Environmental Science Center, Qatar University, Qatar
[2]Environmental Science Program, College of Science, Qatar University, Qatar
[3]Environment Division, Qatar Fertilizer Company, Qatar
srajendran@qu.edu.qa

Abstract

Aeolian processes produce vast areas of sand and dunes in the arid region and need monitoring since they are encroaching land and degrading infrastructures. In this study, we used the satellite data of ASTER and mineral indices namely quartz index (QI) and carbonate index (CI), and identified and discriminated the sand deposits, dunes, and associated rock formations that occurred in and around the QAFCO site 5/6, Qatar. The mapping of the area using high spatial resolution WorldView-2 satellite data confirmed the presence of sand deposits, dunes, and sand encroachments in the site. Our field studies validated the satellite data results. The grain size analyses of samples showed that the deposits have predominantly sand grains (81.3 to 99.81 %). The XRD analyses of samples identified the presence of quartz, calcite, dolomite, albite, and halite minerals. These are confirmed by geochemical analyses, which showed the high concentration of SiO_2, Al_2O_3, CaO, MgO, Na_2O, CO_3, SO_4, Cl, and B. In addition, the study of sand stabilization by bacteria method to stop the erosion at selected places of the site showed the applicability of the technique. All results allowed us to assess the implications of the deposits and encroachments at the industry site.

Keywords: ASTER Mapping; Stabilization; Aeolian deposits; QAFCO; Qatar

Energy and Environment
(Faculty and Postdoc)

Investigating the Concomitant Removal of Hydrocarbons and Heavy Metals by highly adapted Bacillus and Pseudomonas strains

Zulfa Aldisi, Mohammad Alghouti, Nabil Zouari
Qatar University, Qatar
zaldisi@qu.edu.qa

Abstract

This study investigates the concomitant removal of hydrocarbons and heavy metals by highly adapted Bacillus and Pseudomonas strains. In regions characterized by harsh conditions such as Qatar, the weathering processes would affect the content, status, and distribution of these contaminants. It was shown in the weathered soil from Dukhan oil wastes dumpsite that 14 heavy metals exceeded the EPA limits. Moreover, it was demonstrated that soil organics did not affect the distribution of the metals in the soil. However, most of the heavy metals were strongly bonded to the residual and the iron-manganese oxide fractions. Eighteen bacterial strains isolated from highly weathered oily soils were able to grow with heavy metal concentrations up to 3 mM and above for some. Seven selected strains (4 Bacillus and 3 Pseudomonas) showed the ability to remove almost 60 to 70% of most of the heavy metals when used at 1 mM. Moreover, they removed up to 75% of the diesel range organics. These results are of interest for selecting bacterial strains, which can overcome the toxicity of hydrocarbons and heavy metals and remove them concomitantly.

Keywords: Hydrocarbon-degrading bacteria; Heavy metals; Bacillus; Pseudomonas; Weathered oil

Energy and Environment
(Faculty and Postdoc)

Microplastics in the Beach Sediments around the Ras Rakan Island, Qatar

Veerasingam Subramanian, V.M Aboobacker, A.E. Giraldes, S Dib,
Jassim Al-Khayat, P Vethamony
Environmental Science Center, Qatar University
physicssingam@gmail.com

Abstract

The ubiquitous microplastic (MP) pollution is an emerging environmental issue in the marine environment. In this study, historical accumulation trends of MPs in the beach sediments around the Ras Rakan Island of Qatar have been established. The vertical distribution of MPs ranged from 0 to 665 particles/kg with maximum abundance at the surface layer (0–5 cm). Pellets were the dominant type of MPs in the surface sediments, whereas fibers were dominant in the bottom sediments. The polymer composition of MPs was identified using Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) spectroscopy. Polyethylene (PE), polypropylene (PP), polyamide (PA), polyethylene terephthalate (PET), polyvinyl chloride (PVC) and Polystyrene (EPS) were the abundant polymers present in the sediments. High MP concentrations were found in the western and northern parts of the island. The prevailing winds, waves, tides and currents are the forces responsible for the distribution and transport of MPs from the offshore to the island and further to vertical re-distribution as time progresses. The level of MP pollution along the Coast of Ras Rakan Island was higher than that found on the coast of mainland Qatar. This informs that remote islands should also be considered for MP pollution monitoring to assess the risk associated with MP on the biota.

Keywords: Microplastics; Sediments; Historical pollution trend; Ras Rakan Island

Energy and Environment
(Faculty and Postdoc)

Assemblage of Encrusting Organisms on Floating Marine Debris along the West Coast of Qatar

Jassim Abdulla Al-Khayat, Veerasingam S, Aboobacker V.M, Vethamony P

Environmental Science Center, Qatar University, Qatar

jalkhayat@qu.edu.qa

Abstract

The floating marine debris (FMD) and the associated rafting communities are one of the major stressors to ecosystem services, global biodiversity, economy, and human health. In this study, assemblages of encrusting organisms on different types of stranded FMD along the west coast of Qatar, Arabian Gulf (hereafter referred to as 'Gulf') were examined. The analysis showed 18 fouling species belonging to 5 phyla (Annelida, Anthropoda, Bryozoa, Mollusca and Porifera) on the FMD. The most abundant fouling species were the encrusting Amphibalanus amphitrite, polychaete Spirobranchus kraussii, Bryozoan species and Megabalanus coccopoma. More number of taxa were found on larger size FMD than on smaller FMD. Some of the barnacle rafting types were found to be non-indigenous species. The central and northwestern parts of Qatar had more FMD and fouled species than in other locations. The present study confirmed that huge amount of bio-fouled FMD items, causing great damage to biodiversity, drift in the surface layer of ocean under the influence of coastal dynamics, and eventually strand onto the beaches. We propose a simple, but an effective management plan for FMD and associated organisms at regional scale to restore the biodiversity, sustainability and health of the marine ecosystem in the Gulf.

Keywords: Marine litter; Hitchhiking; Invasive species; Qatar

Energy and Environment
(Faculty and Postdoc)

Variability of Physical and Biogeochemical Parameters in the Exclusive Economic Zone of Qatar

Aboobacker Valliyil Mohammed[1], Fazle Rakib[2], Ibrahim M.A.S. Al-Ansari[1], Yusuf Sinan Husrevoglu[3], Oguz Yigiterhan[1], Ibrahim A.M.J. Al-Maslamani[4], Vethamony Ponnumony[1]

[1]Environmental Science Center, Qatar University, Qatar
[2]Department of Biological and Environmental Sciences, Qatar University, Qatar
[3]Institute of Marine Sciences, Middle East Technical University, Erdemli, Mersin, Turkey
[4]Office of Vice President for Research and Graduate Studies, Qatar University
vmaboobacker@qu.edu.qa

Abstract

The oceanographic data collected along a transect in the Exclusive Economic Zone (EEZ) of Qatar during late summer (September 2014) and winter (January 2015) have been analyzed to investigate the spatial and temporal variability of hydrography and biogeochemistry. The study reveals that stratification is dominant in the deep-water regions during September, with a vertical variation of around 9 °C from surface to bottom. However, the water column remains in homogeneity during January due to strong wind mixing and surface cooling. The dissolved oxygen (DO) in the upper layer of the EEZ is on a reasonable range in both the seasons, while they gradually decrease with respect to depth in the mid and bottom layers during January. This leads to hypoxic conditions in summer. Chlorophyll-a (Chl-a) is relatively high during summer in the offshore region, while that in the nearshore regions is very low. The variability in the physical and biogeochemical parameters has shown significant effects in primary productivity in the EEZ of Qatar.

Keywords: Hydrography; Dissolved oxygen; Chlorophyll- a; Ocean stratification; Seasonal hypoxia

Energy and Environment
(Faculty and Postdoc)

Effect of Silicon Nitride and Graphene Nanoplatelets on the properties of Aluminum Metal Matrix Composites

Rokaya Hamdy Abdelatty, Adnan Khan, Moinuddin Yusuf,
Abdullah Alashraf, Rana Abdul Shakoor

[1]Center for Advanced Materials, Qatar University, Qatar
rokaya.abdelatty@qu.edu.qa

Abstract

This research work aims at investigating the influence of a fixed content of silicon nitride (Si_3N_4) and varied contents of graphene nanoplatelets (GNPs) on the physical and mechanical properties of Al-Si_3N_4-GNPs composites. The composites were fabricated by a microwave-assisted powder metallurgy route. The Si_3N_4 concentration was fixed at (5 wt.%) while the GNPs concentration was varied between (0 wt.%) to (1.5 wt.%) in the Al-Si_3N_4-GNPs. The structural analysis indicates the formation of phase pure materials with high crystallinity. The microstructural analysis confirmed the presence of the Si_3N_4 and GNPs showing enhanced agglomeration with the increasing amount of GNPs. Moreover, the surface roughness of the synthesized composites increases with an increasing amount of GNPs reaching its maximum value (RMS = 65.32 nm) at 1.5 wt.% of GNPs. The Al-Si_3N_4-GNPs composites exhibit improved microhardness and promising load-indentation behavior during nanoindentation when compared to pure aluminum (Al). Moreover, Al-Si_3N_4-GNPs composites demonstrate higher values of compressive yield strength (CYS) and ultimate compressive strength (UCS) when compared to pure Al despite showing a declining trend with an increasing amount of GNPs in the matrix. Finally, a shear mode of fracture is prevalent in Al-Si_3N_4-GNPs composites under compression loading.

Keywords: Aluminum; Composites; Microwave sintering; Microstructure; Nanoindentation

Energy and Environment
(Faculty and Postdoc)

Preliminary Investigation of Heavy Metals in Deposited Dust on Roadside Sidr Leaves

Noora Al-Naimi, Hamood Al-Saadi, Ahmed Abou Elezz, Maryam Al-Adba, Hassan Hassan
Environmental Science Center, Qatar University
n.alnaimi@qu.edu.qa

Abstract

Urban pollution has different forms; one of them is air pollution by natural sources such as dust storms or by anthropogenic sources such as traffic, whereas both are considered among the most risky environmental problems especially when it reaches soil surface and is transported to plants and enters food chain. The current study aims to evaluate the heavy metals in dust, deposited on the leaves of the Sidr trees by roadsides as a first step in assessing the use of this plant as a bio-monitor of environmental pollution. The Sidr tree was chosen to evaluate the impact of pollution because it is very common in the region and among evergreen trees in the streets, gardens and residential areas of Doha. The study was carried out close to Qatar University campus in Doha city (traffic intersections and near construction activities) as well as from a farm (located far away from traffic) as a control sample. The concentrations of ten traffic-related metals namely iron (Fe), cadmium (Cd), lead (Pb), copper (Cu), nickel (Ni), zinc (Zn), manganese (Mn), aluminum (Al), barium (Ba), and mercury (Hg) were determined in the deposited dust on leaves using ICP-OES. In our preliminary findings, we found that the distribution of trace metals in leaf dust samples from our study is similar to those reported in an earlier study done in southwestern Iran.

Keywords: Heavy metals; Dust; Sidr; Urban pollution; Qatar

Energy and Environment
(Faculty and Postdoc)

Distribution, Characterization and Weathering of Tarmats along the West Coast of Qatar

Vethamony Ponnumony, Veerasingam Subramanian, Jassim Al-Khayat,
Aboobacker V.M, Fadhil Sadooni, Hamad Al-Kuwari
Environmental Science Center, Qatar University
pvethamony@qu.edu.qa

Abstract

Oil residue in the form of tarmat (TM) deposited on the coast of Arabian Gulf countries is a major environmental concern. In this study, the current TM pollution trend along the west coast of Qatar has been assessed and compared with historical deposition trend. The range of TM distribution is 0–104 g m-1 with an average value of 9.25 g m-1. Though the current TM level is thirty-fold lesser than that was found during 1993–1997 (average 290 g m-1), the distribution pattern is similar. The chemical composition and structural characterization of TMs were studied using an ATR-FTIR spectroscopy, which indicated the presence of higher aromatic compounds in the north (N) coast TMs than those found in the northwest (NW) and southwest (SW) coasts. TM of NW coast is highly weathered compared to those found in the N and SW coasts. We found that the ATR-FTIR spectroscopic method is a rapid approach to characterize and study the weathering of TMs without any tedious sample preparation or solvent extraction.

Keywords: Tarmat; Chemical composition; Structural characterization; ATR-FTIR spectroscopy; West coast of Qatar

Energy and Environment
(Faculty and Postdoc)

Assessment of SnO2 Nanoparticles' Impact on local Pichoclorum Atomus Growth Performance, Cell Morphology and Metabolites Content

Touria Bounnit, Imen Saadaoui, Rihab Rasheed, Hareb Al jabri, Sami Sayadi, Ahmad Ayesh
Qatar University, Qatar
touria.bounnit@qu.edu.qa

Abstract

Oxide nanoparticles are among the most used nanomaterials and have received considerable attention over their potential ecological effects. Increasing investigations report toxicity of certain oxide nanoparticles, however, there are also studies showing opposite results, highlighting the fact that these nanoparticles may differ in their toxicological effects, which depend on particle variety and size, test organism species, and test method. The current study investigates the ecotoxicity of SnO2 nanoparticles on a local marine algae isolate. Five different concentrations (1, 5, 25, 50 and 100mg/L) were tested and the culture was followed for 72h. Algae growth, morphology and metabolites were followed each 24h. The obtained data showed that the SnO2 presented a toxicity on the algae growth that was decreasing with the dose, with lower doses presenting more negative impacts than the higher doses. In parallel, the slow growth observed at 1-5 mg/L was explained by the dramatic damages caused by the SnO2 on the cell morphology, which was detected using the scanning electronic microscopy. Indeed, this low negative impact of higher concentrations of SnO2 (50-100mg/L) is explained by the high agglomeration of ten particles leading to reduced effect on the cell morphology and health. Furthermore, and in accordance with the morphological data, the metabolites analysis data revealed that SnO2 nanoparticles induced stress, which was manifested by an increase in the lipid content and decrease in the proteins, a metabolite that is involved in the algal growth.

Keywords: Tin oxide nanoparticles; Pichoclorum Atomus; Toxicity; Morphological damage; Algal metbaolites

Energy and Environment
(Faculty and Postdoc)

Towards Sustainable Management of Coastal and Offshore Islands in Arabian Gulf Typology: Sensitivity Analysis, Ecological Risk Assessment of Halul and Al-Alyia Islands

Elnaim Elobaid, Bruno Welter Giraldes, Hamad Al-Kuwari, Jassim Al-Khayat,
Fadhil Sadooni, Ekhlas Elbary
Qatar University
bweltergiraldes@qu.edu.qa

Abstract

The great majority of marine ecosystems in Qatar are in fast decline and nearing collapse, where most ecosystem has lost the biological and economic functionality. Aiming to support the decision makers in the management and restoration strategies for recovering the biological and economic functionality of the ecosystems/natural resources of Qatar, we conducted 1) a typology mapping of the main components of the ecosystem of two islands, 2) a sensitivity and vulnerability assessment according to the known guidelines and standards. Highlighting the potential ecological risk and required recommendations for sustainable management plans, within the frame of Qatar National Vision 2030 (QNV 2030).

The Islands present different anthropogenic pressure. As expected, Al Alyia the coastal Island is under real risk, with critical areas of sensibility but still presenting a potential for recovering its economy and ecological functionality, highlighting the collapsed stage of the very sensitive coral reefs, the vulnerability of oyster beds and seagrass and the functionality of the mangrove (expanding) and Sabha with massive birds nesting.

The offshore Island Halul presented in the typology mapping the coral reefs as the main ecosystem but with the presence of seagrass, algae bed, sandy beach, and Sabha. The coral reef still presents a certain functionality, with corals covering several hard substrates, however with high sensitivity and high vulnerability, especially the coral in the shallow areas with scattered colonies, and the vulnerable nesting of marine turtles on beaches.

As the management, we recommend increasing the restoration effort of targeted ecosystems, mainly involving coral reefs for increasing the marine biodiversity in general and restoring the oyster beds for recovering the filtration service. Strategies must be made for recovering the ecosystems' functionality and restore the productivity of the Qatari fishing stock. We recommend applying this mapping method and sensitivity classification for all marine areas around Qatar for supporting the management plans.

Keywords: Typology mapping; Sensitivity and Vulnerability Scale; Ecosystem restoration; Marine ecosystem; Environmental management

Energy and Environment
(Faculty and Postdoc)

Assessment of Organic and Inorganic Pollutants along the Qatari Coast

Noora Al-Shamary
Qatar University, Qatar
noora.m@qu.edu.qa

Abstract

Qatar sits in the middle of the world's most important hydrocarbon producing areas where significant regional refining activity and shipping traffic take place. In addition to significant local coastline, development prominently along the eastern coast, has taken place over recent decades. Protecting Qatar's marine ecosystems from the adverse effects of environmental contaminants is a core component of the Environmental Development pillar within the National Vision 2030. However, a limited number of studies have investigated contaminant concentrations in the coastal environment of Qatar. The accumulation of contaminants in aquatic environments can affect coastal and marine ecosystems, and cause adverse effect on marine organisms and human health.

This study aims to determine contamination in Qatar's coastal environment by measuring organic and inorganic contaminants, along with physiochemical parameters, at four sites located on the contrasting east and west coast of the country. The Pearl Oyster Pinctada radiata, which is considered an iconic organism in Qatar, was used to determine a baseline of contaminants in an aquatic organism. Surface seawater, surface sediment and oysters were collected four times over two years in different seasons from the four sites. In-situ parameters (temperature, pH, and salinity), and abiotic parameters (TOC and grain sizes) were measured for seawater and sediment. Organic (TPHs, PAHs) and inorganic contaminants (trace metals including: Cd, Cu, Cr, Ni, Pb and Zn, T-Hg) were measured in all samples. Overall, Al Wakra (higher in boat traffic and fueling activities) on the east coast reported the highest levels of contaminants. High PAHs were observed in oyster tissues, while high Pb was noted in seawater and high Zn was observed in sediment and oyster. Benzo (a) pyrene was the highest compound detected in oyster. However, high TPHs were also noted in oyster tissues from Simaisma. At Al Khor, also on the east coast, high level of TPHs were recorded in seawater, while high PAHs and TOC observed in surface sediment, which had a relatively higher clay and silt content than other sites. Umm Bab (with a desalination plant near the coast), the sole sample site on the west coast, showed the highest level of TOC in seawater and sediment, highest Ni in seawater and highest total mercury in oyster. Our results, in general, report lower levels in seawater and sediment compared to other studies in the region and more widely; however, in oysters most of the contaminants are higher when compared to international guideline values. These higher levels indicate the potential for these filter-feeding organisms to absorb contaminants into their tissues from the environment that surrounds them. Additionally, bioaccumulation can occur. This study provides background information for further investigation to understand the presence and distribution of organic and inorganic contaminants in Qatar's rapidly changing coastal environment. It indicates the usefulness of applying a holistic view to environmental monitoring including the use of biomonitoring.

Keywords: TPHs; PAHs; Pinctada radiate; Metals; Total mercury
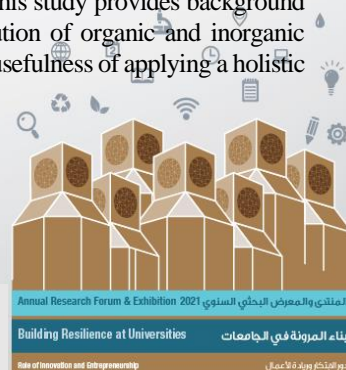
Energy and Environment
(Faculty and Postdoc)

Surface Waves generated by Shamal and Easterly winds off Qatar

Aboobacker Valliyil Mohammed, Veerasingam Subramanian,
Ebrahim M.A.S. Al-Ansari, Vethamony Ponnumony
UNESCO Chair in Marine Sciences, Environmental Science Center, Qatar University, Qatar
vmaboobacker@qu.edu.qa

Abstract

Waves in the Arabian Gulf are primarily controlled by the regional winds, for example, shamal winds during winter and early summer. Though Gulf wave characteristics have been heavily utilized for the design of offshore platforms and structures, wave features associated with various wind systems are not explicitly covered scientifically, say, for the Exclusive Economic Zone (EEZ) of Qatar. Therefore, we made an attempt to identify the features associated with different wind systems by analyzing the measured waves off Fuwairit, north coast of Qatar during 29 Oct – 26 Nov 2019. The analyses have been further extended to the Gulf using the reanalysis waves obtained from the COPERNICUS Marine Environment Monitoring Services (CMEMS) to describe the monthly, seasonal and annual characteristics. The results indicate that the easterly waves generated due to Nashi winds influence the east and northeast coasts of Qatar and shamal waves show clear dominance in the northern and northeastern offshore boundaries of the EEZ of Qatar. We find exceptional easterly (Nashi) waves during March 2019 contributing to the highest monthly mean significant wave height, which is a deviation from the known long-term wave climate of the Gulf.

Keywords: Waves off Qatar; Arabian/Persian Gulf; Nashi winds; Shamal winds; Shamal waves

Energy and Environment
(Faculty and Postdoc)

Detecting Organic Nitrogen with 1H-15N HMBC Spectra

Haw-Lih Su[1], Rajeesha Rajan[2], Yousef Mohammad Hijji[2], Mohammad Ibrahim Ahmad Ibrahim[1],
Mohammed Hussain S A Alsafran[1,3]

[1]Central Laboratories Unit, Qatar University, Qatar
[2]Department of Chemistry and Earth Sciences, Qatar University, qatar
[3]Department of Biological and Environmental Sciences, Qatar University, Qatar
hsu@qu.edu.qa

Abstract

NMR spectroscopy has been the most important tool for organic chemistry research, providing detailed structure information. While 1H and 13C NMR spectra were frequently measured, 15N NMR spectra were relatively rare, even though nitrogen is commonly observed in organic molecules. This is due to the low gyromagnetic ratio and nature abundance. Usually 15N NMR spectra are observed when the sample is in very high concentration or the nitrogen is enriched with 15N isotope.

HMBC is one of the 2D NMR techniques, measuring the through-bond correlations inside a molecule. 1H-15N HMBC actually collects a series of measurements of 1H NMR spectra with 15N information. Therefore, HMBC could get stronger signals than 15N signals and provide the opportunity for the indirect measurement of 15N signals.

Keywords: 15N NMR; HMBC; Gyromagnetic Ratio; 2D NMR

Energy and Environment
(Faculty and Postdoc)

A comparative study of Seagrasses Species in Regional Seas and QMZ

Ekhlas M.M. Abdelbary, Aisha AlAshwal
Qatar University, Qatar
aalashwal@qu.edu.qa

Abstract

Seagrasses are flowering monocot green plants that have adapted to marine life, and remain completely immersed in seawater and are primary producers of food for numerous marine animals.

Seagrasses are of worldwide distribution and it was earlier estimated that there are approximately 60-72 known species of seagrasses. It is now evident that the number of seagrasses species is almost 200, comprising 25 genera and 5 families, namely Cymodoceaceae, Hydrocharitaceae, Posidoniaceae, Zosteraceae and Ruppiaceae, covering a global area of 300,000-600,000 km^2. It is also estimated that they have declined in area by 29%.

The Western Indo-Pacific realm encompasses 13 species in two families; the Cymodoceacae with 4 genera and the Hydrocharitaceae with 3 genera. Twelve species extend into the Red Sea, 4 occur in the Arabian/Persian Gulf and 4 in the Arabian Sea.

The total area of Qatar marine zone (EEZ) is approximately 35,000km^2 and three species of seagrasses are known to occur in this zone. These are *Halophila stipulacea*, *Halophila ovalis* and *Halodule uninervisis*, the most common one.

It is established that seagrasses consolidate and stabilize bottom sediments, create and maintain good water quality (clarity), produce oxygen, provide food, nursery ground for many animals and have been proven to be very important in GHG emissions.

Keywords: Seagrasses; Halophila stipulacea; Haplophila ovalis; Halodule uninervisis; QMZ

Energy and Environment
(Faculty and Postdoc)

Coral Research and Nursery Farm Project

Pedro Range[1], Bruno Giraldes[1], Jassim Al-Khayat[1], Manuel M. Romeo[1], Nissy Chacko[1], Mark Chatting[1], Aisha Alashwal[1], Nagat Al-Omari[1], Kholoud Sarhan[1], Sally Saliba[1], Hamad Al-Mohannadi[2], Khalid Bashir[2], Syed Faisal Mustafa[2], Maryam Abdulla[2], Hamad Al-kuwari[1]

[1]Qatar University, Qatar
[2]Qatargas Operating Company Limited, Qatar
prange@qu.edu.qa

Abstract

In the framework of the Coral Management Plan for the North Field Expansion Project (NFE) and North Field Production Sustainability Project (NFPS), Qatargas has partnered with the *Environmental Science Center (ESC)* to develop the first land-based coral nursery in Qatar. This nursery plan includes the extraction of 1000 corals' colonies from the NFPS and NFE pipeline corridors, north of Ras Laffan, and hence their transportation to the nursery facility, rehabilitation under controlled husbandry conditions, fragmentation, out-plantation to carefully selected recipient sites and long-term monitoring (up to 48 months). The first two batches of 200 corals were extracted in March and outplanted in April 2021. Results of the first two monitoring events, after 44 and 66 days, were quite encouraging for the seven coral genera tested. Attachment success was very high, with 92% to 97% of the outplanted fragments being detected during monitoring. No bleaching, disease or mortality was recorded so far. The coral propagation methods used in this project (i.e., fragmentation, husbandry and outplanting), although widely used, have been tested with a restricted number of branching coral species and usually in *in-situ* nurseries. Our project is among the first to apply this type of approach (land-based nursery) to reef restoration in the Arabian Gulf.

Keywords: Coral restoration; Arabian Gulf; Micro-fragmentation; Land-based nursery

Energy and Environment
(Faculty and Postdoc)

Atmospheric Black Carbon over Qatar: Seasonal Variability and Source Apportionment

Ersin Tutsak, Mohamed M. Mahfouz, Imran Shahid

Qatar University

ersin@qu.edu.qa

Abstract

The earth's atmosphere contains minute particles suspended within it. These atmospheric particles influence the earth's radiation budget through their ability to absorb and scatter radiation. Black carbon (BC) is a type of carbonaceous particle, characterized by highly absorbing solar radiation. Unlike sulfate and sea-salt aerosols, black carbon causes positive radiative forcing due to its absorbing nature. With the accumulation of greenhouse gases in the atmosphere, the average global temperature increased by 1.09°C (IPCC, 2021), between 1850-1900 and the last decade. Since black carbon is one of the major light-absorbing components of aerosol, there is a need to assess BC concentration, their origin, and the contribution of both human-induced combustion and biomass burning emissions to BC levels. In this study, four-year measurements of aerosol absorption at seven wavelengths were investigated in order to determine the daily and seasonal behavior of black carbon and contribution of fossil fuel (FF) and biomass burning (BB) emissions to total BC mass concentration in a suburban area located north of Doha. The highest concentrations of BC were observed during the winter and the lowest values during the summer. The absorption coefficient (B_{abs}) at 470 nm (950 nm) showed large daily variability, ranging from 7 (3) to 187 (95) Mm^{-1}. The mean B_{abs} at 470 nm and 950 nm for the full period were 55 ± 29 Mm^{-1} and 25 ± 13 Mm^{-1}, respectively. Fossil fuel emissions were found to be the major source of BC levels. Nonetheless, the influence of biomass burning should not be disregarded. Future studies must be done to fully identify the enhanced absorption in shorter wavelengths.

Keywords: Aerosol; Black carbon; Absorption coefficient; Source apportionment

Energy and Environment
(Faculty and Postdoc)

Investigation on the effect of LiTFSI salt on PVDF-based Solid Polymer Electrolyte Membranes for Lithium-Ion Batteries

Christian Arro, Mohammad Ibrahim Ahmad, Nasr Bensalah
Qatar University
nasr.bensalah@qu.edu.qa

Abstract

Solid polymer electrolytes provide an alternative approach to providing improved safety whilst concurrently acting as a performance enhanced separator within Lithium-ion batteries (LIBs). This investigation studies the effects of Lithium bis(trifluoromethanesulfonyl)imide (LiTFSI) salts in a polymer blend with Polyvinylidene fluoride (PVDF) and Poly (vinylpyrrolidone) (PvP) or Poly (4-vinylpyridine) (P4VP) on the performance of SPE membranes. Characterization by X-ray diffraction and Fourier-transform infrared spectroscopy highlights the changes due to LiTFSI, specifically amorphization. Performance studies with increasing LiTFSI showed improved thermal stability and the inhibition of PVDF endotherms on differential scanning calorimetry (DSC) profiles. The drawbacks of increased LiTFSI content were evident on the mechanical performance with decreased thresholds on the tensile strength. Inversely, improvements on the dielectric performance and conductivity were observed with excellent workability from a wide electrochemical stability window of 0.5 to 3.64 V *vs.* Li^+/Li. Additionally, the incorporation of metal-fillers; Aluminum Oxide, Zirconia Oxide and Silicon Oxide was similarly studied.

Keywords: Solid Polymer Electrolytes; PVDF blends; LiTFSI salts; Thermal stability; Dielectrics

Energy and Environment
(Graduate Students)

Self-healing behavior of Epoxy-based Double-layer Nanocomposite Coatings modified with Zirconia Nanoparticles

Sehrish Habib, Amani Hassanein, Abdul Shakoor, Ramazan Kahraman,
Sadig Mahdi Ahmed
Qatar University, Qatar
sh18052@qu.edu.qa

Abstract

This work reports the self-healing behavior of epoxy reinforced ZrO_2 double-layer nanocomposite coatings to alleviate the deleterious effects of corrosion in the oil and gas industry. The corrosion inhibitor (imidazole) and self-healing agent (polyethyleneimine) were separately loaded into zirconia nanocarrier. The epoxy used as the matrix was reinforced with modified Zirconia and applied on pre-treated steel substrate as pre and top layer. The pre-layer was Zirconia modified with imidazole reinforced into epoxy, and the top layer was Zirconia, modified with polyethyleneimine, reinforced into epoxy. Both layers worked independently to provide double protection to the steel substrate. TEM analysis validated that ZrO_2 was 15-25 nm in size with spherical morphology. FTIR analysis results confirmed the chemical interactions and bonding among various chemical species. UV-vis analysis proved the pH and time-dependent release of inhibitor and self-healing agent. Self-healing behavior of the double-layer epoxy-based coating was validated through SEM, which revealed the healing of scratched area within 96 h. EIS analysis performed in 0.61 M NaCl solution demonstrated better corrosion protection of double-layer coatings on steel as compared to blank epoxy and single-layer coatings. This improved corrosion inhibition and resistance are attributed to the efficient release of corrosion inhibitors and self-healing agents from ZrO_2 nanoparticles in response to the change in the external stimuli. These coatings can be considered a new route for protecting against corrosion in the oil and gas industry and marine applications.

Keywords: Zirconia nanoparticles; Epoxy; Double layer; Nanocomposite coatings; Corrosion behavior

Energy and Environment
(Graduate Students)

Novel Prosopis Juliflora Leaf Ethanolic extract as natural Antifungal agent against Botrytis Cinerea: Application on Strawberries' shelf-life extension

Iman Saleh, Mohammed Abu-Dieyeh
Qatar University, Qatar
is1704842@qu.edu.qa

Abstract

Spoilage from fresh produces is a worldwide concern that accompanies the global increase in food demand. Adverse human health and environmental effects of commercial pesticides is a major public concern. Botrytis cinerea is one of the top ten pathogens that affect fresh produce including strawberries' shelf-life around the world. Botrytis cinerea can progress easily from infected fruits to healthy ones even at low storage temperatures, which can lead to spoilage of entire lots in few weeks.

Strawberries are widely consumed raw berries, which are famous in their processed forms such as jam and juices. The delicate fruit has a very short postharvest life. It is susceptible to mechanical injuries, fast dehydration and fungal infection. Prosopis juliflora is an invasive tree in many countries including Qatar.

In this report, the Prosopis juliflora water soluble leaves ethanolic (PJ-WS-LE) novel extraction method will be described with an evaluation of its effectiveness as antifungal agent and possible coating material for shelf-life extension.

PJ-WS-LE extract showed total inhibition of Botrytis cinerea growth with a minimum inhibitory concentration of 1mg/ml. Exposure to the extract affected badly the structure of the hyphal fungi. The extract extended also strawberries' shelf-life by 2.32X.

PJ-WS-LE extract will be chemically described and its effectiveness in the extension of other fresh produces' shelf-life will be evaluated.

Keywords: Strawberry; Postharvest diseases; PJ-WS-LE extract; Storage shelf-life; Antifungal

Energy and Environment
(Graduate Students)

Synthesis & Performance Evaluation of Hybrid Cathode Materials for Energy Storage

Buzaina Moossa[2], Jeffin James Abraham[1], Ramazan Kahraman[2],
Siham Al Qaradawi[3], Rana Abdul Shakoor[1]
[1]Center for Advanced Materials (CAM), Qatar University, Qatar
[2]Department of Chemical Engineering, College of Engineering, Qatar University, Qatar
[3]Department of Chemistry & Earth Sciences, College of Arts and Science (CAS), Qatar University, Qatar
bm1806150@qu.edu.qa

Abstract

Research into the development of novel cathode materials for energy storage applications is progressing at a rapid rate to meet the ever-growing demands of modern society. Amongst various options, batteries are playing a vital role to replace conventional energy sources such as fossil fuels with green technologies. Among various battery technologies, lithium-ion batteries (LIBs) have been well explored and have succeeded in being adjusted with find many commercial applications. At the same time, as an alternative to LIBs, Sodium-Ion Batteries (SIBs) are also gaining popularity due to the presence of Sodium (Na) in abundance and its similar electrochemical characteristics with lithium (Li). However, SIBs are suffering from many challenges such as slow ionic movement, instability in different phases, and low energy density, etc. Many strategies in the literature have been proposed to address the aforementioned challenges of SIBs. Among them, the substitution of Na with Li to form hybrid cathode materials has turned out to be quite promising. The present work aims to investigate the effect of Na substitution with Li in a pyrophosphate framework. Towards this direction, $Na_{(2-x)}Li_xFeP_2O_7$ (x=0,0.6) hybrid cathode materials were synthesized, and their structural, thermal, and electrochemical properties were studied. It is noticed that the incorporation of Li in the triclinic structure of $Na_2FeP_2O_7$ has a significant effect on its thermal and electrochemical performance. This study can be considered as a baseline to develop some other pyrophosphate-based high-performance hybrid cathode materials.

Keywords: Batteries; Structure; Electrochemical activity; Charge/discharge capacity; Rate capability

Energy and Environment
(Graduate Students)

Bio-inspired Fabrication of Ultrafiltration Membranes incorporating Polydopamine Functionalized Graphene Oxide Nanoparticles

Abedalkader Ibraheem Alkhouzaam, Hazim Qiblawey, Majeda Khraisheh

Qatar University, Qatar

200602139@qu.edu.qa

Abstract

Novel PSF composite UF membranes incorporating low loadings of polydopamine-functionalized graphene oxide particles (rGO-PDA) were fabricated and investigated. The functionalization was confirmed using FTIR-UATR, Raman spectra, XPS, and SEM. Pristine PSF, PSF/GO, and PSF/rGO-PDA MMMs were then prepared using the phase inversion technique and analyzed using FTIR, SEM, AFM, and contact angle (CA). The cross-section SEM images showed better distribution of rGO-PDA particles in the pores and polymer wall whereas the pristine GO particles aggregate and partially block the pores. Thus, the pure water flux increased with the addition of rGO-PDA without affecting the rejection properties, while the flux decreased with the embedding of pristine GO particles. The highest pure water permeability (PWP) was obtained with PSF/rGO-PDA-0.1 to be approximately twice that of the pristine PSF and PSF/GO-0.1. All membranes exhibited complete rejection of BSA and HA, and showed almost similar performance against different dyes. The FRRs of the pristine PSF after three fouling cycles (FRR3) against BSA and HA were recorded to be 57.8% and 70.7% respectively. FRR3 was enhanced by around 30% with PSF/rGO-PDA composites. The MMMs prepared in this work are expected to have great potential on ultrafiltration and similar studies on other membrane processes.

Keywords: Antifouling; Graphene oxide membranes; Polysulfone; Ultrafiltration; Water treatment

Energy and Environment
(Graduate Students)

Magnetorheological Elastomer (MRE) based Torsional Vibration Isolator for application in a Prototype Drilling Shaft

Thaer Mahmoud Syam, Asan Gani Bin Abdul Muthalif
Qatar University, Qatar
ts1405457@qu.edu.qa

Abstract

Magnetorheological Elastomer (MRE) is a type of smart composite material consisting of a polymer matrix embedded with ferromagnetic particles. In the presence of an external magnetic field, its mechanical properties, such as stiffness, changes make it attractive in vibration isolation applications. Unwanted vibration in machines can cause severe damage and machine breakdown. In Qatar, the extraction of the natural gas from the ground requires sophisticated drilling machines. In this work, a semi-active vibration isolator using MRE is proposed for a potential application in a drilling system to isolate the torsional vibration. MRE was fabricated with a 35% mass fraction (MF) consisting of silicon rubber and iron particles. It was fitted with aluminum couplers and attached to the shaft (drill string) to study its efficiency in vibration isolation under a magnetic field. Two tests were conducted on the drilling prototype setup used in this work; the first test was a hammer impact test. The torsional transfer function TTF analysis showed that the system's natural frequency has shifted from 13.9 Hz to 17.5 Hz by the influence of increasing magnetic field around the MRE. The results showed that the continuous rotational vibration amplitude of the prototype is attenuated by more than 40%.

Keywords: Drilling process; Magnetorheological elastomer; Smart materials; Torsional vibration isolation

Energy and Environment

(Graduate Students)

Experimental Investigations of Gas Kick for Single and Two-Phase Gas-liquid Flow in near Horizontal Wells

Motasem Wadi Abdelrazeq[1], Ahmad Khalaf Sleiti[1],
Mohammad Azizur Rahman[2], Abinash Barooah[2]
[1]Qatar University, Qatar
[2]Texas A&M University, Qatar
ma1511475@qu.edu.qa

Abstract

Multiphase flow in pipelines is of great importance and broadly used in several industries for various applications. A multiphase flow is a complex physical phenomenon where more than one phase occurs. In oil and gas exploration process, more attention has been given to the well drilling operation to fulfill the extreme high demand of natural gas. Well drilling operation and technology has transformed to ultra-high pressure and high temperature reservoirs. This transformation has negatively impacted the drilling conditions and the safety of the drilling rig, as a gas kick would become more likely to occur at these extreme conditions. The resulting uncontrolled gas kicks may ignite and explode causing dramatic blowouts associated with very serious consequences, including financial losses, damaging the environment, and loss of personnel's lives. The early detection of a gas kick is therefore essentially needed for timely response with appropriately well control measures.

Keywords: Gas-kick; Multiphase flow; Deep well; Two-phase flow; Annular pipe

Energy and Environment
(Graduate Students)

Flare Gas-to-Power using Supercritical CO2 Power Cycle: Energy and Exergy Analyses

Khaled Mahmoud Aboueata, Ahmad Khalaf Sleiti
Qatar University, Qatar
ka1402945@qu.edu.qa

Abstract

Generating electricity from power cycle using supercritical carbon dioxide (sCO_2) as a working fluid is a step towards efficiency improvement in power production field. The huge amount of studies on this topic shows promising results of utilization from low to medium grade heat of power generation. Several layouts, arrangements, and thermodynamical features were presented to improve the performance of the power cycle. The main property of such a power cycle is that it utilizes wasted heat to produce electricity. One source of wasted heat is flared gas in oil and gas industry. Flaring process is considered as an extensive economic loss due to its high heating value. This flare gas is burned in industry due to several purposes, mainly safety and process needs. Utilization of flare gas in producing electricity through sCO_2 cycle is being proposed in this research, where two cycles were proposed to study the performance of the cycle using flare gas as fuel. First, the Flare-to-Power sCO2 (FTP1- sCO_2) cycle utilizing the flare gas mixed with natural gas to heat the working fluid of the cycle which sCO2. The second cycle (FTP2- sCO_2) flare gas is utilized in reheating process for the exhaust flow of a primary heating working fluid. The performance of the cycles is evaluated by implementing energetic and exegetic analysis. The results of the study showed that FTP 1 has higher thermal and overall exergy efficiencies compared to FTP 2. Furthermore, the analysis showed that as maximum pressure increases thermal efficiency increase, the same behavior was found also while increasing T_max. The maximum thermal efficiency was found to be 44.87% at T_max= 850 C, P_h= 25 MPa, P_l= 3.3 MPa, T_min= 32 C, and m_flare=0.18 kg/s, for a 50 MW power capacity.

Keywords: Power; Supercritical CO2; Flare gas; Wasted energy; Greenhouse gases

Energy and Environment
(Graduate Students)

Parametric Study on Moment Redistribution of Fiber Reinforced Concrete Continuous Beams with Basalt FRP Bars

Abdulrahman Hamdi Abushanab, Wael I Alnahhal
Qatar University, Qatar
aa1104287@qu.edu.qa

Abstract

The state of Qatar bears harsh environment and coastal conditions which stand for most of the year. As a result, steel-reinforced concrete structures are subjected to rapid corrosion and deterioration. Therefore, there is a necessity to replace the conventional steel reinforcement by fiber-reinforced polymers (FRP) bars. Apart from FRP bars' corrosion resistance, their strength to weight ratio is higher than steel reinforcement which makes the FRP bars a viable alternative to steel reinforcement. Continuous concrete beams are commonly used elements in structures such as parking garages and overpasses. In such structures, forces could be distributed between the critical sections after cracking. This phenomenon is called moment redistribution. It reduces the congested rebars in connections and enhances the ductility of the members. However, the linear-elastic behavior of FRP materials makes the ability of continuous beams to redistribute loads and moments questionable. This study aims to investigate the capability of moment redistribution of basalt fiber reinforced concrete (BFRC) continuous beams reinforced with basalt FRP (BFRP) bars. Ten reinforced concrete (RC) continuous beams of 200 x 300 x 4000 mm were tested up to failure under five-point loading. The main investigated parameters were the reinforcement ratio (0.6rb, 1.0rb, 1.8rb and 2.8rb; where rb is the balanced reinforcement ratio), stirrups spacing (80 and 120 mm) and volume fractions of Basalt-macro fibers (BMF) (0.75 and 1.5%). A parametric study was then conducted using a validated finite element (FE) model to extend the investigated parameters that may affect the moment redistribution of RC continuous beams. It was concluded that moment redistribution occurs in beams that have at least a ratio of bottom to top reinforcement of 0.3.

Keywords: Basalt fiber reinforced concrete; Continuous beams; Moment redistribution; BFRP bars

Energy and Environment
(Graduate Students)

Self-Healing Performance of Smart Polymeric Coatings Modified with Tung Oil and Linalyl Acetate

Norhan Ashraf Ismail[1,2], Adnan Khan[1], Ramazan Kahraman[2], Rana Abdul Shakoor[1]

[1]Center for Advanced Materials, Qatar University, Qatar
[2]Department of Chemical Engineering, Qatar University, Qatar
ni1300925@qu.edu.qa

Abstract

This work focuses on the synthesis and characterization of polymeric smart self-healing coatings. A comparison of structural, thermal, and self-healing properties of two different polymeric coatings comprising distinct self-healing agents (tung oil and linalyl acetate) is studied to elucidate the role of self-healing agents in corrosion protection. Towards this direction, urea-formaldehyde microcapsules (UFMCs) loaded with tung oil (TMMCs) and linalyl acetate (LMMCs) were synthesized using the in-situ polymerization method. The synthesis of both LMMCs and TMMCs under identical experimental conditions (900 rpm, 55 ◦C) has resulted in a similar average particle size range (63–125 µm). The polymeric smart self-healing coatings were developed by reinforcing a polymeric matrix separately with a fixed amount of LMMCs (3 wt.% and 5 wt.%), and TMMCs (3 wt.% and 5 wt.%) referred to as LMCOATs and TMCOATs, respectively. The development of smart coatings (LMCOATs and TMCOATs) contributes to achieving decent thermal stability up to 450◦C. Electrochemical impedance spectroscopy (EIS) analysis indicates that the corrosion resistance of smart coatings increases with increasing concentration of the microcapsules (TMMCs, LMMCs) in the epoxy matrix reaching ~1 GΩ. As a comparison, LMCOATs containing 5 wt.% LMMCs demonstrate the best stability in the barrier properties than other developed coatings and can be considered for many potential applications.

Keywords: Microcapsules; Epoxy; Coatings; Self-healing; Electrochemical impedance

Energy and Environment
(Graduate Students)

Experimental Investigation of Foam Drilling Fluid using Visualization Technique

Abinash Barooah[1,2], Muhammad Saad Khan[3], Ahmad K. Sleiti[4], Motasem Abdelrazeq[4],
Mohammad Azizur Rahman[1], Ibrahim Hassan[1], Rashid Hasan[2], Berna Hascakir[2]
[1]Petroleum Engineering Department, Texas A&M University, Qatar;
[2]Petroleum Engineering Department, Texas A&M University College Station, USA
[3]Mechanical Engineering Department, Texas A&M University , Qatar;
[4]Department of Mechanical and Industrial Engineering, Qatar University, Qatar
abinashb3@tamu.edu

Abstract

Cutting transport is one of the major factors, which affects the cost, time and quality of drilling operations. Over the years, as the number of directional wells have increased to improve the productivity, it has been observed that cutting transport is more difficult in horizontal and directional wells as compared to vertical wells. While the foam/aerated drilling fluid provides significant advantages over conventional drilling fluid such as higher rate of penetration and reduction in formation damage, however these advantages are reduced due to inefficient cutting transport to the surface.

This study investigates the effect of different parameters such as cuttings weight concentration, liquid flow rate and gas flow rate on cutting transport using foam/aerated drilling fluid. The experiments were conducted in a 6.16 m long horizontal pipe with 2.5 in. inner diameter and 4.5 in. outer diameter and annular diameter ratio of 1.8. The liquid and the gas flow rate was varied between 219 – 380 kg/min and 4 – 6.5 L/min, while the gas input pressure was kept constant at 2 bar. An anionic surfactant was used to stabilize the foam with a stationary liquid density of 818 kg/m3. The concentration of the borosilicate solid glass beads of 2-3 mm average diameter was varied between 0 – 4 wt. %.

The results showed that increase in the liquid flow rate or Reynold number improved cutting transport, whereas increase in the gas flow rate and solid cuttings concentration decreased the cutting transport velocity for a constant gas input pressure. A non-dimensional performance parameter was introduced, for comparison of the cutting transport efficiency of different fluids such as water, 0.05 wt. % and 0.1 wt. % bio-polymer concentrations. It was observed that foam fluid has the highest bed height, Reynold number and lowest solid velocity (Reynold number). Performance parameter indicates that foam fluid has a better cutting transport efficiency as compared to bio-polymer based drilling fluid for horizontal drilling.

This study can act as a guide to improve our knowledge of cutting transport and how cutting transport efficiency of different fluids can be compared using performance parameter.

Keywords: Cutting transport; Foam drilling fluid; Visualization; Horizontal well

Energy and Environment
(Graduate Students)

Optimum Sintering Method and temperature for Cold Compact Bismuth Telluride pellets for Thermoelectric applications

Farheen Fathima Jaldurgam[1,2], Zubair Ahmad[2,3], Farid Touati[1]
[1]Department of Electrical Engineering, CENG, Qatar University, Qatar
[2]Qatar University Young Scientist Center, Qatar University, Qatar
[3]Center for Advanced Materials, Qatar University, Qatar
fj1912900@qu.edu.qa

Abstract

This work intends to investigate the optimum sintering method and temperature that can improve the efficiency of bismuth telluride cold compact pellets for thermoelectric applications. Different p-type and n-type bismuth telluride cold compact pellets were treated using three different sintering techniques and conditions: pressure less (conventional), microwave, and tube (using argon environment) at temperatures 250°C, 300°C, 350°C, and 400°C. The structural, microscopic, electron transport, thermal, and dielectric properties of the pristine and sintered samples were examined. Broadband dielectric spectroscopy was performed to extract a detailed picture of the dielectric properties of the samples. Even though each type of sintering had its own merits and demerits, the optimum conditions for enhanced electric and thermal features were found in microwave furnaces followed by tube and conventional. Low thermal conductivity of 0.4 W/m/K was observed in the samples sintered at 250 °C while the increase in sintering temperature from 250°C to 300°C improved the crystallinity of the material. Moreover, the crystal structure of the bismuth telluride altered with the occurrence of higher oxidation leading to the formation of high bismuth telluride oxide phases at sintering temperatures above 300°C, more dominantly in the n-type samples.

Keywords: Thermoelectric; Bismuth telluride; Broadband Dielectric Spectroscopy; Sintering

Energy and Environment
(Graduate Students)

Military Fuel Cell-Based Vehicles: Modular Power DC-DC Converter System

Walid Mahmoud Aboueata[1], Ahmed Massoud[1], Sinan Al-Obaidi[2]
[1]Qatar University, Qatar
[2]Barzan Holdings, Qatar
wa1402947@qu.edu.qa

Abstract

Electric Vehicles (EVs) have attracted researchers' attention to further develop and enhance this strategic area. Compared to fuel-based vehicles, EVs are more in demand nowadays due to their high performance and modern features. Integrating renewable energy sources such as PV and fuel cells to EVs expands this technology's research area to increase system reliability. Fuel-cell electric vehicles (FCEVs) introduce more challenges to the researchers to integrate this type of renewable energy source to charge the EV battery while driving. In this paper, design and control of a modular DC-DC converter for fuel-cell based EVs has been studied. A maximum power point tracking (MPPT) technique is used to extract the FC's maximum power. Since the FC produces a relatively low voltage, a high gain DC-DC converter is required to step up the voltage to the battery's rated voltage. This can be achieved through an input-parallel output-series Cuk-based DC-DC converter. The system small-signal model and control are presented to ensure equal current sharing at the input side while maintaining equal output voltage sharing even with a mismatch in the system module. The presented concept has been elucidated through simulation using Matlab/Simulink platform.

Keywords: Fuel-Cell electric vehicle; High gain DC-DC converter; Modular DC-DC converter; On-board charging

Energy and Environment
(Graduate Students)

Towards Developing a Hybrid Nonlinear Vibration Energy Harvester for Remote Sensing Applications: A Design and Optimization Study

Muhammad Hafizh, Asan G.A Muthalif
Qatar University, Qatar
mh1605936@qu.edu.qa

Abstract

A novel design of a hybrid piezoelectric-electromagnetic harvester for vortex-induced vibration applications inside a pipe-flow is proposed. The piezoelectric energy harvester is modeled with a macro-fiber composite with an electromagnetic oscillator. Analytical and numerical models were developed for the fluid-structure interaction. An optimization study was conducted using finite element modelling across different bluff body shapes and orientations where triangle and 2.5x ellipse were optimal choices for maximizing energy harvesting properties. An investigation into dual-mass energy harvesting was also performed for bandwidth enhancement. A secondary beam has improved the piezoelectric performance by 21% to 52%. Finally, an experimental study was conducted to verify the narrowband resonance models and validate the use of a magnetically coupled dual broadband harvester (58% enhancement). Optimization and design of the harvester has led to improvements in performance that can realize powering sensors and devices in wireless applications.

Keywords: Vortex-Induced vibration; Energy harvesting; Piezoelectric; Electromagnetic; Shape optimization

Energy and Environment
(Graduate Students)

Enhancement of Adhesion Characteristics of Low-density Polyethylene using Atmospheric Plasma Initiated-Grafting of Polyethylene Glycol

Taghreed Abdulhameed Al-Gunaid, Dr. Anton Popelka, Dr. Igor Krupa
Qatar University, Qatar
ta090196@qu.edu.qa

Abstract

The low-density polyethylene/aluminum (LDPE/Al) joint in Tetra Pak food container provides stability and strength to food packaging, ensures protection against outside moisture, and maintains the nutritional values and flavors of food without the need for additives in the food products. However, it was found that the adhesion strength of LDPE with Al is weak or almost non-existent, due to the non-polar hydrophobic LDPE surface. Therefore, it was necessary to apply surface treatment to LDPE. Plasma-assisted grafting of the LDPE surface with different molecular weight compounds of polyethylene glycol (PEG) was used to improve LDPE/Al adhesion. It was found that this surface modification contributed to significantly improve the wettability of the LDPE surface, as was confirmed by contact angle measurements. The chemical composition changes after plasma treatment and modification process was observed by X-ray photoelectron spectroscopy (XPS) and Fourier transform infrared spectroscopy (FTIR). A surface morphology was analyzed by scanning electron microscopy (SEM) and atomic force microscopy (AFM). Adhesion characteristics of LDPE/Al adhesive joints were analyzed by the peel tests. The most significant adhesion improvement of the PEG modified LDPE surface was achieved using 10.0 wt.% aqueous (6000 M) PEG solution, while the peel resistance increased by approximately 54 times in comparison with untreated LDPE.

Keywords: Polyethylene; Surface treatment; Corona discharge; Polyethylene glycol; Adhesion

Qatar University Press

Qatar University Annual Research Forum & Exhibition 2021

Building Resilience at Universities:
Role of Innovation and Entrepreneurship

Energy and Environment
(Graduate Students)

Life Cycle Cost Analysis for Variable Refrigerant Flow (VRF) and Constant Refrigerant Flow (CRF) Air Conditioning Systems in Arid Climate: A Case Study in Qatar

Georges Atallah, Faris Tarlochan
Qatar University, Qatar
ga1912343@qu.edu.qa

Abstract

All over the world, there is a call to encourage sustainable energy thinking and implementation. In the heating, ventilation and air conditioning field, the rise of the variable refrigerant flow systems has made a big progress. This study presents a life-cycle cost analysis to evaluate the economic feasibility of constant refrigerant flow (CRF) in particular the conventional ducted unit air conditioning system and the variable refrigerant flow (VRF) system by using detailed cooling load profiles, initial, operating, and maintenance costs. Two operating hour scenarios are utilized and the present-worth value technique for life-cycle cost analysis is applied to an existing office building located in Qatar which can be conditioned by CRF and VRF systems. The results indicate that although the initial cost of the VRF system is higher than that of the CRF system, the present-worth cost of the VRF system is lower than that of the CRF system at the end of the lifetime due to lower operating costs. The implementation of these results on a national scale will promote the use of sustainable energy technologies such as the VRF system.

Keywords: Life cycle cost; Air-conditioning; Variable refrigerant flow; Constant refrigerant flow; Sustainable energy

Energy and Environment
(Graduate Students)

Ni-P-ZrC Nanocomposite Coating with Enhanced Corrosion Resistance and Mechanical Properties

Osama Fayyaz[1], R. A. Shakoor[2], Anwarul Hasan[3], M. F. Montemor[4], Wei Gao[5],
Shahid Rasul[6], Kashif Khan[7], Mohammad Rashed Iqbal Faruque[8]

[1]Department of Mechanical and Industrial Engineering, College of Engineering, Qatar University, Qatar
[2]Center for Advanced Materials, Qatar University, Qatar
[3]Department of Mechanical and Industrial Engineering, College of Engineering, Qatar University;
[4]Instituto Superior Técnico (IST), University of Lisbon, Lisbon, Portugal;
[5]Department of Chemical and Materials Engineering, University of Auckland (UOA), Auckland, New Zealand [6]Department of Mechanical and Construction Engineering, North Umbria University, Newcastle, UK
[7]School of Mechanical, Aerospace and Automotive Engineering, Coventry University, Coventry, UK
[8]Space Science Centre, Institute of Climate Change of the Universiti Kebangsaan Malaysia (UKM), Malaysia
of1806234@qu.edu.qa

Abstract

Corrosion is considered to be greatest challenge for many industries. Nickel-based metallic coatings are emerging as one of the most suitable solution considering various aspects of operating conditions. The current investigation reports the enhancement in mechanical, wear, erosion and corrosion resistance properties of the as-electrodeposited Ni-P-ZrC nanocomposite coatings. For a reasonable examination, Ni-P and Ni-P-ZrC nanocomposite coatings containing 0.75 g/L zirconium carbide nanoparticle (ZCNPs) were synthesized through the modified Watts bath. The integrated coatings were completely explored utilizing different methods specifically field emission scanning electron microscopy (FE-SEM), energy dispersive spectroscopy (EDS), X-ray diffraction (XDR), Atomic Force Microscopy (AFM), microhardness, nanoindentation, and electrochemical impedance spectroscopy (EIS). Effective co-electrodeposition of ZCNPs in the Ni-P matrix was accomplished with no detectable imperfections. It was observed that embedment of ZCNPs extensively affects mechanical, and anti-corrosive nature of the Ni-P matrix. Improvement in the mechanical properties can be assimilated to dispersion hardening of ZCNPs within the Ni-P matrix. The wear and erosion results also revealed the improvement in coatings due to the formation of composite structure with Ni-P as matrix and ZCNPs as reinforcement. Moreover, the corrosion protection efficiency (PE%) of the Ni-P coating was improved by the incorporation of ZCNPs from 71 to 85.4%. The Ni-P-ZrC nanocomposite coatings provides a competitive choice for their application in the automobile, electronic, aviation, oil, and gas industry.

Keywords: Nanocomposite; Corrosion mechanism; Coatings; Deposition mechanism; Dispersion hardening

Energy and Environment
(Graduate Students)

Effect of Plant Growth Regulators on Callus Induction from Leaf and Petiole explants of Hummeid *(Rumex Vesicarius)*

Kokila Kumudu Wickramanayake[1], Talaat Abdel-Fattah Ahmed[1],
Mohammed Hussain S A Al safran[2]
[1]Environment Science Centre, Qatar University, Qatar
[2]Agricultural Research Station, Qatar University, Qatar
kokila.wicki@gmail.com

Abstract

Advancement in plant cell culture technology has permitted the increasing interest in harvesting plant metabolites from cell cultures. This technique is based on *in vitro* propagation of plant callus which contains many beneficial compounds under sterile conditions as the plant source or raw material for natural product extraction. *In vitro* production of plant sources acknowledges; conservation of plant species in natural habitats which has been a global issue due to over harvesting of medicinal plants for the natural products manufacturing and production of phytochemicals, independent from seasonal and environmental limitations. Establishment of cell cultures is challenging. The main aim is to establish cell cultures as the starting material for the phytochemical analysis in *Rumex Vesicarius*.

Keywords: Callus; Rumex vesicarius; PGR; Tissue culture

Energy and Environment
(Graduate Students)

Biodiversity of Arbuscular Mycorrhizal Fungi in Plant Roots and Rhizosphere Soil from different arid locations of Qatar

Khazna alrajhi
Qatar University, Qatar
ka1704870@student.qu.edu.qa

Abstract

Recently more attention or interest has been developed towards the role of Arbuscular Mycorrhizal Fungi (AMF) in plant growth. Qatar, which is a part of the Arabian Gulf region, is mostly arid with hot and dry climatic conditions. The current research aims to investigate the Occurrence, species composition and abundance of AMF in Qatar, for which rhizosphere soil samples and roots of 16 plants belonging to 12 families from eight locations were collected. The AMF from different samples were identified based on the sequencing of the PCR product of the amplified conserved ITS region. The results showed that the AMF infection rate varies with location and plant species. *Tamarix aphylla* recorded the highest AMF infection rate (100%), followed by *Blepharis ciliaris* (98%) and *Sporobolus ioclados* (92%). AMF spore counts per 100g of soil ranged from 29.3 spores in *Blepharis ciliaris* to 643 spores /100g in *Fagonia indica*. The spore counts per location is variable and the range was 29.3 to 643/100g soil, however, no correlation has been detected between root colonization rate and spore counts. While all AMF identified at species levels were reported in other regions this research will be the first to investigate the AMF biodiversity from Qatar. However, new species are still expected since some were identified only at higher taxonomic levels. *Claroideoglomus drummondii* and *Rhizophagus irregularis* were the most widespread species while *Claroideoglomus claroideum* and *Diversispora aurantia* were the less present. This study provides comprehensive biological data about taxonomy, distribution and prevalence of AMF in Qatar soil, which opens new research towards developing its future applications for environmental conservation and sustainable agriculture.

Keywords: Arbuscular mycorrhizal fungi; Root colonization; Biodiversity; Qatar

Energy and Environment
(Graduate Students)

Quantifying Biomass of Microphytobenthos in sediments of Mangroves in the east coast of Qatar

Dina Jamal Isaifan, Dr. Yousra Suleiman
Qatar University, Qatar
di1510538@qu.edu.qa

Abstract

Mangroves, *Avicennia marina*, are highly productive coastal ecosystems with capacity to store carbon within plants and in sediments. Micropytobenthos (MPB) in the sediments also fix carbon and play a significant role in carbon burial. However, there is paucity of information on the role of MPB in coastal carbon budget. We quantified the biomass of MPB as an important carbon pool in the mangrove of Al Thakhira, located at the east coast of Qatar. Sediments at different tidal levels namely, supratidal, intertidal, and subtidal were collected and analyzed for grain size, chlorophyll (a), total carbon, and inorganic carbon contents. Results indicated that sand was the dominant species (60%), followed by silt (39%) and clay (1%) at all tidal levels. While the supratidal level had significantly higher silty sand content, silt dominated the intertidal levels. Moreover, chlorophyll (a) was significantly influenced by tidal levels with highest levels in the subtidal level sediments, where mangroves grow extensively. Results also demonstrated that as we move towards the intertidal zone, the total carbon content in sediments gets higher. Finally, chlorophyll (a) and TOC% were positively associated (r=0.643) in all tidal zones. As we move towards the mangrove subtidal growth area, the total carbon content in sediments gets higher. This work recommends that mangrove forests in Qatar be protected by special sanctuaries and law-enforcement to maintain this natural and dynamic blue carbon ecosystem.

Keywords: Mangroves; TOC; IC; Micropytobenthos; Qatar

Energy and Environment
(Graduate Students)

Investigational Study for the efficiency of Fe3O4@SiO2 nanoparticles in the Oil Recovery Process using glass micromodel

Wamda Elhaj, Fares Almomani
Qatar University, Qatar
we1609816@qu.edu.qa

Abstract

Nanofluids have shown their potential in the oil recovery process through surface modification. Due to their surface characteristics, they can apply to improve the oil production from reservoirs by enabling different enhanced recovery mechanisms. The preparation and development of the $Fe_3O_4@SiO_2$ nanoparticles for the oil recovery process is an innovative and novel approach that influences the oil generation from reservoirs. The performance of the $Fe_3O_4@SiO_2$ and the other nanofluids (seawater, Fe_3O_4, and SiO_2) in the enhanced oil recovery process is assessed and compared with other flooding scenarios. The $Fe_3O_4@SiO_2$ NPs achieved the highest oil production rate of 90.2%, while Fe_3O_4 and SiO_2 NPs achieved 70.8% and 55.3%, respectively. In contrast, the value achieved for the seawater injection was 76.5%. For the oil recovery process, the Fe_3O_4 was applied for the inhibition (i.e., decrease) of oil sedimentation, and the SiO_2 NPs were applied for wettability alteration and IFT reduction. The experimental results showed that the produced $Fe_3O_4@SiO_2$ NPs improved the oil recovery rates (90.2%) as well as the synergetic impact of the developed NPs by initiating several mechanisms corresponding to the use of the separate NPs in the micromodel. Moreover, the results exhibited that the reservoir conditions are a crucial function for increasing the oil recovery rates, improving the emulsion stability, and is a substantial step for the oil recovery method that applies this particular technique.

Keywords: Oil production; Oil sedimentation; Fe3O4@SiO2 NP; Wettability alteration; IFT reduction

Energy and Environment
(Graduate Students)

Qatari tight Gas Reservoirs: Molecular Simulation insights toward Estimation of Ultimate Recovery (EUR) from Carbonated Reservoirs

Elkhansa Elbashier[1], Ibnelwaleed Hussein[2]
[1]Gas Processing Center, College of Engineering, Qatar University, Qatar
[2]Gas Processing Center, College of Engineering, Qatar University, Qatar
elkhansa@qu.edu.qa

Abstract

The geometrical properties of the reservoir rocks are usually affected by natural thermodynamics or environmental changes that may affect the amount of gas in place in the reservoir. To address these properties, we conduct density functional theory calculations to study the effect of gas composition on the adsorption (E_{ads}), considering surface strain and curvature effects. Additional analyses, like geometrical analysis, and surface energy, were conducted to explain the results. The results of the strain effect showed that regardless of the strain values or curvature levels, all considered gases are physisorbed, with CO_2 having the largest E_{ads}. In addition to their weak interaction with the surface, CH_4 shows no particular changing trend of the E_{ads} with strain. The effect of strain becomes more pronounced in the case of CO_2 and C_2H_6. A new model of the nanopore, which is the cylindrical-shaped nanopore, is introduced. Cylindrical nanopores have greater adsorption affinity compared to the flat surface, which demonstrates their higher gas capacity. Additionally, a mathematical model of the E_{ads} vs. the diameter is developed. The capacity test of CH_4 and CO_2 showed adsorption of >24 molecules. These findings can be useful for determining the estimated ultimate recovery in carbonaceous tight gas reservoirs.

Keywords: Tight gas reservoirs; Density Functional Theory; Gas adsorption; Strain effect; Curvature effect

Energy and Environment
(Graduate Students)

A Case Study of Qatar: Health Risk Assessment associated with Bisphenol A

Suraj Adewale Bello
Qatar University, Qatar
a.suraj@qu.edu.qa

Abstract

This study is aimed at evaluating exposure to bisphenol A in drinkable water. Much studies have not been conducted on Bisphenol A in the drinkable water globally, in Arabian Gulf and particularly in Qatar. This assessment studies the probable risks associated with exposure of children as well as adults to bisphenol A in drinkable water around Doha. The risk assessment was conducted based on the water analyses collected over the two seasons (winter and summer) as well as most recent bisphenol A toxicity data published by the Environmental Protection Agency, USA (US EPA). It was found that the concentration levels of bisphenol A (0.0002205mg/kg b.w./day, 0.0001515mg/kg b.w./day) in both seasons fell below acceptable levels (0.05mg/kg b.w./day). Statistical analysis established that there is no variation in the concentration levels during summer and winter. The calculated health risk assessment measured in terms of hazard quotient or hazard ratio and hazard index were less than one (summer 6.18E-02 < 1, winter 14.24E-02 < 1). Hence, non-carcinogenic health risk was found to be within the safety limit for bisphenol.

Keywords: Bisphenol; Risk; Dose; Hazard

Energy and Environment
(Graduate Students)

Germanium Oxide/germanium/ reduced Graphene (GeO2/Ge/r-GO) Hybrid Composite Anodes for Lithium-ion Batteries: Effect of Ge loading on Electrochemical Performance

Christian Arro, Assem Mohamed, Nasr Bensalah
Qatar University, Qatar
nasr.bensalah@qu.edu.qa

Abstract

Hybrid composites between Germanium (Ge) and carbonaceous materials are promising anode materials for Li-ion batteries (LIBs). The mitigation of reduced cycling ability and rate capability allows for the unhindered benefit of higher capacities in Ge-based anodes. Here, the effect of Ge mass loading on the electrochemical performance of GeO2/Ge/r-GO composites was evaluated as LIBs anode. GeO2/Ge/r-GO composites were synthesized by controlled microwave radiation of ball-milled Ge and sonicated dispersion of graphene oxide (GO). The composite anode at Ge 25% showed greatest cycling retention with 91% after 100 cycles and an average specific capacity of 300 mAh/g (1600 mAh/g Ge). At 75% Ge mass loading the anode suffered with limited cycling retention of 57.5% at the cost of greater specific capacities. The composite at 50% Ge attained advantageous characteristics of both composites with a stable cycling performance of 71.4% after 50 cycles and an average specific capacity of 400 mAh/g (1067 mAh/g Ge). These findings can be used to shape high-energy Ge-based anodes and guide future development in energy storage.

Keywords: Li ion batteries; Ge-based anodes; Graphene oxide; Hybrid composites; Alloying/De-alloying

Energy and Environment
(Graduate Students)

An Integrated Approach to Produced Water Treatment using Sand Filtration, Activated Carbon and Microemulsions modified Activated Carbon

Maryam Ali Al-Kaabi, Mohammad Ahmad Al-Ghouti, Nabil A. Zouari,
Talaat Abdelfattah Ahmed
Qatar University, Qatar
199851369@qu.edu.qa

Abstract

The produced water from natural gas production process in the North field offshore is considered as the largest wastewater volume in Qatar, which could be potentially used for clean water resources for the industry as well as for some other domestic uses, if it is treated properly. This research aims to study the physical and chemical characterizations of the produced water from the North field and examine the removal of major inorganic and organic pollutants and heavy metals from the PW by using different treatments method such as using the sand filtration, activated carbon filtration and modified activated carbon filtration.

The physical and chemical characterization of produced water was examined followed by treatment through sand filtration coupled with activated carbon and microemulsion modified activated carbon techniques. The results of characterization showed that the produced water had high concentration of COD, TOC, BTEX and various metals. After sand filtration, considerable reduction in TSS and COD was achieved. Furthermore, BTEX were also removed by more than 93% except for toluene. However, sand filtration was not enough to remove most of the metals and ions. Therefore, further treatment was done through activated carbon and modified activated carbon and their treatment efficiency was compared. Both techniques were able to achieve higher removal efficiencies for BTEX, metals and ions. Thus, the treated water was free from all major pollutants of PW and can be considered suitable for reuse at industrial application. Further studies and applications could be applied on produced water such as studying the biological characterization and applying biological treatment processes.

Keywords: COD: Chemical oxygen demand; TOC: Total organic carbon; BTEX: Benzene Toluene Ethylbenzene and Xylene; AC: Activated carbon; MAC: Modified activated carbon

Energy and Environment
(Undergraduate Students)

Prevalence of Toxigenic Fungi and Mycotoxins in Arabic Coffee: Protective Effect of Traditional Coffee Roasting, Brewing and Microbial Volatiles

Wadha Ahmed Khalifa Al-Attiya, Zahoor UI Hassan, Roda Al-Thani, Samir Jaoua
Qatar University, Qatar
wa1601502@student.qu.edu.qa

Abstract

Like other agricultural crops, fungal infection and synthesis of mycotoxins in coffee leads to significant economic losses. This study is aimed at investigating the prevalence of toxigenic fungi, their metabolites, and the effect of traditional roasting and brewing on ochratoxin A (OTA) and aflatoxins (AFs) contents of naturally contaminated coffee samples. In addition, *in vivo* biocontrol assays were performed to explore the antagonistic activities of *Bacillus simplex* 350-3 (BS350-3) on the growth and mycotoxins synthesis potential of *Aspergillus ochraceus* and *A. flavus*. The relative density of *A. niger*, *A. flavus*, *Penicillium verrucosum* and *A. carbonarius* on green coffee bean was 60.82%, 7.21%, 3.09% and 1.03%, respectively. OTA contents were lowest in green coffee beans (2.15 µg/kg), followed by roasted (2.76 µg/kg) and soluble coffee (8.95 µg/kg). Likewise, AFs levels were highest in soluble coffee (90.58 µg/kg) followed by roasted (33.61 µg/kg) and green coffee (9.07 µg/kg). Roasting naturally contaminated coffee beans by three traditional styles; low, medium and high, followed by brewing resulted in reduction of 58.74%, 60.88% and 64.70% in OTA and 40.18%, 47.86% and 62.38% AFs contents, respectively. BS350-3 volatiles resulted in significant inhibition in AFs and OTA synthesis by *A. flavus* and *A. carbonarius* on infected coffee beans, respectively. Gas chromatography mass spectrochemistry (GC-MS/MS) analysis of headspace BS350-3 volatiles showed quinoline, benzenemethanamine and 1-Octadecene as bioactive antifungal molecules. These findings suggest that marketed coffee samples are generally contaminated with OTA and AFs; with a significant number of roasted and soluble coffee contaminated at the levels above EU permissible limits for OTA. Further, along with coffee roasting and brewing; microbial volatiles possess a promising potential, which can be optimized to minimize the dietary exposure to mycotoxins.

Keywords: Mycotoxins; Coffee; Physical control; Antimicrobial activities; Food safety

Energy and Environment
(Undergraduate Students)

Standing Wheelchair with Built-in Climate Control System

Abdullah Anwar Ahmed, Khalid Ameen Alzowkari, Tha'er Zeyad Allouh,
Abdallah Saed Al Yafei, Dr. Asan Gani Abdul Muthalif
Qatar University
as1303716@qu.edu.qa

Abstract

This project presents an innovation to be developed in wheelchairs used nowadays to provide its users with better life quality, elevates the level of their ambitions and to enable them to overcome today's special needs obstacles in different fields. As engineers, it is our role to contribute to finding answers to the world's dilemmas through applying a detailed analysis of the issue addressed and what are the possible solutions to it based on the knowledge obtained through our academic and experimental experience. Wheelchair users are suffering from discrimination in different aspects of life, such as work opportunities, usage of public facilities and many other life aspects. The standing wheelchair with built-in climate control system will introduce a new horizon for its users in the search of social equality and achievement. The mechanism to be developed is made of 4 different subsystems that demonstrate different mechanical engineering disciplines, which are mainly mechanical mechanisms, control systems, heat transfer, material science, thermodynamics, and mechanical statics-dynamics.

Keywords: Wheelchair; Climate control system; Seat ventilation; Standing mechanism; Special needs

Energy and Environment
(Undergraduate Students)

Facile and novel LiAlO₂ film electrodes for energy efficient Li recovery from seawater reverse osmosis (SWRO) Brine

Umme Hafsa[1], Sifani Zavahir[1], Tasneem ElMakki[1], Zubair Ahmad[2], Dong Suk Han[1, 3]

[1]Center for Advanced Materials, Qatar University, Qatar
[2]Young Scientists Center, Qatar University, Qatar
[3]Department of Chemical Engineering, College of Engineering, Qatar University
uh1807926@student.qu.edu.qa

Abstract

Concentration of Li in seawater is too low at 0.17 ppm despite its high content altogether with a reported 230 billion tons. Hence, seawater is not a practical source to recover Li from; Li is largely extracted by solar drying of salt-lake brines (100-200 ppm of Li). Salt-lake brines are confined to a certain region and not available for most parts of the world. However, seawater reverse osmosis (SWRO) brine is rather a widely available resource due to large adoption of the technique for water desalination. Hence, this study focuses on extraction of Li from concentrated SWRO brine. Li content in the feed can be increased up to 0.85 ppm, which is seemingly a favorable input stream. Electrically switched ion exchange (ESIX) on the other hand is energy efficient and economical in isolating Li, compared to other contemporary techniques such as capacitive deionization and electrodialysis. These approaches are meant to significantly shorten the time consumed in conventional solar drying process. Density functional theory studies have shown novel LiAlO₂ type working electrode can be a better electrode to capture Li in ESIX system over widely known LMO and LiFePO₄ working electrodes. Thus, this study intends to evaluate qualitatively and quantitatively the suitability of ESIX approach working in two electrodes configuration with LiAlO₂ working electrode and activated carbon counter electrode to recover Li from concentrated SWRO brine. The operating system affirmed the recovery of Li with a specific energy consumption of 100Wh/mol and 97% purity, along with recyclability of the working electrode over minimum of 5 cycles without any apparent activity loss.

Keywords: Lithium; Electrically switched ion exchange (ESIX); Seawater reverse osmosis (SWRO) brine; Membrane distillation (MD)

Energy and Environment
(Undergraduate Students)

Design and Development of Rapid EV Charging System with V2G and V2H Operations

Laith Kanaan, Atif Iqbal

Qatar University, Qatar

lk1406289@qu.edu.qa

Abstract

Plug in Electric vehicles (EVs) can act as source or load to the electric distribution network concept known as the vehicle-to-grid (V2G) system, or the lesser-known vehicle-to-home (V2H) system. Such systems can improve the stability of the national grid by what is known as peak shaving, where the peak load is distributed throughout the day, causing less stress on transmission and generation stations. They can also increase the efficiency of transmission by introducing reactive power into the grid, which will increase the P.U. transmission voltage without the use of compensation. V2G systems can also be beneficial to the end users, as there is some economical gain from it since the end user will be selling electricity from their EV to the grid at a higher tariff than usual. For a V2G concept to be applied on a national scale, a few key components must be present, including a clear, tamper-free and secure path of communication, an optimized charging/discharging schedule, and the technological hardware to support a bidirectional power flow. This paper skims through the details of a proposed V2G/V2H enabled fast charging solution, including the basic functions of the design, the topology and design of the converters, as well as the hardware implementation aspect. The design was made to accommodate clean energy, as well as the local grid, where it can operate on four modes: V2G, G2V, V2H, and PV2V.

Keywords: Clean Energy; Electric vehicles; Power electronics; V2G; Fast charging

Energy and Environment
(Undergraduate Students)

The Catalytic Thermo-oxidative Decomposition of Glimepiride

Najam US Sahar Riyaz, Ismail Badran
Department of Chemistry and Earth Sciences, Qatar University, Qatar
nr1703094@qu.edu.qa

Abstract

In this study, the thermal decomposition of glimepiride, a common antidiabetic drug, was analyzed in the presence of N_2 and O_2 and various metal oxide catalysts. The analysis was conducted using TGA. The results showed that there were two significant mass losses in the presence of N_2, that correspond to thermal decomposition of the drug. When N_2 was replaced by O_2, an additional mass loss was observed that corresponds to the oxidation of the drug at higher temperature. Density functional theory was implemented to explain the thermo-oxidative decomposition of the drug. The isoconversional method was also used to deduce the activation energies of the process. Upon all catalysts used, vanadium oxide was the most efficient in lowering the temperature required for thermal decomposition. The results of this study pave way for future work into purifying wastewater from pharmaceuticals via adsorption using metal oxides catalysts.

Keywords: Glimepiride; Wastewater; Catalysis; Adsorption; Decomposition

Energy and Environment
(Undergraduate Students)

Salinity Effects on Symbiodinium sp. growth rate in Controlled conditions and produced Biomass Biochemical Characterization

Ayesha Siddiqua, Mohamed Najib Daly Yahia
Qatar University, Qatar
as1701206@qu.edu.qa

Abstract

Salinity is an abiotic influencer to the growth and the efficiency of the algal *Symbiodinium* that coexists in symbiosis with corals. In light of the high salinity conditions that prevail in the Arabian Gulf including the waters of Qatar, we observed the effect of salinity above local-ambient levels on *Symbiodinium's* growth rate, biomass and its photosynthetic efficiency.

Symbiodinium sp. extracted from *Platygyra daedalea* was launched in f/2 media in controlled incubator conditions at salinities of 30, 40 (control), 45, 50, 60 and 70 psu for 11 days. Subsamples were obtained and fixed for cell density counts and growth rate calculations. Photosynthetic efficiency was determined using an Aquapen, and biomass at the end of the experiment was sent for biochemical characterization. A two-way ANOVA test was performed on the data using SigmaPlot software.

Our results indicated that at salinities 55 psu and greater, significant decline in both cell density and photosynthetic efficiency was observed. At 70 psu, growth rate was exclusively negatively affected, and biochemical compositions varied at all salinity levels with a notable increase in lipid content at 70 psu.

Impact of high salinity has not been widely studied in the Arabian Gulf. Thus, this study will aid conservational efforts while also encouraging further studies on the contribution of abiotic factors to *Symbiodinium* sp. growth in the region.

Keywords: Corals; *Symbiodinium*; Culture; Salinity; Photosynthetic activity

Energy and Environment
(Undergraduate Students)

Material Flow Analysis of Plastic Waste in Qatar: Focusing on the Marine Environment

Danah Ibrahim Alagha, John N. Hahladakis

Qatar University, Qatar

da1704627@qu.edu.qa

Abstract

As the population continues to grow, the generation of waste and specifically plastic waste, has also increased significantly in the past decades both globally and regionally. However, little attention has been directed to this problem in the region.

This study aims to delineate and map the status of the plastic waste problem in Qatar with a focus on the plastic inflow to the marine environment. A generic material flow diagram was built using a material flow analysis software named STAN, to depict the flow of the plastic waste.

The study focuses on the plastic waste in the marine environment, depicting the different types, sizes and shapes of plastic particles, and the recovery and recycling efforts that have been made, in order to reduce plastic waste and minimize its risk on the environment.

Keywords: Plastic waste; Marine litter; Qatar; Material flow analysis

Health and Biomedical Sciences
(Faculty and Postdoc)

Prevalence and Potential Determinants of COVID-19 Vaccine Hesitancy and Resistance in Qatar

Salma Khaled, Catalina Petcu, Lina Bader, Iman Amro, Aisha Al-Hamadi, Marwa Al-Assi,
Amal Aawadalla Mohamed Ali, Kien Le Trung, Abdoulaye Diop, Tarek Bellaj,
Mohamed Al-Thani, Peter Woodruff, Majid Alabdulla, Peter Haddad
Qatar University, Qatar
cpetcu@qu.edu.qa

Abstract

Global COVID-19 pandemic containment necessitates understanding the risk of hesitance or resistance to vaccine uptake in different populations. The Middle East and North Africa currently lack vital representative vaccine hesitancy data. We conducted the first representative national phone survey among the adult population of Qatar, between December 2020 and January 2021, to estimate the prevalence and identify potential determinants of vaccine willingness: acceptance (strongly agree), resistance (strongly disagree), and hesitance (somewhat agree, neutral, somewhat disagree). Bivariate and multinomial logistic regression models estimated associations between willingness groups and fifteen variables. In the total sample, 42.7% (95% CI: 39.5–46.1) were accepting, 45.2% (95% CI: 41.9–48.4) hesitant, and 12.1% (95% CI: 10.1–14.4) resistant. Vaccine resistant compared with hesitant and accepting groups reported no endorsement source will increase vaccine confidence (58.9% vs. 5.6% vs. 0.2%, respectively). Female gender, Arab ethnicity, migrant status/type, and vaccine side-effects concerns were associated with hesitancy and resistance. COVID-19 related bereavement, infection, and quarantine status were not significantly associated with any willingness group. Absence of or lack of concern about contracting the virus was solely associated with resistance. COVID-19 vaccine resistance, hesitance, and side-effects concerns are high in Qatar's population compared with those globally. Urgent public health engagement should focus on women, Qataris (non-migrants), and Arab ethnicity.

Keywords: COVID-19; Vaccine willingness; Hesitancy; Arab; Qatar.

Health and Biomedical Sciences
(Faculty and Postdoc)

Cardiac Myosin Binding Protein-C in Sprague Dawley (SD) Rats exposed to Sub-Chronic oral dose of Cadmium Chloride

Enjoud Khalifa Al-Borshaid, Kavitha Varadharajan,
Muralitharan Shanmugakonar, Hamda Al-Naemi
Laboratory Animal Research Centre, Qatar University, Qatar
kavithasajani@qu.edu.qa

Abstract

Cadmium is one of the major environmental pollutants associated with an increment in industrial and urbanization activities. It has health consequences when it reaches the human diet through the soil, water, and plant. Chronic exposure to cadmium has a serious effect on human health. It accumulates mainly in the liver and the kidney. In addition, it can accumulate in the different organs and tissues and exert its toxic effect on the body. Data generated from animal studies reported that elevated levels of cadmium in the blood lead to cardiovascular complications. Cardiac myosin-binding protein C (cMyBP-C) is associated with the myosin thick filament and is involved in cross-bridges cycling and regulation of muscle contraction. It is a reliable marker to indicate the status of cardiac contractility. Therefore, this study is carried out to investigate the effect of cadmium on levels of cMyBP-C during chronic cadmium toxicity. Male Sprague Dawley rats were subjected to a daily cadmium chloride dose (15ppm/Kg of body weight) for a period of 10 weeks. Then heart samples were collected and both gene and protein expression of cMyBP-C were analyzed. The data demonstrated that cadmium decreased cMyBP-C at the protein level and downregulated its expression at the gene level. Therefore, cMyBP-C can be used as a potential biomarker for cadmium cardiotoxicity

Keywords: SD Rats; Cadmium toxicity; Cardiac myosin-binding protein C; Gene expression; Protein expression

Health and Biomedical Sciences
(Faculty and Postdoc)

Optical Non-invasive Technique for Cholesterol Detection in Blood

D N Prasad[1], Sumaya Al-Maadeed[2], Asan Abdul Muthalif[3],
Kishor Kumar Sadasivuni[1]

[1]Centre for Advanced Materials (CAM), Qatar University, Qatar
[2]Department of Computer Engineering, Qatar University, Qatar
[3]Department of Mechanical & Industrial Engineering, Qatar University, Qatar
kishorkumars@qu.edu.qa

Abstract

The aim of this research is to design and develop a non-invasive cholesterol sensor based on the principle of light absorption. The current existing invasive methods can be replaced with non-invasive techniques. The interaction of light with matter has been utilized to design a smart device that measures blood cholesterol without collecting blood samples. It requires developing an optical sensor that focuses on the use of near infrared (NIR)-LED.

Keywords: Non-invasive; Cholesterol; Optical sensor; Internet of medical things

Health and Biomedical Sciences
(Faculty and Postdoc)

Colorimetry-based Detection of Exhaled Breath Biomarkers for Predicting Heart Failure

Nithusha Kallingal[1], Kishor Kumar Sadasivuni[1], Issam Bahadur[3], Huseyin Cagatay Yalcin[2], Asiya Al-Busaidi[3], Hassen M. Ouakad[3], Somaya Al-Maadeed[4]

[1]Center for Advanced Materials, Qatar University, Qatar
[2]Biomedical Research Center, Qatar University, Qatar
[3]Mechanical and Industrial Engineering Department, College of Engineering, Sultan Qaboos University, Oman
[4]Department of Computer Science and Engineering, Qatar University, Qatar
kishorkumars@qu.edu.qa

Abstract

The exhaled breath volatile organic compounds (VOC's) represent a biosignature with the potential to identify and describe heart failure diseases. Exhaled Breath biomarkers-based diagnosis of heart diseases may be easier and earlier detection than other available techniques. So, this is a review of combining both exhaled breath analysis with cost effective colorimetry technology to detect biomarkers for heart failure diseases. We also studied the effectiveness of biomarker trimethyl amine for cardiovascular diseases detection.

Keywords: Non-invasive; Exhaled breath; Colorimetry; Heart failure

Health and Biomedical Sciences
(Faculty and Postdoc)

Pilot Evaluation of the "Practice Educators' Academy" Preceptor Development Program for Continuing Health Professional Education Programs in Qatar

Banan Mukhalalati[1], Ahmed Awaisu[1], Sara Elshami[1], Bridget Javed[1], Marwan Abu-Hijleh[2],
Susannah Hart[2], Hiba Bawadi[3], Randa Almahasneh[4], Abdullatif Al-Khal[5], Kristine Al-Amri[5]

[1]College of Pharmacy, Health Cluster, Qatar University, Qatar
[2]College of Medicine, Health Cluster, Qatar University, Qatar
[3]College of Health Sciences, Health Cluster, Qatar University, Qatar
[4]College of Education, Qatar University, Qatar
[5]Hamad Medical Corporation, Qatar
banan.m@qu.edu.qa

Abstract

"The Practice Educators' Academy Program" is an innovative educational intervention developed following a preceptor-focused needs assessment. This study evaluated the program's effect on self-efficacy and knowledge amongst multi-disciplinary clinical preceptors who precept students across the Health Cluster in Qatar University, Qatar. Additionally, the study assessed satisfaction with the program's comprehensiveness, appropriateness, and relevance. The program's effectiveness was assessed utilizing a pretest-posttest pilot intervention study with a single group of preceptors. Preceptor self-efficacy was assessed using the Preceptor Self-Efficacy Questionnaire, a validated 21-item questionnaire. Preceptor knowledge was assessed through a 25-item multiple-choice question test. Satisfaction with program content and delivery was assessed through a 14-item questionnaire with open comments. Participation of 30 preceptors in the self-efficacy questionnaire resulted in a statistically significant increase in their posttest median score (pretest-to-posttest: 3.3-to-3.6, p= 0.001). Twenty-six preceptors completed the knowledge-based assessment, with a statistically significant increased posttest mean score (pretest-to-posttest: 10.2-to-15.7, p< 0.001). Participants indicated high levels of satisfaction with the program (average score= 4.42/5). Our findings suggest the pilot program is effective as demonstrated through a significant improvement in preceptors' self-efficacy and knowledge. Recommendations for future iterations include placing greater focus on active learning strategies, and inter-disciplinary integration.

Keywords: Continuing health professions education program; Preceptor development; Educational intervention; Self-efficacy knowledge

Health and Biomedical Sciences
(Faculty and Postdoc)

Additive Manufacturing of Smart Material and Complex Structures

Sajeel N K, Muni Raj Maurya, Mohammed Talal Houkan, Kishor Kumar Sadasivuni
Center of Advanced Materials, Qatar University, Qatar
kishorkumars@qu.edu.qa

Abstract

Additive Manufacturing (AM), typically referred to as rapid prototyping or three-dimensional (3D) printing has rapidly emerged as a sustainable, highly efficient and intelligent tool. Moreover, recent developments in novel materials and software tools have synergistically expanded the stage for additive manufacturing. Here we present the fabricated 3D printed objects for application in biomedical, sensor, gas filter and fluid flow controllers. The fabricated CO_2 gas sensor exhibited the sensitivity of as low as 10 ppm and offered high selectivity towards other gases.

Keywords: 3D printing; Self-sanitizing glove; Mask; Gas filter; CO_2 sensor

Health and Biomedical Sciences
(Faculty and Postdoc)

Physical Fitness and Academic Performance in Normal Weight, Overweight, and Obese Schoolchildren in Qatar: A Pilot Study for Physical Education Perspective

Souhail Hermassi[1], Lawrence D. Hayes[2], René Schwesig[3]

[1]Physical Education Department College of Education, Qatar University, Qatar
[2]School of Health and Life Sciences, University of the West of Scotland, Glasgow, United Kingdom
[3]Department of Orthopedic and Trauma Surgery, Martin-Luther-University Halle-Wittenberg, Germany
shermassi@qu.edu.qa

Abstract

Childhood obesity and loss of physical fitness are rising problems internationally. Although research concerning mitigation strategies has been enforced, empirical results until now fail to address problems and needs of the Gulf region, which has unique geographical and cultural features. Therefore, this study investigated academic performance and physical fitness in normal, overweight, and obese child handball athletes in Qatar. Measurements included anthropometric data (BMI and body fat percentage (%BF)), and physical performance tests: agility T-half test; squat jump (SJ), and countermovement jump (CMJ), 10 and 15 m sprint; medicine ball throw. Aerobic capacity was evaluated using the Yo-Yo Intermittent Recovery Test level 1. Academic achievement was assessed through school records of grades point average (GPA) of Mathematics, Science and Arabic. With the exception of medicine ball throw (obese: 4.08 ± 1.05 m) and sprinting parameters (overweight: 10 m: 2.43 ± 0.35 s, 15 m: 3.60 ± 0.46 s), athletes from the normal weight group showed the highest performance level in all parameters. Between group differences existed for the T-Half Test ($p = 0.035$, $\eta_p^2 = 0.190$), CMJ ($p = 0.001$, $\eta_p^2 = 0.363$) and SJ ($p = 0.007$, $\eta_p^2 = 0.269$). For CMJ and SJ, the comparison between overweight and normal weight also yielded a difference (CMJ: $p = 0.005$; SJ: $p = 0.009$). The academic parameters generated the largest difference between groups for science ($p = 0.057$; $\eta_p^2 = 0.164$). For all parameters studied, the normal weight group had the highest performance level. In contrast, the overweight group showed the lowest level of academic performance. These findings suggest being overweight or obese are related to science academic performance among schoolchildren in Qatar. Physical education teachers should be cognizant that health promotion interventions improving composition may have the additional potential to improve dimensions of academic performance.

Keywords: Schoolchild; Anthropometrics; Achievement; Youth players; Academic performance

Health and Biomedical Sciences
(Faculty and Postdoc)

Contribution of Glycosaminoglycan binding in CCL21-mediated Migration of Breast Cancer cells

Mohammed Imad Malki

College of Medicine, Qatar University, Qatar

momalki@qu.edu.qa

Abstract

Lymph node metastasis constitutes a key event in Breast Cancer progression and it is a process at least partially mediated by the chemokine CCR7. Chemokine function is dependent upon their binding to both cell-surface glycosaminoglycans (GAGs) molecules and to their specific receptors; thus, the role of GAGs in CCR7-mediated lymph node metastasis was investigated by creating a non-GAG binding chemokine CCL21 (mut-CCL21). Mut-CCL21 (Δ98-134) was synthesized, at 50nM it had similar potential to mobilize intracellular calcium compared to wild-type CCL21 (WT-CCL21). Next, a series of experiments was performed to determine how deletion of the GAG-binding site altered the ability of CCL21 to stimulate chemotaxis within a concentration gradient generated by free solute diffusion. Both WT-CCL21 and mut-CCL21 had a similar potential to stimulate chemotactic migration of PBMC (P>0.05). However, 4T1-Luc cells exhibit reduced migration at 30 & 50nM (p<0.001). Interestingly, this effect was greatly exacerbated in trans-endothelial migration, with the mut-CCL21 failing to increase cell migration above the background level at 30 nM in PBMC and 4T1-Luc cells (p> 0.001 vs WT). This difference could potentially be attributed to reduced GAG binding, as surface plasmon resonance spectroscopy showed that mut-CCL21 did not significantly bind heparan sulphate compared to the WT-CCL21. Finally, a murine model was used to assess the potential of mut-CCL21 to prevent lymph node metastasis *in vivo*. Mice were injected with 4T1-Luc cells in the mammary fat pad and treated daily for a week with 20µg mut-CCL21 once the tumor was visible. Mice were imaged weekly with IVIS to assess bioluminescence and sacrificed on day 18. Luciferase expression was significantly reduced in lymph nodes from mice that had been treated with mut-CCL21 compared to the control (p=0.0148), suggesting the potential to target chemokine binding to GAGs as a therapeutic option.

Keywords: Breast cancer; Chemokines; Metastasis; CCL21

Health and Biomedical Sciences
(Faculty and Postdoc)

Dietary Patterns and Risk of Inflammatory Bowel Disease: Findings from a Case-Control Study

Reema Tayyem[1,2], Tamara Qalqili[2], Yaser Rayyan[2]
[1]Qatar University, Qatar
[2]The University of Jordan, Jordan
reema.tayyem@qu.edu.qa

Abstract

Scientific evidence shows that dietary patterns are associated with the risk of IBD, particularly among unhealthy and Western dietary patterns. However, Western dietary patterns are not exclusive to Western countries, as Jordanians are steadily moving towards a Western lifestyle, which includes an increased consumption of processed foods. This study aims to investigate the association between dietary patterns and the risk factors for IBD cases among Jordanian adults. This case-control study was conducted between November 2018 and December 2019 in the largest three hospitals in Jordan. Three hundred and thirty-five Jordanian adults aged between 18–68 years were enrolled in this study: one hundred and eighty-five IBD patients who were recently diagnosed with IBD (n = 100 for ulcerative colitis (UC) and n = 85 for Crohn's disease (CD)) and 150 IBD-free controls. Participants were matched based on age and marital status. In addition, dietary data was collected from all participants using a validated food frequency questionnaire. Factor analysis and principal component analysis were used to determine the dietary patterns. Odds ratios (OR) and their 95% confidence interval (CI) were calculated using a multinomial logistic regression model. Two dietary patterns were identified among the study participants: high-vegetable and high-protein dietary patterns. There was a significantly higher risk of IBD with high-protein intake at the third and fourth quartiles in the non-adjusted model as well as the other two adjusted models. In contrast, the high-vegetable dietary pattern shows a significantly protective effect on IBD in the third and fourth quartiles in all the models. Thus, a high-vegetable dietary pattern may be protective against the risk of IBD, while a high-protein dietary pattern is associated with an increased risk of IBD among a group of the Jordanian population.

Keywords: Dietary patterns; Inflammatory Bowel Disease; Case-control study; Ulcerative colitis; Crohn's Disease

Health and Biomedical Sciences
(Faculty and Postdoc)

Needs Assessments approaches to inform Continuous Professional Development for Health Professionals: A Scoping Systematic Review

Muna Said Al-Ismail[1], Zachariah Jamal Nazar[1], Derek Charles Stewart[1], Lina Mohammad Naseralallah[2],
Tarteel Ali Hussain[1], Hadi Mohamad Abu Rasheed[3], Aala Hassan Daud[4]

[1]College of Pharmacy, QU Health, Qatar University, Qatar
[2]Clinical Pharmacy Department, Hamad Medical Corporation, Qatar
[3]Qatar Cancer Society, Qatar
[4]College of Dental Medicine, QU Health, Qatar University, Qatar
muna.alismail@qu.edu.qa

Abstract

The need for continuing professional development (CPD) within the healthcare profession is well established. A rigorous learning need assessment (LNA) is a crucial initial step in the CPD process. Given the scarcity of the systematic and comprehensive approaches to the process of undertaking a LNA, this scoping review aims to collate the reported methods adopted for conducting a LNA in the context of health professional CPD.

The authors searched PubMed, Embase, CINAHL, ERIC, IPA, APA PsycArticles, and Google Scholar for English studies published from database inception until the end of August 2020. A manual search of the reference lists of the included studies was conducted. Two reviewers screened the articles for eligibility using the inclusion criteria. All authors extracted the key data and a narrative approach to synthesize the data was employed.

We included 151 studies in the review. The majority of the studies adopted quantitative methods (85 studies; 56.3%). The most commonly used methods to investigate learning needs were surveys alone (81 studies; 53.6%). The majority of studies reported the needs assessment from the perspective of clinicians (144 studies 95.4%) and it was very rare that individual studies investigated the perspectives of more than one stakeholder. Methods of conducting LNA included assessment of various gaps (e.g. knowledge, skill) in the target audience. Self-assessment of knowledge was the most frequently assessed gap (65 studies; 43%). Majority of the studies provided some details describing how the findings of the learning needs assessment were used. The most commonly reported findings were to inform future CPD content and delivery.

The findings from this study demonstrate the lack of published evidence of systematic and comprehensive approaches to LNA for the purpose of informing CPD for healthcare professionals. Future studies that aim for developing systemic LAN approaches are recommended.

Keywords: Continuing professional development; Needs assessment; Scoping systematic review; Health professionals

Health and Biomedical Sciences
(Faculty and Postdoc)

Patient Specific Transcatheter Aortic Valve Replacement Therapy Pathway with Computational Fluid Structure Interaction Analysis

Onur Mutlu, Hüseyin Çağatay Yalçın
Qatar University, Qatar
onurmutlu94@gmail.com

Abstract

Total cardiovascular disease (CVD) prevalence has risen dramatically from 271 million in 1990 to 523 million in 2019, and CVD fatalities rose gradually from 12.1 million in 1990 to 18.6 million in 2019. According to American Heart Association statistics, annual heart valve procedures in the United States were above 100,000 in 2013, with approximately 50,000 AV replacements. The ideal replacement valve should be durable, resistant to thrombosis, and have excellent hemodynamics features. Transcatheter aortic valve replacement (TAVR) has been introduced about two decades ago as an alternative for minimally invasive implantation of new generation bioprosthetic heart valves. Computational modeling can be used during therapy planning for the selection of appropriate replacement valves for TAVR. In this NPRP funded project, we are establishing a mechanical and FSI analysis path, for a detailed patient-specific hemodynamics analysis for TAVR, considering the most important parameters affecting TAV efficiency. This approach will enable the choice of the most suitable TAV type and deployment position for the treatment. TAV which is crimped and placed into the catheter by mechanical analysis is deployed in a patient-specific geometry in a virtual treatment then contact pressure and the stress are measured on the aortic root, stent, and aortic leaflets. TAV performance indicators are determined by FSI analysis using coupled ABAQUS and Flow-vision software. With this advanced analysis and simulation path, we expect to estimate accurately the clinical TAVR parameters such as contact pressure, contact area, principal stress, etc. before the operation during therapy planning. This approach will help clinicians in optimal valve selection for TAVR patients.

Keywords: TAVR; CFD; FSI; FAE

Health and Biomedical Sciences
(Faculty and Postdoc)

Soluble ACE2 and Angiotensin II levels Modulated in Hypertensive COVID-19 Patients treated with different Antihypertension Drugs

Huseyin C. Yalcin, Mohamed A Elrayess, Hadeel T Al-Jighefee,
Mahmoud Khatib A. A. Al-Ruweidi, Shamma Almuraikhy, Hadi M. Yassine
Qatar University, Qatar
hyalcin@qu.edu.qa

Abstract

Hypertension is a major risk factor and common comorbidity among severe Coronavirus Disease 2019 (COVID-19) patients. Prominent antihypertensive drugs, such as angiotensin-converting-enzyme inhibitors (ACEi) and angiotensin receptor blockers (ARB) can modulate the expression of angiotensin-converting enzyme 2 (ACE2) and may influence COVID-19 prognosis. Other classes of antihypertensive drugs, such as beta-blockers (BB) and calcium channel blockers (CCB) are associated with reduced mortality. Still, their effect on the circulating levels of ACE2 and angiotensin II, as well as the severity of COVID-19, are less characterized. Two hundred hypertensive COVID-19 patients on four different classes of antihypertensive medication (ACEi, ARB, BB, and CCB), with different COVID-19 severities (mild, moderate, and severe) were recruited, and clinical data were assessed. Sera-circulating ACE2 and angiotensin II levels were measured using standard ELISA kits. Linear regression models were used to assess the effect of antihypertensive medications on circulating levels of ACE2 and angiotensin II in relation to disease severity and other clinical indices. Included patients were on ACEi (n=57), ARB (n=68), BB (n=15), or CCB (n=30), with mild (n=76), moderate (n=76), or severe (n=52) COVID-19. ACE2 levels were higher in patients with severe COVID-19 than those with mild (p=0.04) and moderate (p=0.007) disease. ACE2 levels correlated positively with the length of hospital stay (r=0.3, p=0.003), while angiotensin II levels decreased with disease severity (p=0.04). Higher ACE2 levels were associated with elevated CRP and D-dimer, while higher angiotensin II levels were associated with lower levels of CRP, D-dimer, and troponin. Among the four treated groups, patients on ARB exhibited elevation in ACE2 levels with increased disease severity (p=0.01), whereas patients on ACEi showed lower angiotensin II levels with increased disease severity. Patients on BB showed the lowest disease severity compared to other treated groups. Our data show increased COVID-19 severity with elevated levels of circulating ACE2 and lower levels of angiotensin II and suggest a protective effect of BB treatment against disease severity in hypertensive patients, independently of ACE2 and angiotensin II levels.

Keywords: Hypertension; ACE2; COVID-19; Renin-angiotensin system; Angiotensin-converting-enzyme inhibitors

Health and Biomedical Sciences
(Faculty and Postdoc)

Assessment of Human Fetal Left Heart Hemodynamics during Prenatal Development

Huseyin C. Yalcin[1], Huseyin E Salman[2], Reema Y. Kamal[3]
[1]Qatar University, Qatar
[2]TOBB University of Economics and Technology, Ankara, Turkey
[3]Hamad Medical Corporation, Qatar
hyalcin@qu.edu.qa

Abstract

The hemodynamic forces and wall shear stresses (WSS) play an important role during the fetal heart development. Abnormal levels of flow-driven shear stress can deteriorate the proper functioning of the cells responsible for the growth and remodeling of the heart and lead to congenital heart defects (CHDs). Hypoplastic left heart syndrome (HLHS) is a critical CHD with severely underdeveloped left ventricle and responsible for 25-40% of all neonatal cardiac deaths. To characterize the main differences between the healthy and HLHS fetal hearts in terms of morphology, flow behavior, and WSS levels, will help to understand the mechanobiological development of the human fetal hearts. The comparison of healthy and HLHS fetal hearts is important to understand the embryonic development of HLHS. Computational fluid dynamics (CFD) modeling is performed to elucidate the flow behavior and WSS levels in the heart chambers. First, the model geometries are generated using the medical images. Then, the flow domain is discretized in spatial and time domains for solving the governing fluid flow equations. Inlet flow conditions are determined using the Doppler ultrasound velocity measurements. The analyses cover the range of gestational week 16 and week 34. HLHS hearts have higher peak flow rates at the valves compared to the control hearts. The turbulent activity in the left side of the heart is higher than the right side. For the control hearts, there is a balance between the left and right sides of the heart, which is preserved during the development. The ratio of the cross-sectional area between the left and right sides of the heart is about 57.5% to 42.5% for the control hearts. HLHS significantly reduces the cross-sectional area of the left side of the heart. For HLHS hearts, the ratio between the left and right sides becomes about 30% to 70%. The average WSS levels significantly increase at the left side of the HLHS hearts. This study indicates the critical importance of the altered inflow hemodynamics during the human fetal heart development. CFD analysis can be used to predict the initiation and growth of CHDs. The presence of CHDs significantly changes the biomechanical environment in the fetal hearts.

Keywords: Hemodynamics; Left ventricle; Hypoplastic left heart syndrome; Congenital heart defects; Mechanobiology

Health and Biomedical Sciences
(Faculty and Postdoc)

Direct Measurement of Vessel Pressure in Chicken Embryo during Development

Vijayakumar Sukumaran, Rawia Abdelraheem, Huseyin Yalcin
Biomedical Research Institute, Qatar University, Qatar
vijay@qu.edu.qa

Abstract

Hemodynamic conditions play a critical role in embryonic cardiovascular development, and altered blood flow leads to congenital heart defects (CHD). Chicken embryos are commonly used as models of cardiac development, with abnormal blood flow achieved through left artery ligation (LAL) surgery intervention to restrict the blood flow. The heart is the first functioning organ in the developing embryo and a detailed understanding of the physiological mechanisms involved in its formation provides insights into CHD. Therefore, it is important to measure the pressure during the development of an embryo. This study is aimed to develop measure the pressure during normal and LAL condition in chicken embryo by using an WPI-900A micro pressure system. This approach is based on servo-null method where a microelectrode is introduced into the vitelline artery to directly measure the vessel pressure of the chicken embryo during development (HH18-HH32). We also described the initial calibration of the microelectrode as well as pressure measurement at different time points. In addition, we measure pressure after hemodynamic alteration via LAL surgery. We have successfully measured the vitelline artery pressure after 5 days of post incubated (HH26) chicken embryo. Our study provides a precise measurement of clinical relevant cardiac function. These measurements highlight the importance of hemodynamic alteration during the cardiovascular developments.

Keywords: Chicken embryo; Cardiovascular system; Hemodynamic alteration; Vitelline artery

Health and Biomedical Sciences

(Faculty and Postdoc)

Development and In Vivo Testing of Smart Nanoparticles for Enhanced Anti-Cancer Activity and Reduced Cardiotoxicity Associated with Tyrosine Kinase Inhibitors

Huseyin Yalcin, Hissa Al-Thani, Samar Shurbaji
Qatar University, Qatar
hyalcin@qu.edu.qa

Abstract

Tyrosine kinase inhibitors (TKIs) are new generation of anti-cancer drugs with very high efficiency against cancer cells. However, TKIs are associated with severe cardiotoxicity limiting their clinical benefits. One TKI that has been developed recently but not explored much is Ponatinib. The use of nanoparticles as a better therapeutic agent to deliver anti-cancer drugs and reduce their cardiotoxicity has been recently considered. In this study, PLGA-PEG-PLGA nanoparticles were synthesized to deliver Ponatinib while reducing its cardiotoxicity for treatment of chronic myeloid leukemia. Shape, size, surface charge and drug uptake ability of these nanoparticles were assessed using transmission electron microscopy (TEM), ZetaSIZER NANO and high-performance liquid chromatography (HPLC). Cardiotoxicity of Ponatinib, unloaded and loaded PLGA-PEG-PLGA nanoparticles were studied on zebrafish model through measuring the survival rate and cardiac function parameters, to optimize efficient drug concentrations in an in vivo setting. These particles were tested on zebrafish cancer xenograft model in which, K562 cell line, was transplanted into zebrafish embryos. We showed that, at an optimal concentration (0.0025mg/ml), Ponatinib loaded PLGA-PEG-PLGA particles are non-toxic/non-cardio-toxic and are very efficient against cancer growth and metastasis. Zebrafish is a good animal model for investigating the cardiotoxicity associated with the anti-cancer drugs such as TKIs, to determine the optimum concentration of smart nanoparticles with the least side effects and to generate xenograft model of several cancer types. Also, PLGA-PEG-PLGA NPs could be good candidate for CML treatment, but their cellular internalization should be enhanced. This could be achieved by coating and labeling the surface of PLGA-PEG-PLGA NPs with specific ligands that are unique to CML cells.

Keywords: Tyrosine kinase inhibitors; Cancer; Zebrafish, Nanoparicle

Health and Biomedical Sciences
(Faculty and Postdoc)

Quantitative analysis of lecture-capture archive viewing by pharmacy students during the emergency switch to remote learning

Farhat Naz Hussain[1], Reem Al-Mannai[1], Abdelali Agouni[1,2,3]

[1]College of Pharmacy, QU Health, Qatar University, Qatar, Qatar
[2]Biomedical and Pharmaceutical Research Unit (BPRU), QU Health, Qatar University, Qatar,
[3]Research Support for Grants and Contracts Department, Office of the Vice-President for Research, Qatar University, Qatar,
fhussain@qu.edu.qa

Abstract

Purpose: The COVID-19 pandemic caused the sudden suspension of face-to-face classes in many higher institutions worldwide. To leverage preparedness of higher education in similar emergencies preventing on-campus classes, we aimed to understand some of the factors that facilitated the rapid switch to remote learning.

Methods: We quantitatively analyzed how rapid switch to remote learning following pandemic (Spring 2020) impacted access to lecture-recording archives by undergraduate pharmacy students. The number of views per lecture for each course were mapped to the time of the day, weeks of the term and number of weekly assessments. Data were compared between Spring 2019 and 2020 in addition to analyzing differences before and after remote learning (Spring 2020).

Findings: Weekly lecture-recording views after the suspension of in-person classes in Spring 2020 were higher compared to Spring 2019 (452 *versus* 291 views). Driven by viewing of the previous year's archives (Spring 2019), the number of weekly views soared in weeks 11-13 (Spring 2020) compared to before coinciding with the sudden switch to online learning although all scheduled assessments in this period were postponed. This was confirmed by comparing views of Spring 2019 archives at two time points – November 2019 and September 2020. All courses studied had higher views per lecture in September 2020 compared to November 2019.

Conclusion: Our study underscores the benefits of embedding lecture-capture systems to support student's learning and leverage preparedness of universities to respond to emergencies preventing face-to-face classes.

Keywords: COVID-19, remote learning, lecture capture, pandemic, pharmacy education

Health and Biomedical Sciences
(Faculty and Postdoc)

Impact of Attention Deficit Hyperactivity Disorder on Driving among Drivers in Qatar

Wael Alhajyaseen[1], Chantal Timmermans[1], Abdrabo Soliman[1], Tom Brijs[2],
Khaled Bedair[1], Veerle Ross[2], Wondwesen Girma Mamo[1]

[1]Qatar University, Qatar, Qatar
[2]Hasselt University, Belgium
w.mamo@qu.edu.qa

Abstract

This study aims to investigate the impact of ADHD traits on young drivers' deviant driving behaviors that may contribute to their involvement in traffic crashes. **Methods**: A sample of 450 young drivers from the State of Qatar were asked to fill the Adult ADHD Self-Report Scale and the Driver Behaviour Questionnaire, in order to examine the impact of self-reported ADHD traits on ordinary violations, driving errors, lapses and aggressive violations. A path analysis model was developed to test the predictability of these ADHD traits on deviant driving behaviours. **Results**: Male drivers with hyperactivity-impulsivity traits are significantly more likely to report deviant driving behaviors. In contrast, female drivers with inattention traits are more likely to report deviant driving behaviors. The inattention trait has a minor predictive role for young male drivers and is not significantly related to aggressive violations. Female drivers' aggressive violations are not predicted by the hyperactivity-impulsivity trait, but the inattention traits among those drivers are the strongest predictor of aggressive violations. **Conclusion**: Theses results have practical implication regarding creating inclusion environment to trainee drivers with ADHD in driving school. This can be achieved by developing special driving training and education programs.

Keywords: Inattention; Hyperactivity-impulsivity; Deviant driving behavior; DBQ; Qatar

Health and Biomedical Sciences

(Faculty and Postdoc)

Investigation of potential rupture locations for abdominal aortic aneurysms with patient-specific computational fluid dynamic analysis approach

Onur Mutlu, Hüseyin Çağatay Yalçın
Qatar University, Qatar, Qatar
onurmutlu94@gmail.com

Abstract

Background: About 18 million people die each year from cardiovascular disorders, accounting for 31% of all deaths worldwide. Abdominal Aortic Aneurysm (AAA) is a serious clinical condition manifested as dilation of the aorta beyond 50% of the normal vessel diameter. Current clinical practice is to surgically repair large AAAs with a diameter > 5.5 cm. However, the practice is questionable based on small AAA rupture and large AAA no rupture cases. Currently, there is no accepted technique to quantify the risk of rupture for individual AAAs. It is believed that rupture locations are where peak wall stresses act. Hemodynamic forces by the flowing blood such as shear stress are also thought to contribute to the formation of aneurysms leading to rupture. **Aim:** Our aim is to perform precise computational analysis for the assessment of rupture risk for AAA patients. **Methods:** In this IRCC funded project, we will develop a patient-specific computational modeling methodology to assess wall stresses acting on the diseased AAA, for reliable rupture risk assessment of the conditions. In the computational simulations, we will adapt the fluid-structure interaction approach to account for both tissue displacements and hemodynamic forces, for enhanced accuracy. We have recruited 20 AAA patients at HMC and collected CT scans and ultrasound images for these patients. Using these medical data, we are developing accurate 3D model geometries. Doppler ultrasound measurements are used as velocity boundary conditions in the simulations. **Expected Results:** Findings from this project will contribute significantly to understanding the biomechanics and mechanobiology of AAA rupture and will help to establish a computational modeling approach for rupture risk assessment of AAAs.

Keywords: AAA (Abdominal Aortic Aneurysm); CFD; FSI; OSI; TAWSS

Health and Biomedical Sciences
(Faculty and Postdoc)

Genetic Susceptibility to Infectious Diseases in the Qatari Population

Maria Khalid Smatti[1,2], Yasser Al-Sarraj[2], Omar Albagha[2,3], Hadi Yassine[1,2]
[1]Qatar University, Qatar, Qatar
[2]Hamad Bin Khalifa University, Qatar
[3]University of Edinburgh, UK
msmatti@qu.edu.qa

Abstract

Background: Infectious diseases (IDs) account for 8% of deaths annually in Qatar, and therefore, represent a significant challenge for public health. Interestingly, the spread and severity of viral infections vary considerably between individuals and populations. The most recent example is SARS-CoV-2, which ranges from mild/asymptomatic to a severe respiratory syndrome. It has been previously reported that polymorphisms in genes linked to immunity can influence individuals' responses to infections as observed in tuberculosis, influenza, and HIV; however, studies exploring causal host genetic variants in IDs are still limited and dramatically skewed with regard to population inclusion. In fact, the genetic susceptibility to IDs in the Qatari population is largely unknown. **Aim:** To perform a comprehensive genetic screening to investigate the presence and frequency of variants previously associated with various infections in the Qatari population. **Methods:** Whole-genome sequencing was previously performed for 18,000 QBB participants using Illumina HiSeq X Ten1 sequencers. The initial data processing and quality assessment of the raw data has also been performed and variant calling files (VCF) were created. We were granted the access to the VCF files of 6,218 sequenced samples. The genetic variant data was then converted to PLINK file format using PLINK-1.9. Standardized quality-assurance and quality control (QA/QC) methods were followed to generate high quality and confidence on both SNPs and sample levels. The final file used for calculating allele frequency contained 6,047 subjects. Additionally, list of infections-related SNPs that were previously reported in the literature and deposited in GWAS catalog was extracted and used to calculate and compare the allelic frequency in the Qatari genomes compared to other populations. **Results:** The frequency of infections-related SNPs in the Qatari population was significantly lower for most infections. Most variants (78%) showed negative fold change in the Qatari genomes. Only 22% of all variants were more prevalent in Qatari population compared to others. The most significant differences were observed in genes related to TB and HIV (200-940 and 160-710 fold change, respectively). **Conclusion:** This study reports a lower susceptibility of the Qatari population to IDs in general. Nonetheless, this might also indicate the presence of unknown Qatari-unique variants and hence, highlights the need for further investigation in future GWAS.

Keywords: Host genetics; Susceptibility; SNPs; Qatar Genome; Infectious Diseases

Health and Biomedical Sciences
(Faculty and Postdoc)

Nitric Oxide Releasing Hydrogel Nanoparticles Decreases Epithelial Cell Injuries Associated With Airway Reopening

Samar Haroon Shurbaji, Huseyin Yalcin
Qatar University, Qatar
sshurbaji@qu.edu.qa

Abstract

Introduction: Acute respiratory distress syndrome (ARDS) is an acute inflammatory lung condition. It is characterized by disruption of gas exchange inside the alveoli, accumulation of protein edema, and an increase in lung stiffness. One major cause of ARDS is a lung infection, such as SARS-COV-2 infection. Lungs of ARDS patients need to be mechanically ventilated for airway reopening. Consequently, ventilation might damage delicate lung tissue leading to excess edema, known as ventilator-induced lung injury (VILI). Mortality of COVID-19 patients under VILI seems to be higher than non-COVID patients, necessitating effective preventative therapies. VILI occurs when small air bubbles form in the alveoli, injuring epithelial cells (EPC) due to shear stress. Nitric oxide (NO) inhalation was suggested as a therapy for ARDS, however, it was shown that it is not effective because of the extremely short half-life of NO. Methods:In this study, NO-releasing nanoparticles were produced and tested in an in vitro model, representing airways in the deep lung. Cellular injuries were quantified via fluorescent live/dead assay. Atomic force microscopy (AFM) was used to assess cell morphology. qRT-PCR was performed to assess the expression of inflammatory markers, specifically IL6 and CCL2. ELISA was performed to assess IL6 and confirm qRT-PCR results at the protein level. Finally, ROS levels were assessed in all groups. Results: Here, we show that NO delivery via nanoparticles enhanced EPC survival and recovery, AFM measurements revealed that NO exposure affect cell morphology, while qRT-PCR demonstrated a significant downregulation in IL6 and CCL2 expression when treating the cells to NO both before and after shear exposure. ELISA results for IL6 confirmed qRT-PCR data. ROS experiment results support our findings from previous experiments. Conclusion : These findings demonstrate that NO-releasing nanoparticles can be used as an effective delivery approach of NO to deep lung to prevent/reduce ARDS associated inflammation and cell injuries. This information is particularly useful to treat severe ARDS due to COVID-19 infection. These nanoparticles will be useful when clinically administrated to COVID-19 patients to reduce the symptoms originating from lung distress.

Keywords: ARDS;Nanoparticles; NO NPs; Nitric oxide; shear stress

Health and Biomedical Sciences

(Faculty and Postdoc)

Experimental and Biological Investigation of Hemodynamics-induced Injuries for Cardiovascular Disorders

Samar Haroon Shurbaji, Huseyin Yalcin
Qatar University, Qatar
sshurbaji@qu.edu.qa

Abstract

Introduction:Abdominal aortic aneurysm (AAA) is a degenerative disease process of the abdominal aorta that leads to a focal dilation and irreversible remodeling of the arterial wall. In this condition, the aortic vessel diameter is dilated beyond 50% its its size.AAA might gradually expand until rupture If left untreated. Current surgical treatment options also are associated with high mortality rates. Therefore, for AAA, it is critically important to determine when the risk of rupture justifies repair. Current clinical practice is to surgically repair large AAAs with diameter > 5.5 cm. However, the incidence of rupture is independent of the diameter size. Currently there is no accepted technique to quantify the risk of rupture for individual AAAs. It is believed that, rupture locations are where peak wall stresses act. Hemodynamic forces by the flowing blood such as shear stress are also thought to contribute to the formation of aneurysm leading to rupture. Endothelial cells respond to disturbed flows in the aneurysm and initiate inflammation that are thought to be important in disease progression. However, little is known about the flow dynamics in AAA, and how it affects endothelial cell biology leading to AAA rupture. Methods: In this project, we will use different flow systems to induce shear stress over cell's monolayer. After inducing shear stress, gene expression for shear responsive genes and inflammatory markers will be assessed. Basically, we used the peristaltic pump to induce pulsatile flow over cell's monolayer, and laminar flow using our modified set up. We will compare gene expression data obtained from those two systems with data obtained from our Fluigent pressurized driven pump. Then, we will use another state-of-the-art system, namely a biological pulsed duplicator. Using the system, endothelial cells that are cultured within AAA shaped chambers will be exposed to physiological flows in order to reveal differential endothelial cell signals at potential rupture locations Results: In this project, pulsatile and steady flow were successfully induced and validated. Endothelial cells are mostly affected by mechanical signals, mostly shear stress. The cell's cytoskeleton is responsible for cell shape and integrity. Those proteins are affected by fluid flow. We expect to have a differences in the gene expression of different flow conditions. After we obtain the gene expression data, those will be compared to more precise flow set up (Fluigent pressurized driven pump)

Keywords: Abdominal aortic aneurysm; Endothelial cells; Mmicrofludics; Shear stress

Health and Biomedical Sciences
(Faculty and Postdoc)

Detection of antinuclear antibodies targeting intracellular signal transduction, metabolism, apoptotic processes and cell death in critical COVID-19 patients

Aisha Fakhroo[1], Fatma Ali[2], Gheyath K. Nasrallah[2],
Nico Marr[3], Hadi Mohamad Yassine[2]
[1]Barzan Holdings, Qatar
[2]Qatar University, Qatar
[3]Sidra Medicine, Qatar
hyassine@qu.edu.qa

Abstract

Background: The heterogeneity of COVID-19 lies within its diverse symptoms and severity, ranging from mild to lethal. Acute respiratory distress syndrome (ARDS) has been shown to be the leading cause of mortality in COVID-19 patients, characterized by a hyper cytokine storm. Autoimmunity is proposed to occur as a result of COVID-19, given the high similarity of the immune responses observed in COVID-19 and autoimmune diseases. Results: Here, we investigate the level of autoimmune antibodies in COVID-19 patients with different severities. Initial screening for antinuclear antibodies (ANA) IgG revealed that 1.6% (2/126) and 4% (5/126) of ICU COVID-19 cases developed strong and moderate ANA levels, respectively. However, all the non-ICU cases (n = 273) were ANA negative. The high ANA level was confirmed by immunofluorescence (IFA) and large-scale autoantibody screening by phage immunoprecipitation-sequencing (PhIP-Seq). Indeed, the majority of the samples showed "speckled" ANA pattern by microscopy, and we demonstrate that samples of ICU patients with strong and moderate ANA levels contain autoantibody specificities that predominantly targeted proteins involved in intracellular signal transduction, metabolism, apoptotic processes, and cell death; further denoting reactivity to nuclear and cytoplasmic antigens. Conclusion:Our results further support the notion of routine screening for autoimmune responses in COVID-19 patients, which might help improve disease prognosis and patient management. Further, results provide compelling evidence that ANA-positive individuals should be excluded from being donors for convalescent plasma therapy in the context of Covid-19.

Keywords: Autoimmunity; ANA; ICU; COVID-19; Coronavirus

Health and Biomedical Sciences
(Faculty and Postdoc)

Risk prediction of early decline in renal function in diabetic kidney disease with algorithm including fractional excretion of glycated amino acids

Naila Rabbani[1], Alberto de a Fuente[2], Paul Thornalley[2]

[1]College of Medicine, Qatar Health, Qatar University, Qatar

[2]Diabetes Research Center, Qatar Biomedical Research Institute, Hamad Bin Khalifa University, Qatar

n.rabbani@qu.edu.qa

Abstract

Background and aims: Diabetic kidney disease occurs in *ca.* 40% patients with diabetes. Approximately 1 in 5 patients with type 1 diabetes mellitus (T1DM) and 1 in 3 patients with type 2 diabetes mellitus (T2DM) develop early decline in renal function (EDRF), requiring renal dialysis after 5 - 20 years. Currently, at the time of normoalbuminuria or new onset microalbuminuria (incipient diabetic nephropathy), it is uncertain which patients are at risk of EDRF. With Joslin Kidney Study investigators, we found patients with T1DM who later developed EDRF (Decliners) have higher fractional excretion (FE) of 6 glycated amino acids - fructosyl-lysine and 5 advanced glycation endproducts (AGEs), compared to patients with stable renal function (Non-decliners). However, FE of any single glycated amino acid could not classify Decliners or Non-decliners. The aim of this study was to apply artificial intelligence machine learning to develop diagnostic algorithms to classify Decliners and Non-decliners by optimum combination of levels of glycated and oxidized amino acids in plasma and urine, related FEs and conventional clinical chemistry variables. **Materials and methods:** Patients with T1DM with stable renal function (n = 63) and EDRF (n = 22) were recruited for this study. Data on levels of 14 glycated and oxidized amino acids in plasma, urine, related FEs, glycated hemoglobin A1C, log(urinary albumin creatinine ratio, ACR), age, gender and duration of diabetes at the time of new onset microalbuminuria were included as features in algorithm development. Algorithms were trained and tested on 90%/10% data split, repeated 1000 times, using the Extreme Gradient Boosting method. **Results:** The algorithm gave an optimal classification of Decliners and Non-decliners. Optimum with features: A1C, log[ACR], FE(N$_\square$-carboxymethylarginine, CMA), FE(glyoxal-derived hydroimidazolone, G-H1) and plasma concentration of N$_\varepsilon$-carboxymethyl-lysine (CML) free adduct; For The diagnostic performance for risk prediction of future EDRF was (mean ± SD): sensitivity 74 ± 9%, specificity 91 ± 45 and accuracy 87 ± 4%. The positive likelihood ratio LR+ was 11.0, indicating that this method gives strong, often conclusive evidence of future EDRF in patients with T1DM. In contrast, algorithms with A1C and logACR only as features gave LR+ 2.6, providing small evidence of risk of future EDRF. **Conclusion:** With conclude that FEs of glycated amino acids are novel risk predictors of EDRF, likely linked to reporting of early-decline of cationic amino acid transporter function in the renal tubular epithelium. Genetic polymorphism of these amino acid transporters has been linked to rapid decline in renal function in genome-wide association studies. Measurement of only 3 glycated amino acids, CMA, G-H1 and CML, produced an algorithm with optimum risk prediction of EDRF. With further validation, including in patients with T2DM and with chronic kidney disease without diabetes, this method may markedly improve clinical risk prediction of EDRF.

Keywords: Diabetic kidney disease; Early decline in renal function (EDRF); Glycated amino acids; Fractional excretion; Machine learning; Risk predictors
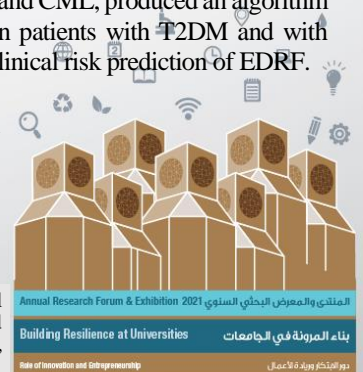
Health and Biomedical Sciences
(Faculty and Postdoc)

Study of the In Vitro Biodegradation Behavior of Mg–2.5Zn–xES Composite for Orthopedic Application

Ahmed Bahgat[1], Paul Okonkwo[2], Gupta Manoj[3], Noora Alqahtani[1],
Rana Shakoor[1], Aboubakr Abdullah[1]

[1]Qatar University, Qatar
[2]College of Engineering, Dhofar University, Salalah, Oman
[3]College of Engineering, National university of Singapore, Singapore
ahmedbahgat@qu.edu.qa

Abstract

Non-degradable steel and titanium implants used to replace defects of the locomotor system or fabricate vascular stents provide maximum stability but have too many drawbacks. However; the defects in oxide layer and the corrosive nature of physiological environment, the thermodynamic tendencies make the alloys susceptible to release of cationic species in the form of corrosion, which result in triggering various biological factors and compromises the mechanical integrity of the implanted materials. Currently, biodegradable magnesium alloys are considered as promising materials for creation of fixation devices in orthopedics and cardiovascular surgery. In this work, zinc (Zn) and eggshell (ES) reinforced biodegradable magnesium alloy (Mg–2.5Zn), and environment concise (eco) composite (Mg–2.5Zn–xES) was fabricated using disintegrated melt deposition (DMD) technique. In vitro experiments were conducted to explore the effect variable concentration of ES (3 and 7 wt%) on the biodegradation behavior of Mg–Zn alloy using simulated body fluid (SBF) at 37 ℃. The corrosion behavior of the Mg–2.5Zn–xES alloys was explored in SBF solution using different techniques such as weight loss measurement, hydrogen evolution, potentiodynamic polarization, electrochemical Impedance Spectroscopy (EIS). EIS revealed increased in vitro degradation of the biodegradable magnesium alloy, and ecofriendly composite as the percentage of ES reinforcement was increased. X-ray diffraction (XRD) was performed to observe the chemical composition of elements and reaction products present in the degraded samples after the corrosion process.

Keywords: Biodegradable; Mg alloy; Corrosion; Implant

Health and Biomedical Sciences
(Faculty and Postdoc)

The prevalence of statin prescription for primary prevention of Arteriosclerotic Cardiovascular Diseases among patients with Type 2 Diabetes in Qatar

Alaa Hasan Daban[1,2]
[1]Primary health corporation, Qatar
[2]College of health sciences, Qatar
ad1705355@qu.edu.qa

Abstract

Background: Qatar has one of the highest prevalence rates for diabetes in the world. Arteriosclerotic cardiovascular diseases (ASCVDs) are responsible for nearly 50% of deaths among patients with diabetes in Qatar. Treating with statins is a simple and effective approach for preventing ASCVD among patients with diabetes. Local and international guidelines recommend the use of statins for primary prevention of ASCVD in patients with diabetes, especially for those 40-75 years of age. Yet statins are still under-prescribed to diabetic individuals for primary prevention of ASCVD worldwide, especially in primary care settings which is where most of the medical management of diabetes occurs. Little is known about the prevalence of statin prescription for primary prevention of ASCVD among diabetics in primary care settings in Qatar. Objectives: To measure the proportion of T2dm patients receiving statins for primary prevention of ASCVD in primary care settings and to investigate patients' characteristics associated with statin prescription. Results: Of 23,934 patients with complete data, 57% were males and 31.9% were Qatari nationals. Average age for participants was 54.8 ± 8.25 years. 66 % of the patients received statins at least once during the year 2019. The statin prescription rate for Non-Qatari males was 70.1% and was significantly higher than non-Qatari females, Qatari females, or Qatari males (62.2%, 62.9% and 63.9% respectively P value <0.000) In a multivariable model analysis and after controlling for other covariates in the model, statin prescription was positively associated with being male (adjusted odds ratio (aOR): 1.2, [95% CI: 1.12-1.28]), history of smoking, i.e. former smoker (aOR 1.16 [95% CI: 1.03-1.29]), current smoker (aOR 1.11 [95% CI: 1.01-1.22]), associated diagnosis of hypertension (aOR 1.51 [95% CI: 1.41-1.61]), being prescribed other non-statin lipids lowering medications (aOR 1.44 [95% CI: 1.27-1.63]), increased age (aOR 1.03/year [95% CI: 1.026-1.034]), increasing daily pill burden (aOR 1.23/pill [95% CI: 1.21-1.25]), increasing number of daily medication injections (aOR 1.29/injection [95% CI: 1.23-1.35]), and frequent visits to GP clinic (aOR 1.22/visit [95% CI: 1.19-1.24]). Statin prescription was negatively associated with having a history of diabetic neuropathy (aOR 0.87 [95% CI: 0.75-1.0]), increasing BMI (aOR 0.996/unit [95% CI: 0.9892-1.00]), being Qatari (aOR 0.87 [95% CI: 0.81-0.93]) or being prescribed an anti-platelet (aOR 0.96/unit [95% CI: 0.89-1.03]). Significant negative effect modification between hypertension and either male gender or Qatari nationality was found, further lowering the odds for Qatari males. Conclusion: Prevalence of statin prescription for primary prevention of ASCVD among patients with T2dm was suboptimal in primary care settings in Qatar and need to be improved. Factors associated with a lower prevalence of statin prescription namely female gender and Qatari nationality needs to be addressed. Further studies are needed to explore causes of the low prescription rates of statins in Qatar.

Keywords: Statin; Arteriosclerotic; Prevalence; Prevention
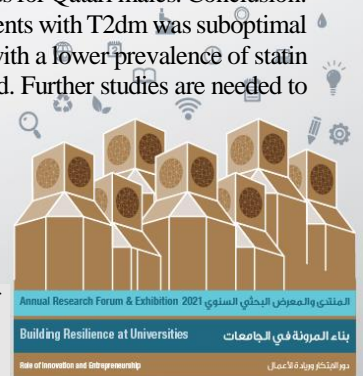
Health and Biomedical Sciences
(Faculty and Postdoc)

Omega-3 fatty acid-rich fish oil supplementation prevents rosiglitazone-induced osteopenia in aging mice

Chiara Cugno[1], Ganesh Halade[2], Md Mizanur Rahman[3]
[1]Sidra Medicine, Qatar
[2]University of South Florida, USA
[3]Qatar University, Qatar,
mrahman@qu.edu.qa

Abstract

Rosiglitazone is an effective insulin-sensitizer, however, associated with bone loss mainly due to increased bone resorption, and bone marrow adiposity, and decreased bone formation. We investigated the effect of the co-administration of fish oil (FO) rich in omega-3 fatty acids (FAs) on rosiglitazone (RSG)-induced bone loss in aging C57BL/6 mice and the mechanisms underlying potential preventive effect. Mice fed the iso-caloric diet supplemented with fish oil exhibited significantly higher levels of bone density in different regions compared to the other groups. In the same cohort of mice, reduced activity of COX-2, enhanced activity of alkaline phosphatase, lower levels of cathepsin k, PPAR-γ, and pro-inflammatory cytokines, and a higher level of anti-inflammatory cytokines were observed. Moreover, fish oil restored rosiglitazone-induced down-regulation of osteoblast differentiation and up-regulation of adipocyte differentiation in C3H10T1/2 cells and inhibited the up-regulation of osteoclast differentiation of RANKL-treated RAW264.7 cells. We finally tested our hypothesis on human Mesenchymal Stromal Cells (MSCs) differentiated to osteocytes and adipocytes confirming the beneficial effect of docosahexaenoic acid (DHA) omega-3 FA during treatment with rosiglitazone, through the down-regulation of adipogenic genes, such as adipsin and FABP4 along the PPARg/FABP4 axis, and reducing the capability of osteocytes to switch toward adipogenesis. Our findings demonstrate that fish oil may prevent rosiglitazone-induced bone loss by inhibiting inflammation, osteoclastogenesis, and adipogenesis and by enhancing osteogenesis in the bone microenvironment. Further clinical studies will be undertaken to establish this treatment regimen for the successful treatment of diabetic patients with rosiglitazone without adverse side effects on bone.

Keywords: Diabetes; Rosiglitazone; Bone loss; Fish oil; Omega-3 fatty acids

Health and Biomedical Sciences
(Graduate Students)

Segmenting Liver Volume for Surgical Analysis

Ayman Jamal Al-Kababji[1], Faycal Bensaali[1], Sarada Prasad Dakua[2]
[1]Department of Electrical Engineering, College of Engineering, Qatar
[2]Department of Surgery, Hamad Medical Corporation, Qatar
aa1405810@qu.edu.qa

Abstract

Introduction: Almost two million people worldwide die annually due to hepatic-related diseases. Half of these diseases are attributed to cirrhosis and the other half are related to hepatitis and hepatocellular carcinoma (HCC). The liver is also a metastasis hub from adjacent organs. This research aims to create an accurate high-quality delineation of the human liver and prepare them to be 3D printed for medical analysis to help aid medical practitioners in pre-procedural planning. **Materials and Methods:** Convolutional neural networks (ConvNets) are used to perform the liver tissues delineation. A famous ConvNet, named U-net, is used as the basis benchmark architecture that is also known for its great outcomes in the medical segmentation field. Contrast-enhanced computerized tomography (CT) scans are used from the famous Medical Segmentation Decathlon Challenge (Task 8: Hepatic Vessel), abbreviated as MSDC-T8. It contains 443 CT scans, which is considered the largest dataset that contains both the tumors and vessels ground-truth segmentation. Some researchers also generated the liver masks for this dataset, making it a complete dataset that contains all the relevant tissues' ground-truth masks. **Results:** Currently, the liver delineation has been successfully done with very high DICE = 98.12% (higher than the state-of-the-art results DICE = 97.61%), where a comparison between two famous schedulers namely, ReduceLRonPlateau and OneCycleLR has been conducted. Moreover, the 3D liver volume creation has also been completed and built via the marching cube algorithm. **Conclusions/Future Directions:** The developed ConvNet can segment livers with high confidence. The tumor(s) and vessels tissues segmentation are also under investigation now. Moreover, newly devised self-organized neural networks (Self-ONN) look promising and will be investigated soon. Lastly, a GUI will be built so that the medical practitioner can just insert the CT volume and get the 3D liver volume with all the segmented tissues.

Keywords: Liver delineation; Convolutional neural network; Machine learning; 3D model; Surgical planning

Health and Biomedical Sciences
(Graduate Students)

Nurses' Knowledge and Attitudes about Adult Post-operative Pain Assessment and Management: A Cross-Sectional Study in Qatar

Haya Samara[1,2], Lily OHara[1]
[1]Qatar University, Qatar
[2]Hamad Medical Corporation, Qatar
lohara@qu.edu.qa

Abstract

Background: Pain has been described by clinicians, patients, and researchers alike as a complex and challenging phenomenon. People have different experiences of pain. Nurses' negative attitudes and lack of knowledge are major impediments to effective pain management. **Methods:** The study was a cross-sectional online survey using a validated self-administered questionnaire for post-operative registered nurses working in Hamad Medical Corporation in Qatar. The dependent outcome was the score on the Knowledge and Attitudes Survey Regarding Pain. **Results:** A total of 151 post-operative nurses participated in the study. The mean knowledge and attitudes (K&A) score was 19.6 (SD 4.5) out of 41 (48%), indicating a huge deficit in the nurses' knowledge and attitudes about adult post-operative pain. No sociodemographic variables were associated with K&A scores. Neither the facility the nurses worked at nor hours of previous pain education were associated with K&A scores. **Conclusions:** There is a significant deficit in post-operative nurses' knowledge and attitudes about pain in Hamad Medical Corporation, with no significant differences based on demographics or other characteristics. This suggests the deficit is widespread within the nursing workforce in Qatar. This deficit is potentially impacting significantly on pain assessment and management for adults in post-operative settings. Pragmatic research on evidence-based nursing educational courses focused on pain assessment and management is required to enhance nurses' knowledge and attitudes and improve patient care. **Key messages:** Strategies to strengthen nurses' knowledge and attitudes toward pain in Qatar must be developed and tested.

Keywords: Pain; Knowledge; Attitudes; Health services; Nurses

Health and Biomedical Sciences

(Graduate Students)

Antibiotic Resistance and Virulence Gene Patterns Associated with Avian Pathogenic Escherichia coli from Broiler Chickens in Qatar

Alreem Johar[1], Najlaa Al-Thani[1], Sara Al-Hadidi[2], Elyes Dlissi[3], Mahmoud Mahoud[4], Nahla Eltai[2]

[1]Barzan Holdings, Qatar
[2]BRC- Qatar University, Qatar
[3]Al Asayl Veterinary Laboratory, Qatar
[4]Ministry of Municipality and Environment, Qatar
nahla.eltai@qu.edu.qa

Abstract

Introduction: Avian Pathogenic *Escherichia coli* (APEC) is the contributing agent behind the avian infectious disease colibacillosis, which causes substantial fatalities in poultry industries that significantly impact the economy and food safety. Several virulence genes have been shown to be concomitant with the extra-intestinal survival of APEC. This study investigates the antibiotic resistance patterns and APEC-associated virulence genes content in *Escherichia coli* (*E. coli*) isolated from non-healthy and healthy broiler chickens from a commercial poultry farm in Qatar. **Material and Methods:** 158 *E. coli* strains were isolated from 47 chickens from five different organs (air sac, cloacal, kidney, liver, and trachea). Genomic DNA was extracted from *E. coli* using the QIAamp Pathogen Mini Kit. Multiplex PCR was executed to detect tsh, iucD, ompT, hlyF, iroN, iss, vat, cvi/cva genes associated with PPEC. Antibiotic susceptibility testing was performed using the standard Kirby-Bauer disk and E-test. Amplified virulence genes detected were sequenced and analyzed. Graph Pad version 8 and PAST software version 4.03 were used for statistical and clustering analysis. The chi-square test was performed on all data to compare the antibiotic resistance and virulence gene patterns between non-healthy and healthy chicken samples **Results:** 65% of the isolated bacteria were APEC strains containing five or more virulence genes, and 34% were non-pathogenic *E. coli* (NPEC) strains. The genes ompT, hlyF, iroN, tsh, vat, iss, cvi/cva, and iucD were significantly prevalent in all APEC strains. *E. coli* isolates showed 96% resistance to at least one of the 18 antibiotics, with high resistance to ampicillin, cephalothin, ciprofloxacin, tetracycline, and fosfomycin. **Conclusions:** Our findings indicate high antibiotic resistance prevalence in non-healthy and healthy chicken carcasses. Such resistant *E. coli* can spread to humans. Hence, special programs are required to monitor the use of antibiotics in chicken production in Qatar**.**

Keywords: Colibacillosis; APEC; Antibiotic resistance; Chicken; Avian

Health and Biomedical Sciences
(Graduate Students)

Elaeagnus Angustifolia extract inhabits cell invasion of human colorectal cancer cells and increases the survival rate of the Drosophila colon cancer model

Arij Fouzat
Qatar University, Qatar
ah1304418@qu.edu.qa

Abstract

Colorectal cancer (CRC), the third most common type of cancer in the world, is an aggressive type of cancer with high tendency to metastasize and invade to other tissues and distant organs. Traditional CRC treatment regimen includes 5-fluorouracil (5-FU); however, tumors develop a resistance against these drugs, apart from the severe side effects that develop upon these therapies. Nowadays, traditional medicinal plants are the focus of increased interest as a source for new potential drugs, particularly those that serve as anti-cancerous agents. *Elaeagnus angustifolia* (*EA*) is a medicinal plant that can be used traditionally to manage several human ailments including cancers especially oral and HER2-positive breast cancer as recently reported by our group. However, the effect of *EA* flower extract on human CRC has not been investigated yet. Therefore, *EA* effect was explored *in vitro* using *KRAS* CRC cell lines (HCT-116 and LoVo) and *in vivo* using transgenic *Drosophila melanogaster* model for *KRAS* gene, which is known to develop CRC. Our results from the *in vitro* investigations revealed that *EA* flower extract significantly inhibits cell motility and invasion in addition to colony formation. Moreover, we found that *EA* extract modulates the epithelial–mesenchymal transition (EMT) event and its related genes; EMT is a known hallmark of cancer invasion and metastasis. More significantly, our *in vivo* data pointed out that *EA* extract increases the survival rate of *KRAS* mutation *D. melanogaster* model. Our findings implicate that *EA* extract may possess chemo-preventive effects against human CRC.

Keywords: Colorectal cancer; Elaeagnus angustifolia; cell-cell adhesion; EMT; Drosophila melanogaster

Health and Biomedical Sciences
(Graduate Students)

Effect of Pharmacogenetic-Based Decision Support Tools in Improving Depression Outcomes: A Systematic Review

Shimaa Aboelbaha, Monica Zolezzi, Hazem Elewa
College of Pharmacy Health (CPH), Qatar University, Qatar
sa1401981@qu.edu.qa

Abstract

Introduction: Evidence supporting pharmacogenetic (PGX) tests utility in depression is scarce. The main objectives of this study were to summarize, update, and assess the quality of the available evidence regarding PGX testing in depression as well as estimating the impact of using PGX testing tools in depression outcomes in the MENA region. **Methodology:** Scientific databases were systematically searched from inception to June 30, 2020 for systematic reviews (SRs) and randomized controlled trials (RCTs) assessing clinical utility of PGX tests in treatment of depression. Meta-analysis only and RCTs that that were included in eligible SRs were excluded. Quality of the eligible studies were assessed using Crowe Critical Appraisal Tool (CCAT). **Results:** Six SRs and three RCTs met the inclusion criteria and were included in this study. Results of the SRs have provided weak evidence on the efficacy of PGX testing especially in patients with moderate-severe depression at eight weeks. In addition, there was a lack of evidence regarding safety outcomes. Newer RCTs with better qualities showed clinical promise regarding efficacy outcomes especially in patients with gene-drug interactions. No evidence was found regarding PGX testing impact in the MENA region. **Conclusion:** This SR summarizes findings, provides an update, and assesses the quality of available SRs on this topic. Findings of this study have demonstrated that PGX testing prior to treatment initiation might improve efficacy outcomes. Further studies are warranted to assess PGX testing impact on safety outcomes.

Keywords: Pharmacogenetic testing; Depression; Genetic tools; Efficacy; Safety

Health and Biomedical Sciences
(Graduate Students)

The Combination of Dasatinib and PD L1 inhibitor prevents the progression of epithelial mesenchymal transition and dramatically blocks cell invasion of HER2 positive breast cancer cells

Hadeel Kheraldine[1,2,3], Ishita Gupta[1,2,3], Farhan Cyprian[1,2],
Semir Vranic[1,2], Ala-Eddin Al Moustafa[1,2,3,4]
[1]College of Medicine, Qatar University, Qatar
[2]Biomedical and Pharmaceutical Research Unit, Qatar University, Qatar
[3]Biomedical Research Center, Qatar University, Qatar
[4]Oncology Department, Faculty of Medicine, McGill University, Montreal, QC, Canada
hk1805332@qu.edu.qa

Abstract

Introduction: Both Dasatinib (DA), a tyrosine kinase inhibitor that is used for targeted cancer therapy, and programmed death-ligand 1 (PD-1/PD-L1) inhibitor that is an immune checkpoint therapy, play a vital role in the management of several types of solid tumors, including breast. Nevertheless, the combined outcome of DA and PD-1/PD-L1 inhibitors in human carcinomas has not been explored yet. Materials and methods: We herein compared the individual impact of DA and PD-1/PD-L1 inhibitors (BMS-202) with their combination on two human HER2-positive breast cancer cell lines, SKBR3 and ZR75. Results: Our data revealed that the combination of DA and BMS-202 significantly inhibits cell proliferation in both cell lines as compared to mono treatment and/or untreated cells. Moreover, we observed that combination treatment prevents the progression of "epithelial-mesenchymal transition" (EMT), which is a hallmark of cell invasion and cancer progression. Our data reveal that DA and BMS-202 together dramatically inhibit cell invasion of SKBR3 and ZR75 cells; this is accompanied by the up-regulation of E-cadherin and its restoration along with b-catenin on the cell membrane and its undercoat, respectively, in addition to the downregulation of vimentin, which are major markers of EMT. Additionally, we found that the synergistic treatment of DA and BMS-202 inhibits colony formation of both cell lines in comparison with their matched control. Conclusion: Our findings implicate that, in comparison to monotreatment, combination of DA and BMS-202 could have a significant impact on the management of HER2-positive breast cancer via HER2 inactivation and specifically b-catenin signaling pathways.

Keywords: Dasatinib; PD-1/PD-L1; HER2-positive breast cancer; EMT

Health and Biomedical Sciences

(Graduate Students)

Anticancer activity of Neosetophomone B, A Fungal Secondary Metabolite, against Hematological Malignancies

Shilpa Kuttikrishnan[1,2], Kirti S.Prabhu[1], Tamam Elimat[3], Ashraf Khalil[2],
Nicholas H.Oberlies[4], Feras Q.Alali[2], Shahab Uddin[1]

[1]Qatar University, Qatar
[2]Hamad Medical Corporation, Qatar
[3]Jordan University, Jordan
[4]North Carolina University, UK
sk1904925@qu.edu.qa

Abstract

Cancer is one of the most life threatening diseases, causing nearly 13% death in the worldwide. Leukemia, cancer of the hematopoetic cells is the main cause of cancer death in adults and children. Therapeutic agents used in treatment of cancer are known to have narrow therapeutic window and tendency to develop resistance against some cancer cell lines thus, proposing a need to discover some novel agents to treat cancer. In the present study we investigated the anticancer activity of Neosetophomone B (NSP-B), a fungal secondary metabolite isolated from *Neosetophoma sp* against leukemic cells (K562 and U937). MTT results demonstrated a dose dependent inhibition of cell proliferation in K562 and U937 cell lines. Annexin staining using flow cytometry indicated that NSP-B treatment cause a dose dependent apoptosis in leukemic cells.Western blot analysis showed that NSP-B mediated apoptosis involves sequential activation of caspase 9, 3 and poly (ADP-ribose) polymerase (PARP) cleavage**.** Furthermore NSP-B treatment of leukemic cells resulted in upregulation of pro-apoptotic proteins (Bax) with downregulation of anti-apoptotic proteins (Bcl-2).Thus, present study focuses on exploring the mechanism of anticancer activity of NSP-B on leukemic cells, raising the possibility of its use as a novel therapeutic agent for hematological malignancies. **Results:** We sought to determine whether NSP-B suppresses the growth of leukemic cell lines. We tested a panel of leukemic cell lines with different doses of NSP-B. Cell viability decreased in a concentration-dependent manner in K562 and U937 cell lines. NSP-B induced apoptosis in K562 and U937 cell lines via downregulation of anti-apoptotic proteins and enhancement of pro-apoptotic proteins. NSP-B induced the activation of caspase cascade signaling pathway. Altogether our results suggest that the NSP-B plays an important role in apoptosis in leukemic cell lines .**Conclusions:** Our data provides insight on anticancer activities of NSP-B in leukemic cell lines (K562 and U937). NSP-B inhibit cell viability via inducing apoptosis. The NSP-B mediated apoptosis occurs via downregulation of anti-apoptotic proteins and enhancement of pro-apototic proteins, thereby activating the caspase-cascade signaling. Further studies are required to elicit role of NSP-B in regulating molecular pathway involved in the progression of cancer. Taken together, above results suggest that NSP-B may have a future therapeutic role in leukemia and possibly other hematological malignancies.

Keywords: Cancer; Hematological malignancies; Natural drug; Apoptosis

Health and Biomedical Sciences
(Graduate Students)

Depression in patients with spinal injury in Qatar:
a mixed-methods study

Badriya Al Shamari[1,2], Lily OHara[1]
[1]Qatar University, Qatar
[2]Hamad Medical Corporation, Qatar
lohara@qu.edu.qa

Abstract

Background: There is a high prevalence of depression in people with spinal injury. It has a major negative influence on health and performance of daily living activities following the injury. Social support plays an important role in the recovery process of patients.

Objectives: The objectives of the study were to determine the prevalence of depression; identify the association between the level of depression and the cause and site of spinal injury, sociodemographic factors, and social support; and explore the experiences of depression in patients with spinal injury in Qatar.

Methods: A cross-sectional mixed-methods study was conducted. All patients admitted to Hamad Medical Corporation in 2020 with spinal injury were surveyed using an interviewer-administered questionnaire in Arabic, English or Hindi. Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9). The Social Support Survey was used to assess overall social support and four specific aspects of social support. Demographic data were collected. The cause and site of injury were obtained from patient records. Semi-structured interviews were conducted with purposively selected participants.

Results: A total of 106 participants participated in the survey. In-depth interviews were conducted with 12 participants. For the survey component, the average age of participants was 35.82 ± 10.00 years, the majority were males (94.3%), and 69% had some level of depression (mild: 28%, minimal: 25.5%, and moderate to severe: 15%). Depression was not associated with socio-demographic factors or the cause or site of spinal injury. Emotional/informational support and positive social interaction were inversely correlated with depression scores. The interviews revealed that spinal injury had a negative impact on participants' daily lives and their physical, mental, social, and spiritual wellbeing.

Emotional/informational support and positive social interaction were both inversely correlated with depression. This was consistent with the findings of the interviews, which highlighted the important role of social support in improving participants' ability to cope with their new situation.

Conclusion: Depression is prevalent among patients with spinal injury. Early detection, referral, and treatment of depression are recommended. Strategies to enhance emotional/informational support and positive social interaction should be developed and tested in patients with spinal injury.

Keywords: Depression; Spinal injury; Qatar; Social support; Mental health

Health and Biomedical Sciences
(Graduate Students)

Trends of use of SGLT2 inhibitors in Qatar

Nancy Zaghloul[1,2], Ahmed Awaisu[1], Ahmed Mahfouz[2],
Sumaya Al Saadi[2], Hazem Elewa[1]
[1]Qatar University, Qatar
[2]Hamad Medical Corporation, Qatar
nz1206697@qu.edu.qa

Abstract

   Background: Type 2 diabetes mellitus (T2DM) represents a growing health challenge in Qatar and worldwide. T2DM is associated with a high risk of cardiovascular (CV) morbidity and mortality, and progression of renal disease. Sodium glucose co-transporter 2 inhibitors (SGLT2is) are the most recently approved class of glucose lowering medications (GLMs). To date, there is a limited knowledge about the adoption of SGLT2is by clinicians compared to other oral GLMs in Qatar and Middle East and North Africa (MENA) region. Accordingly, this proposed study aims to explore the trends in SGLT2is use compared to other oral GLMs in Qatar from 2016 to 2020. **Methods:** This is a descriptive, retrospective cross-sectional study where information on all oral GLMs prescriptions dispensed as in- or out-patient from 2016 to 2020 in all Hamad Medical Corporation (HMC) hospitals were collected. Outcomes included the number and relative frequency of quarterly prescriptions of different oral GLMs classes [metformin, sulfonylureas (SUs), dipeptidyl peptidase 4 inhibitors (DPP-4is), thiazolidinediones (TZDs), meglitinides (MEGs), α-glucosidase inhibitors (AGIs), and SGLT2is] from 2016 to 2020. **Results:** Overall, the prescription rate of GLMs increased during the last five years. SGLT2is use increased over the years after being introduced to the formulary in 2017, replacing SUs which exhibited significant decline between 2017 and 2020. There was a slight reduction in metformin use, and a slight increase in DPP-4is use. TZDs, MEGs, and AGIs prescriptions remained stable. Among SGLT2is, empagliflozin showed considerable increase on the expense of dapagliflozin which decreased significantly by the end of 2018. **Conclusion:** SGLT2is have been gradually replacing SUs in Qatar and the trend of their use is similar to that reported in other countries. The trend among SGLT2is suggests greater preference for empagliflozin over dapagliflozin.

Keywords: Trends; SGLT2 inhibitors; Dapagliflozin; Empagliflozin; Glucose lowering medications.

Health and Biomedical Sciences
(Graduate Students)

Identification of a miRNA signature as a diagnostic and prognostic marker in renal cell carcinoma

Muhammad Ammar Zahid, Abdelali Agouni
Qatar University, Qatar
mz1912625@qu.edu.qa

Abstract

Clear cell renal cell carcinoma (ccRCC) is the most common subtype of renal cell carcinoma (RCC). If diagnosed in later stages, ccRCC is associated with high renal cancer related morbidity and poor prognosis. Recently, microRNAs (miRNAs) have attracted interest as potential diagnostic and prognostic biomarkers due to their important role in cancer development and progression. Availability of big omics data in the cancer genome atlas (TCGA) coupled with data mining and machine learning have revolutionized the identification of robust diagnostic and prognostic signatures in different types of cancers. In this study, we have utilized the miRNA sequencing data of 516 ccRCC patients from TCGA to identify a diagnostic and prognostic signature by using a combined approach of differential expression analysis, survival analysis and machine learning. Differential expression analysis identified 30 downregulated and 20 upregulated miRNAs in the primary tumor as compared to solid tissue normal samples. Out of these 50 differentially expressed miRNAs, higher expression of 7 and lower expression of 6 miRNAs were found to be significantly associated with poor survival when analyzed using the Kaplan-Maier survival method. Pathway enrichment analyses related to the differentially expressed miRNAs revealed that fatty acid biosynthesis was the most significantly enriched KEGG pathway while proteoglycans in cancer pathway was enriched by the highest number of survival-associated miRNAs target genes. Differential expression and association with poor survival was used as a prefilter for training a support vector machine model capable of classifying tumor samples from solid tissue normal samples with an accuracy and precision of 99.23% and 98.50%, respectively. We have identified here a nine-miRNA signature in ccRCC patients that is capable of segregating tumor from normal tissue samples with high accuracy and precision. The future validation of this classification model in in a clinical cohort will support translation of these findings into clinical practice for early detection and follow-up of ccRCC.

Keywords: miRNA; Biomarker; Diagnosis; Renal cell carcinoma

Health and Biomedical Sciences
(Graduate Students)

Protein Tyrosine Phosphatase (PTP) 1B Inhibition Improves Endoplasmic Reticulum Stress-Induced Apoptosis and Impaired Angiogenic Response in Endothelial Cells

Shahenda Salaheldine Abdelsalam, Abdelali Agouni
Qatar University, Qatar
sa1512854@qu.edu.qa

Abstract

Insulin is not only important for glucose homeostasis, but also plays a critical role in the activation of endothelial nitric oxide synthase (eNOS) to synthesize nitric oxide (NO) and keeping the endothelium functional. Conditions which result in insulin resistance, such as diabetes and obesity, cause impairment of endothelial function, a condition known as endothelial dysfunction that features a reduced release of NO. Protein tyrosine phosphatase (PTP) 1B, is a known negative regulator of insulin receptor, that has been implicated in the pathogenesis of insulin resistance and endothelial dysfunction. Owing to its critical location at the surface of the endoplasmic reticulum (ER), PTP1B has been found to play an important role in ER stress response. However, the role of ER stress in PTP1B-mediated endothelial dysfunction is not fully elucidated. Toa address this, ER stress was induced pharmacologically in endothelial cells using thapsigargin, in the presence or absence of either a small molecule inhibitor of PTP1B or silencing siRNA duplexes, followed by the assessment of the expression of key ER stress markers, angiogenic capacity and apoptotic signals. We report here, that PTP1B inhibition protected cells against ER stress and ER stress-induced impairment in eNOS activation and angiogenic capacity. PTP1B inhibition or silencing also protected against ER stress-induced endothelial cell apoptosis. Moreover, PTP1B blockade also suppressed ER stress-activated autophagy. Our data emphasize on the critical role of PTP1B in ER stress-mediated endothelial cell dysfunction and highlights the therapeutic potential of PTP1B inhibition against ER stress-mediated cell death and impairment of endothelial function to prevent cardiovascular disease in pathologies charactereized by the activation of ER stress such as diabetes.

Keywords: Endothelial dysfunction; PTP1B; ER stress; Apoptosis

Health and Biomedical Sciences
(Graduate Students)

Reno-protective Effect of Angiotensin Receptor Blocker in Spontaneously Hypertensive Rat Models: A Systematic Review

Salma Mohammed AlDakhakhny, Mohamed Izham Ibrahim,
Hassaan Anwer Rathore, Marwa Ibrahim Swilam Elsayed Hamed
College of Pharmacy, Qatar University, Qatar
Sa1604393@qu.edu.qa

Abstract

Background Chronic Kidney Disease (CKD) is highly prevalent among hypertensive population. Previous date from studies and experiments have confirmed the reno-protective effect and tolerability of angiotensin receptor blockers in diabetic nephropathy. However, clinical data are lacking in hypertensive population. **Objectives** This is the first meta-analysis to evaluate the surrogate outcomes of renal protection with ARBs in hypertensive rodents to serve as a baseline for further studies. **Methods** The systematic review was conducted following the PRISM checklist. Four different databases were searched including PubMed, EMBASE, ScienceDirect and SCOPUS. No restrictions were applied on dose, duration of follow up or ARBs used. Inclusion was restricted to experimental studies reporting means and SEM, published in English, addressing the PICO question and having a moderate to high quality. 37 total eligible articles were identified and **Results:** Of 25 reported primary outcomes in comparison to hypertensive untreated controls, 23 studies showed positive results supporting that ARBs induce reduction in proteinuria and/or albuminuria compared to hypertensive untreated controls. Similarly, in comparison to normotensive untreated controls, 9 of 12 studies showed positive results supporting that ARBs' induced reduction in proteinuria and/or albuminuria can reach levels similar to normotensive controls. For the secondary outcomes, 12 of 18 reported outcomes showed significant improvement in CrCl or reduction in BUN compared to hypertensive untreated rats. Similarly, 10 of 17 outcomes reported showed that the improvement in secondary outcomes reached levels that are comparable to normotensive controls. **Conclusion:** Qualitative data from this systematic review support that ARBs have a Reno-protective effect in different hypertensive models and the effect is independent of BP lowering.

Keywords: ARBs; Hypertension; Reno-protection; Rat models

Health and Biomedical Sciences
(Graduate Students)

Influenza Prevalence and Vaccine Efficacy in Diabetic Patients in Qatar

Swapna Thomas[1], Maria K. Smatti[1], Muna A. Al Maslamani[2], Hadi Mohamad Yassine[1]
[1]Qatar University, Qatar
[2]Hamad Medical Corporation, Qatar
hyassine@qu.edu.qa

Abstract

Introduction: Diabetes (DM) is often recognized as anindependent risk factor for developing severe respiratory tract infections. Influenza infections are associated with higher hospitalization, morbidity and mortality in DM patients. Vaccination against Influenza virus would reduce the burden of flu infection in DM patients. Aim: To assess the prevalence and burden of influenza infection in DM patients in Qatar and to evaluate the efficacy of influenza vaccination in DM patients Methods: The study included 26,989 patients between 2016- 2018. Virology test results (20 pathogens) as well as the levels of HbA1c were collected for all participant. Data was filtered and analysed to explore the influenza prevalence and vaccine efficiacy among diabetis patients in comparision to non-diabetic. Findings: This study shows that DM patients are at higher-risk for influenza infection. In general, Influenza infections covers around 50 % of total respiratory infections in patients with flu like symptoms in Qatar. However, in vaccinated DM patients, influenza test positivity was low. This study reports the efficacy of routine flu vaccination to reduce the burden of influenza infection in DM patients.

Keywords: Influenza; Diabetes; Vaccine; Efficacy

Health and Biomedical Sciences

(Graduate Students)

Evaluation of antiviral activity of Manuka honey against SARS-CoV-2.

Israa Elbashir[1], Aisha Aisha Nasser J M Al-Saei[1], Paul Thornalley[2], Naila Rabbani[1]

[1]College of Medicine, Qatar University, Qatar

[2]Qatar Biomedical Research Institute, Qatar Foundation, Qatar

n.rabbani@qu.edu.qa

Abstract

Background and aims: In 2020 a global pandemic was declared caused by the severe acute respiratory syndrome coronavirus (SARS-CoV-2). The pandemic is still ongoing and continues to cause considerable mortality and morbidity world-wide and new variants of the virus are emerging. Rapid development and rollout of vaccines for SARS-CoV-2 is in progress to counter the pandemic but has been tempered by the emergence of new SARS-CoV-2 variants, many of which exhibit reduced vaccine effectiveness. To date there is no approved antiviral treatment for coronavirus disease 2019 (COVID-19). Several studies have shown that Manuka honey has virucidal/antiviral effect. Methylglyoxal (MG), a bioactive component in Manuka honey, has antiviral activity *in vitro*. MG may modify arginine residues in the functional domains of viral spike and nucleocapsid proteins, resulting in loss of charge, protein misfolding and inactivation. The aim of this study was to characterize the antiviral activity of Manuka honey against SARS-CoV-2 *in vitro* **Materials and methods: W**ild-type SARS-CoV-2 with titers of multiplicities of infection (MOI) 0.1 and 0.05 were incubated with 2-fold serial dilutions of 250+ Manuka honey (equivalent to 250 to 31 µM) in infection medium (Dulbecco's Modified Eagle Medium + 2% fetal bovine serum + 100 units/ml penicillin + 100 µg/ml streptomycin) for 3 h. Manuka honey treated and untreated control SARS-CoV-2 was incubated with confluent cultures of Vero cells *in vitro* for 1 h, cultures washed with phosphate-buffered saline and incubated in fresh infection medium at 37°C for 4 - 5 days until 70% of virus control cells displayed cytopathic effect. We also studied the effect of scavenging MG in Manuka Honey with aminoguanidine (AG; 500 µM) on virucidal activity. The antiviral activity of MG was judged by median tissue culture infectious dose (TCID$_{50}$) assays. Data analysis was by logistic regression. TCID$_{50}$ (mean ± SD) was deduced by interpolation. **Results:** Diluted Manuka honey inhibited SARS-CoV-2 replication in Vero cells. SARS-CoV-2 was incubated in diluted Manuka honey in medium at 37°C for 3 h before adding to Vero cells. Manuka honey dilutions down to 125 µM MG equivalents completely inhibited cytopathic effect of SARS-CoV-2 whereas 31.25 µM and 62.5 µM MG equivalents had limited effect. Logistic regression and interpolation of the cytopathic effect indicated that the TCID$_{50}$ = 72 ± 2 µM MG equivalents for MOI of 0.1. Prior scavenging of MG by addition of AG resulted in virus replication levels equivalent to those seen in the virus control without AG. **Conclusion:** Manuka honey has antiviral activity against SARS-CoV-2 when incubated with the virus in cell-free media at no greater than *ca.* 40-fold dilutions of 250+ grade. Anti-viral activity was inhibited by AG, consistent with the anti-viral effect being mediated by MG. Manuka honey dilutions in MG equivalents had similar antiviral effect compared to authentic MG, also consistent with MG content of Manuka honey mediating the antiviral effect. Whilst Manuka honey may inactivate SARS-CoV-2 in cell-free culture medium, its antiviral activity in vivo for other than topical application may be limited because of the rapid metabolism of MG by the glyoxalase system and limited bioavailability of oral MG.

Keywords: SARS-CoV-2; COVID-19; Methylglyoxal; Antiviral; Manuka honey

Health and Biomedical Sciences
(Graduate Students)

Development of Novel Chalcone Analogs as Potential Multi-Targeted Therapies for Castration-Resistant Prostate Cancer

Ola Hussein[1], Feras Alali[1], Ala-Eddin Al Mustafa[2], Ashraf Khalil[1]
[1]College of Pharmacy, QU Health, Qatar University, Qatar
[2]College of Medicine, QU Health, Qatar University, Qatar
oh1305682@qu.edu.qa

Abstract

Prostate cancer (PCa) is the second most frequently diagnosed malignancy, as well as a leading cause of cancer-related mortality in men globally. Despite the initial response to hormonal targeted therapy, the majority of patients ultimately progress to a lethal form of the disease, castration-resistant prostate cancer (CRPC). Therefore, the objective of this study was to discover and develop novel treatment modalities for CRPC. Chalcones are among the highly attractive scaffolds being investigated for their antitumor activities. A library of 26 chalcone analogs were designed, synthesized and evaluated as potential therapies for CRPC. The design was guided by in-silico ADMET prediction in which analogs with favorable drug-likeness properties were prioritized. The new compounds were synthesized, purified and characterized by extensive structural elucidation studies. The compounds in vitro cytotoxicity was evaluated against two androgen receptor (AR)-negative prostate cancer cell lines (PC3 and DU145). Among the tested compounds, pyridine containing analogs (13, 15 and 16) showed potent antiproliferative activities with IC50 values ranging between 4.32-6.47 µM against PC3 and DU145 cell lines. Detailed biological studies of the lead molecule 16 revealed that it can significantly induce apoptosis through upregulation of Bax and downregulation of Bcl-2. In addition, compound 16 potently inhibited colony formation and reduced cell migration of AR-negative PCa cell lines (PC3 and DU145). The molecular pathway analysis showed that the anticancer activity of compound 16 is associated with blocking of ERK1/2 and Akt activities. Furthermore, compound 16 inhibited angiogenesis in the chick chorioallantoic membrane (CAM) model as compared to control. Structure-activity relationship study revealed that the cytotoxicity could dramatically improve via changing the methoxylation pattern by more than 2-folds (IC50 << 2.5 µM). These results indicate that pyridine-based chalcones could serve as promising lead molecules for the treatment of CRPC; thus, further in vitro and in vivo studies are warranted.

Keywords: Chalcones; Prostate Cancer; Synthesis; SAR; ADMET

Health and Biomedical Sciences
(Graduate Students)

A Whole-Genome Sequencing Association Study of Low Bone Mineral Density Identifies New Susceptibility Loci in the Phase I Qatar Biobank Cohort

Nadin Younes, Atiyeh Abdallah, Marawan Abu madi
Qatar University, Qatar
ny17609@qu.edu.qa

Abstract

Introduction: Bone density disorders are characterized by a reduction in bone mass density and strength, which lead to an increase in the susceptibility to sudden and unexpected fractures. Despite the serious consequences of low bone mineral density (BMD) and its significant impact on human health, most affected individuals may not know that they have the disease because it is asymptomatic. Therefore, understanding the genetic basis of low BMD and osteoporosis is essential to fully elucidate its pathobiology and devise preventative or therapeutic approaches. Materials and Methods: we sequenced the whole genomes of 3000 individuals from the Qatar Biobank and conducted genome-wide association analyses to identify genetic risk factors associated with low BMD in the Qatari population. Results: Fifteen variants were significantly associated with total body BMD ($p < 5 \times 10^{-8}$). Of these, five variants had previously been reported by and were directionally consistent with previous genome-wide association study data. Ten variants were new: six intronic variants located at six gene loci (MALAT1/TALAM1, FASLG, LSAMP, SAG, FAM189A2, and LOC101928063) and four intergenic variants. Conclusion: This first such study in Qatar provides a new insight into the genetic architecture of low BMD in the Qatari population. Nevertheless, more studies are needed to validate these findings and to elucidate the functional effects of these variants on low BMD and bone fracture susceptibility.

Keywords: Qatar biobank; GWAS; Osteoporosis; BMD

Health and Biomedical Sciences
(Graduate Students)

A Framework for Time-Driven Activity-Based Costing for Orthopedic Procedure

Bayan Holozadah[1], Shaligram Pokharel[2]
[1]Graduate Student, Engineering Management Program, Qatar University, Qatar
[2]Professor, Department of Mechanical and Industrial Engineering, Qatar University, Qatar
bh1206761@qu.edu.qa

Abstract

This study used method of Time-Driven Activity-Based costing (TDABC) approach to examined cost reduction in healthcare sector, Knee Arthroplasty Department in Al-Emadi Hospital as case-study for delivering a primary knee arthroplasty consultation. The purpose of the study is to propose an optimization model that tends to determine significant and insignificant resources and cost uncertainties in a particular healthcare service. Then compare results of optimization model with current costing methods used in healthcare. Eight-steps of TDABC method are applied to obtain Capacity Cost Rate (CCR) of each human resource involved in care-delivery cycle. Data was collected from interviewing staff and patients, financial reports, and human resource reports. Multiple linear regression (MLR) model is used to test strength of relationship between time and cost variable. Optimization model applied to decrease uncertainties by using Least Square method. Optimized model showed that human resources are not fully utilized which leads to error in costing model. Seven human resources out of eight are significant to model. Accuracy of optimized model is equal to 3%, with RMSE equal to 6. Total cost of the optimized model equal $177,492.45 which is better simulate actual cost $180,048. The research value is about building a new statistical model using MLR analysis to predict behavior and data trend of main healthcare segmentation: Human Resource. Also, propose a generic optimization model that can be used for specific healthcare service costing.

Keywords: Traditional Accounting; ABC; TDABC; Healthcare Accounting

Health and Biomedical Sciences
(Undergraduate Students)

Habitual tea and coffee consumption and mean reaction time among Qatari adults

Alaa Jaber Heggy, Aisha Ali Masoumi, Maryam saed Alyafei,
Fatima Ebraheem Al-Bader, Tamara Al-Abdi, Zumin Shi
Qatar university, Qatar
ah1703035@qu.edu.qa

Abstract

Background: Tea and coffee consumption is associated with cognitive function in some studies. We aimed to identify tea and coffee drinking patterns and their association with mean reaction time among Qatari adults. **Method:** The study included 1000 adults aged 20 years and above attending the Qatar Biobank Study (QBB). Habitual tea and coffee consumption during the previous year was assessed by questionnaire. Tea and coffee drinking patterns were identified using factor analysis. In a computer-based self-administered touch screens test, mean reaction time (MRT) was used as an indicator of cognitive function. **Results:** The mean age of the participants was 35.8 (SD 10.3) years. Herbal tea and regular coffee consumption was inversely associated with MRT. In the multivariable model, compared with non-consumers, the regression coefficients for MRT were -34.34 (-65.36,-3.33) and -37.85 (-71.03,-4.67) for daily consumers of herbal tea and regular coffee, respectively. Of the two tea and coffee drinking patterns identified, pattern 1 (high consumption of tea, Arabic coffee, and herbal tea) was not associated with MRT but pattern 2 (high loadings of instant coffee, regular coffee and Karak) was inversely associated with MRT in the unadjusted model. There was a significant interaction between pattern 2 and LDL in relation to MRT. Pattern 2 was inversely associated with MRT among those with a low LDL.**Conclusion:** There was an inverse association between regular coffee and herbal tea consumption with mean reaction. There was an interaction between Western coffee pattern and LDL.

Keywords: Coffee; Tea; Mean reaction time; Cognition; Qatar Biobank

Health and Biomedical Sciences
(Undergraduate Students)

Is curcumin at the threshold of therapeutic effectiveness on patients with colon cancer? – A systematic review

Laila Khaled Shafei, Dr. Mohamed Izham, Dr. Nashiru Billa
Qatar University, College of pharmacy, Qatar
ls1601329@qu.edu.qa

Abstract

Curcumin, obtained from Curcuma longa, has been the subject of decades of scientific investigation on its therapeutic usefulness. It is reported to possess several therapeutic properties, of which anti-colon cancer is of interest in this review. Clinically, however, curcumin has yet to firm up its place among established anti-colon cancer therapeutic contenders. We aimed to systematically review the prevailing clinical evidence on the role of curcumin in colon cancer treatment. The review drawing from literature on clinical studies indicates fairly long-term tolerability. No regression of tumor was reported when curcumin was the sole intervention. An increase in p53 level expression was reported in a placebo-controlled study but no reduction in PGE2 or 5HETE. Pharmacokinetic data on healthy humans indicate that formulated curcumin delivery systems present significantly higher systemic bioavailability. It appears therefore that the clinical use of curcumin can potentially be realized only through appropriate formulation interventions

Keywords: Curcumin; Colon; Cancer; Clinical trial; Systematic review

Health and Biomedical Sciences
(Undergraduate Students)

Are Blood Pressure Devices Available in Qatar Community Pharmacies Validated For Accuracy?

Marah Abou-Sido[1], Marwa Hamed[1], Suad Hussen[1], Monica Zolezzi[2],
Sowndramalingam Sankaralingam[3]
[1]Undergraduate student, College of Pharmacy, Qatar University, Qatar
[2]Associate Professor, Clinical Pharmacy and Practice, College of Pharmacy, Qatar University, Qatar
[3]Assistant Professor, Clinical Pharmacy and Practice, College of Pharmacy, Qatar University, Qatar
ma1703719@qu.edu.qa

Abstract

Research purpose: Hypertension is a leading cause of cardiovascular morbidity and mortality in Qatar. Community pharmacist-managed home blood pressure monitoring (HBPM) services have been shown to provide better control of hypertension. Digital BP devices available and sold in community pharmacies are commonly used for HBPM services. Devices validated for accuracy are important for clinical decision-making. Non-validated devices are more likely to be inaccurate and could potentially lead to poor BP control and health risks. The objectives of our study are 1) to identify the proportion of validated BP devices available in community pharmacies in Qatar and 2) to determine the relationship between the validation status of devices and cuff location and price. **Methodology:** We visited 28 community pharmacies including the 2 major pharmacy chains in Qatar. The following data were collected about BP devices: brand/model, validation status, cuff location, and price. **Findings:** A total of 87 distinct models of BP devices from 19 different brands are available in Qatar community pharmacies. The three most commonly available brands are Beurer®, Omron®, and Rossmax®. Most models available are upper arm devices (75%) while the rest are wrist devices (25%). Among all models, only 57.5% are validated. Sixty percent of upper-arm devices and 50% of wrist devices are validated. Importantly, 60% of lower-priced (≤ QAR 250) devices are not validated while 83% of higher-priced (QAR 500-750) devices are validated. **Research originality/value:** This is a novel study that has investigated the validation status of BP devices available in community pharmacies for the first time. This information will serve both pharmacists and the public alike. In Qatar and elsewhere, there are no regulations on the accuracy of devices sold in community pharmacies. Therefore, regulations on the sale of BP devices should be implemented in the best interest of patient safety.

.

Keywords: Community pharmacy; BP device; Validation status; Cuff location; Price

Health and Biomedical Sciences
(Undergraduate Students)

Bibliometric Analysis of Scholarly Output on Cardiovascular Disease- Related Research in Qatar: A Preliminary Analysis

Suad Ibrahim Huseen, Ola Khaled Elakel, Ahmed Awaisu, Mohamed Izham Ibrahim
College of Pharmacy, QU Health, Qatar University, Doha, Qatar
sa1509387@qu.edu.qa

Abstract

Background: Qatar is facing an increased incidence of cardiovascular diseases (CVDs). CVDs research is one of the country's priority research areas according to Qatar National Research Funds (QNRF) and Qatar University research roadmaps. Tremendous amount of investment and funding has been dedicated to this area. **Study objective**: This bibliometric analysis study aimed to provide a quantitative and qualitative description of CVD-related research in Qatar over the last 20 years. **Method**: Literature search was conducted through Scopus, PubMed, Web of Science, and Cochrane. Research published between 2000 and 2020 were included. A preliminary analysis was done for the 534 documents published in the period between 2018 - 2020. **Results**: There was about a 42% increase in publications from 2018 to 2020. Almost half of the publications (48%) were published in first quartile ranked journals (Q1). Stroke was the main covered research area. Approximately 44% of the publications had a main author from a Qatari affiliation, and 56% of the Qatari funded publication received the grants from QNRF. **Conclusion**: This study will serve as a tool for better allocation of funding and grants in CVD-related research. Upon the completion of the study, we will be able to visualize more clearly and make a conclusion about CVD-related research in Qatar.

Keywords: Bibliometrics; Cardiovascular diseases; Qatar; Scopus; Web of Science

Building Resilience at Universities:
Role of Innovation and Entrepreneurship

Health and Biomedical Sciences
(Undergraduate Students)

Comparison of Available Methods for Investigating The in vitro Activity of Colistin Against Different Gram-Negative Bacilli

Noora Shams, Hanin AlHiraky, Nabila Moulana, Maissa Riahihi,
Kaltham Alsowaidi, Khawlah Albukhati, Susu Zughair, Nahla Eltai
Qatar University, Qatar
nahla.eltai@qu.edu.qa

Abstract

Background: The surge in the prevalence of multidrug-resistant (MDR) Gram-negative bacterial infections with limited treatment options and the decrease in the development of new antibiotics are challenges that lead to the reuse of colistin to treat infections caused by MDR pathogens. This study aimed to determine economical, simple, and reliable colistin susceptibility testing methods as an alternative to the time and effort-consuming microdilution technique and identify the colistin resistance's genetic determinants to find if it affects the testing method. **Material and Methods:** Seven colistin susceptibility testing methods, namely, Disk diffusion, E-test, ComASPTM SensiTest, broth disk elution, colistin agar test, CHROMagarTM COL-APSE, and BD Phoenix ID/AST, were compared to the gold standard broth microdilution. Data of the 63 studied isolates were analyzed using very major error (VME), major error (ME), categorical agreement (CA), sensitivity, specificity, Kappa, positive and negative predictive values. Whole-genome sequencing was performed on all isolates to determine if the genetic resistant factors affect the accuracy of the specific colistin susceptibility testing method. **Results:** Our results revealed that disk diffusion is still an ineffective method for measuring colistin susceptibility with the highest ME (31.75%), the lowest Kappa 0 (0%), and CA (68.25%) values. In contrast, the highest sensitivity, specificity, CA, kappa value, positive and negative predictive values were reported on Phoenix, ComASPTM sensitest, and E-test methods compared with the microbroth dilution reference method. Our study did not ensure any relation between the type of colistin resistance genetic determinant (chromosomal/plasmid-mediated) and the performance of the specific colistin susceptibility test **Conclusions:** Phoenix, E-test, and CompASPT SensiTest methods have remained superior in reproducibility, sturdiness, simplicity of use with a performance similar to the current recommended BMD procedure. These methods can be an alternative to the current laborious, impractical broth microdilution technique, especially in microbiology laboratories with a large workload.

Keywords: Colistin; Gram negative bacilli; AST; MDR; Resistance

Health and Biomedical Sciences
(Undergraduate Students)

Exploring QU health students' behavioral determinants, perspectives, and experiences toward student leadership: A quantitative study

Dhabya Mohamed AL-Khater, Menatallah Samer Rayan, Myriam ElJaam,
Mohammed Issam Diab, Derek Charles Stewart, Alla El-Awaisi
Qatar University, Qatar
da1508624@qu.edu.qa

Abstract

Objective: Leadership is an essential part of student's learning experience in the college. The main aim of this study is to determine and explore QU health student's perspectives and experiences toward leadership. Methods: A cross-sectional study was conducted during the academic year 2021. A web-based questionnaire was circulated to 1352 QU health students. Participants were asked to complete a 5-point Likert scale developed using theoretical domains framework (TDF) to identify their perception and behavioral determinants about leadership. They were also asked to rank the importance of personal, interpersonal capabilities, and markers of success of leadership. Participants were asked to answer open-ended questions to determine the training and support needed for leadership. Results: In total, 179 complete responses were collected. About (43.6%) of students strongly agreed that it is crucial for healthcare students to be involved in leadership. Most students agreed that they are capable of carrying leadership responsibilities. Around 71.4% of leaders in QU health perceived that teaching quality improvement as very important to extremely important marker of leader's success. Students identified that negotiation and communication are important skills for leadership. Conclusion: Our study suggests that QU health students perceive leadership as positive and important experience of college life and show high interest for training programs and workshops for student leaders.

Keywords: Student leadership; Training; Health student; Students' behaviours

Health and Biomedical Sciences
(Undergraduate Students)

Portrayal of Autism Spectrum Disorder and related treatments in Qatar's printed media

Halima Saadia[1], Safeya Habib, Monica Zolezzi
Clinical Pharmacy and Practice, Qatar University, Qatar
hs1606808@qu.edu.qa

Abstract

Public cultivates perceptions and beliefs through mass media. Although considerable progress in the diagnosis and treatment of autism spectrum disorder (ASD) has emerged over the last decade, negative media stereotypes about ASD and its treatments are amongst the most hurtful and socially limiting stigma experiences reported by mental health service consumers and family members. The objectives of this study were to explore the portrayal of ASD and its treatments through a content analysis of the daily Qatari newspapers. A total of 178 ASD-related articles were found in 1 year of newspaper coverage. The majority of the articles reported on general news or event, rather than on the scientific or social aspects of ASD. The discourse analysis revealed significantly more stigmatizing statements in articles in Arabic compared to those in English newspapers. Most of the treatments discussed in the print media had insufficient or lacked scientific evidence. Qatar has recently implemented the "National Autism Strategy", which aims for the inclusion of ASD in society. Collaborative efforts with the media will be necessary to achieve this aim.

Keywords: Autis; Autism; ASD

Health and Biomedical Sciences
(Undergraduate Students)

Types and Severity of Medication-Errors with Automated Systems within Medication-Use Process: Systematic-Review

Mariam Mustafa, Najlaa Al-Qahtani, Kazeem B. Yusuff
College of Pharmacy, QU Health, Qatar University, Qatar
mm1605234@student.qu.edu.qa

Abstract

Automated systems have been crucial to reducing medication errors and improving patient safety. However, their use has increased medication-errors associated with other factors:socio-technical interactions, automation bias, workarounds, and overrides. This comprehensive systematic review was conducted to identify types and severity of medication-errors associated with the use of automated system in all stages of the medication use process. This provides new perspectives that contribute significantly to global knowledge in the research area. Three databases were searched to include English-language observational and experimental studies(from 2000-2019) focused on types and severity of medication errors. A data-extraction form was developed, and quality was assessed using Hoy-et-al tool. The search yielded 860 articles after deduplication and thirteen were eligible. The bias risk was low for eight studies(62%) and moderate for five(38%). The medication-error types, and prevalence were omitted information(4-61%), wrong dose(4-30%), incorrect medication(1-18%), incorrect administration time(3-18%), and incorrect frequency(0.6%-21%) and occurred in the prescribing(62%) and administration(69%) stage. The error severity assessment used was NCC-MERP-index(46%), other(23%), or not conducted(31%). Omitted information and incorrect dose were the most common errors associated with automated systems in the prescribing and administration stages. However, the error severity and classification was inconclusive due to differences in study design and assessment criteria.

Keywords: Errors; Type; Severity; Automated systems

Health and Biomedical Sciences
(Undergraduate Students)

Barriers and Facilitators to Mental Health Help-seeking among Older Adults: A Systematic Review

Usra Abushara Elshaikh, Rayan Sheik, Raghad Khalid Saeed,
Tawanda Chivese, Diana Alsayed Hassan
Qatat University, Qatar
ue1706852@qu.edu.qa

Abstract

Background: Older adults are very unlikely to seek mental health help. There are multiple factors that contribute to a person's final decision to seek formal help. The aim of this study is to systematically review and summarize quantitative literature on the barriers and facilitators that influence older adult's mental health help-seeking behaviors. **Methods :** Four databases including PubMed-Medline, EMBASE, ProQuest central, and Scopus were searched to identify barriers and/or facilitators to mental health help-seeking behaviors. Studies were included if they satisfied the following criteria: Articles that were quantitative studies published during the period between 2015-2021, that address barriers and/or facilitators to mental health help seeking among older adults aged 65 years old or older and examining depression, anxiety, and psychological distress disorders. Help-seeking was defined as receiving a consultation from health professionals such as a general practitioner, clinical psychologist, councilor, or social worker. Study quality and risk of bias was assessed using The Newcastle-Ottawa Scale (NOS). **Results:** Five cross-sectional studies met the inclusion criteria for this review. These studies were from Australia, United States, and Malaysia, and were carried out during the period 2015-2021. Two studies examined both facilitators and barriers while three studies examined barriers only. Neither of the studies examined facilitators only. The prevalence of seeking mental health help among elderly people ranged between 77% to 82%. Cost, stigma, and beliefs of the effectiveness of mental health counseling, were the most reported key barriers. Main reported facilitators included prior positive experience with mental health services, high level of education, and a high-income level. **Conclusion:** The findings reported in this systematic review can be used in future research and practical implications to assess the barriers and facilitators among older adults.

Keywords: Mental health; Older adults; Help-seeking behavior; Barriers; Facilitators; Quantitative data

Health and Biomedical Sciences
(Undergraduate Students)

Reno-Protective Effects of Angiotensin Receptor Blockers in Hypertensive Rodent Models: A systematic review

Marwa Ibrahim Hamed, Salma Al-Dakhakhny, Hassaan Rathore,
Mohamed Izham Mohamed Ibrahim
College of Pharmacy, QU Health, Qatar University, Qatar
mh1510294@gmail.com

Abstract

Background and objective: Essential hypertension is a leading risk factor for chronic kidney disease, yet there is no conclusive evidence that lowering blood pressure alone improves renal outcome measures. Angiotensin-II receptor blockers (ARBs) proposed to have renal-protective effects independent of their antihypertensive effect. This systematic review of animal studies aims to collect available information from the published literature about the ARBs' consequences in murine models and analyze it in a structured way to provide a pre-clinical baseline for future analysis of similar clinical investigations. **Methods:** Following the PRISMA checklist, we conducted a systematic review for quasi non-randomized controlled studies using PubMed, Embase, Science-Direct, SCOPUS, and Google Scholar to determine the effects of ARBs on kidney functions. Eligible articles report the ARBs' effect on proteinuria, albuminuria, and glomerular filtration rate in murine models of hypertension. Outcomes were present as Mean ± Standard Error of Mean (SEM) with 95% confidence intervals (CIs). **Results:** This preliminary analysis includes ten out of 56 total eligible articles after quality assessment, reporting twelve renal outcome measures. Two studies showed improvement in CrCl versus one study showing no difference. Four out of five studies showed a reduction in proteinuria compared to the control group. All three studies showed a significant reduction in albuminuria compared to control and other antihypertensives. A study Evaluating BUN showed no difference. Nine outcomes supported the reno-protective effect of ARBs on different hypertensive models with various ARBs and different follow-up durations. Low dose valsartan 10mg/kg was showing no significant effect across two different studies. **Conclusion:** Preliminary results are encouraging. ARBs contribute to improvement in renal biomarkers in different hypertensive models regardless of their BP-lowering effect.

Keywords: Hypertension; ARB; Murine; Renal protection

Health and Biomedical Sciences
(Undergraduate Students)

Examination of Job Satisfaction, Achievements, and Employment Preparedness among College of Pharmacy Alumni: A Study From Qatar

Turfa Awrans Al-Hathal, Lolwa Al-Ghazal, Banan Mukhalalati, Ahmed Awaisu,
Alla El-Awaisi, Fatima Mraiche, Mohammad Diab, Derek Stewart, Sara Elshami
Qatar University, Qatar
Ta1517681@qu.edu.qa

Abstract

Background: Job satisfaction in healthcare is of special interest as has a direct relation with the quality of care provided to patients. It is affected by several factors including the nature of the work, level of educational preparedness and achievements. *Objectives:* This study aims to explore College of Pharmacy - Qatar University (CPH-QU) alumni's satisfaction with employment and the profession, level of educational preparedness and achievements in the practice. *Methods:* A sequential exploratory mixed-method designs was adopted. Seven Focus Group (FG) discussions were performed and a self-reported survey distributed to all alumni graduated between 2011-2020. *Results:* A total of 135 alumni answered the survey (response rate 63%). Majority of respondents were non-Qatari (97%) and 52% of them were recent graduates and obtained doctor of pharmacy (PharmD) as an additional degree (58%). The study findings suggest that CPH alumni are moderately satisfied with the practice and the profession, and Qatari alumni are more satisfied. However, majority of them (44.55%) are not satisfied with the available opportunities for professional development. The level of satisfaction about achievements was significantly high only in the field of research and presentation activities. A general agreement about the level of educational preparedness was dominant, especially in clinical knowledge and skills and experiential training they received. *Conclusion:* The overall satisfaction about workplace and the profession in CPH-QU alumni is moderate and higher among Qatari graduates. Alumni agreed that they were well prepared to meet the practice requirements and mostly satisfied in achieving research and presentation related activities.

Keywords: Job satisfaction; Preparedness; Achievements; Alumni

Health and Biomedical Sciences

(Undergraduate Students)

Colorimetry-Based Detection of Biomarkers in Exhaled Breath for Predicting COVID-19 Disease

Fatimatulzahraa Al-saedi[1], Najam-US-Sahar Riyaz[1], Hagar Morsy[2], Raghad Abuznad[1], Alaa Elsafi Ahmed[1], Aeshah Alruwaili[2], Muna Ibrahim[1], Mizaj Shabil Sha[3], Haseena Onthath[3], Muni Raj Maurya[3], Kishor Kumar Sadasivuni[3], Peter Kasak[3]

[1]College of Art and Science-Chemistry and Earth Science, Qatar University, Qatar
[2]Department of Chemistry, Qatar University, Qatar
[3]Center for Advanced Materials, Qatar University, Qatar
kishorkumars@qu.edu.qa

Abstract

Exhaled breath is the biological medium that carries relevant medical information and can be used to analyse biomarkers characteristic for detecting abnormal health status. Thus, by systematically analysing the interaction mechanism of the coronavirus with the human cell and its effect on the biological activity, it is possible to indentify the compounds whose proportion in the exhale breath is affected. One such biomarkers are hydrogen peroxide (H_2O_2) and nitric oxide (NO), which represents oxidative stress in the body. The present study represents the colorimetry based quantification of H_2O_2 and NO using $KMnO_4$ and m-cresol purple dye, respectively. The dyes exhibited 0.01 ppm limit of detection (LOD) for H_2O_2 and LOD of 0.02 ppm was estimated for NO. Moreover, dyes apprehended high degree of selectivity towards other bio-compounds present in the breath. The colorimetry sensor is best suited for quantifying oxidative stress in the body, which is one of the indicator of coronavirus infection. Thus, the sensor offers rapid point-of-detection for predicting COVID-19 infection in human body.

Keywords: Non-invasive; Exhaled breath; Oxidative stress; Colorimetry; COVID-19

Health and Biomedical Sciences
(Undergraduate Students)

Content Validation of an Algorithm for the Assessment, Management and Monitoring of Drug-Induced QTc Prolongation in the Psychiatric

Doaa Elsayed Mahmoud[1], Shorouq Homs[1], Waad Elamin[1],
Iman Qubaiah[1], Monica Zolezzi[1], Athar Elhakim[2]
[1]Qatar University, Qatar; [2]College of North Atlantic Qatar, Qatar
dm1601604@qu.edu.qa

Abstract

Background: QTc interval prolongation leads to serious complications, making it a concern for clinicians. Assessing the risk of QTc interval prolongation in the psychiatric population is important, as they are exposed to medications known to increase the risk of life-threatening arrhythmias. *Aim:* To validate the content of an algorithm for the assessment, management and monitoring of drug-induced QTc prolongation in the psychiatric population. *Methodology:* Qualitative semi-structured interviews of cardiology experts were used to gather information on their approach in assessing the risk of drug-induced QTc prolongation at the time of prescribing. After the interview, an orientation to the algorithm was provided, followed by a self-administered survey which included quantitative (4-point Likert scale to rate their opinion on each decision step) and qualitative components to assess the algorithm's content validity. *Results:* Four themes emerged from the cardiologists' interviews, which pointed towards a lack of a unified protocol or a systematic approach when assessing QTc interval prolongation. Quantitative results showed average mean scores ranging from 3.08 to 3.67, 3.08 to 3.58, and 3.17 to 3.75, for the appropriateness; the safety; and the reliability of the references, respectively, of each decision step in the algorithm. Qualitative analysis of the open-ended questions showed that cardiologists supported implementing the algorithm, with slight modifications to make it simpler and less time consuming. *Conclusion:* Qualitative and quantitative results point towards positive indices for the algorithm's content validity. Further validation studies with other potential users of the algorithm (such as mental health practitioners) are needed.

Keywords: QTc Prolongation; Mental Health; Psychotropic medications; Pharmacists; Algorithm

Health and Biomedical Sciences
(Undergraduate Students)

Artificial Intelligence in Predicting Heart Failure

Rashid Ebrahim Al-Mannai[1], Mohammed Hamad Almerekhi[1], Mohammed Abdulla Al-Mannai[1],
Mishahira N[2], Kishor Kumar Sadasivuni[2], Huseyin Cagatay Yalcin[3], Hassen M. Ouakad[4],
Issam Bahadur[4], Somaya Al-Maadeed[1], Asiya Albusaidi[4]

[1]Department of Computer Science and Engineering, Qatar University, Qatar
[2]Center for Advanced Materials, Qatar University, Qatar
[3]Biomedical Research Center, Qatar University, Qatar
[4]Mechanical and Industrial Engineering Department, Sultan Qaboos University, Oman
kishorkumars@qu.edu.qa

Abstract

Heart Failure is a major chronic disease that is increasing day by day and a great health burden in health care systems world wide. Artificial intelligence (AI) techniques such as machine learning (ML), deep learning (DL), and cognitive computer can play a critical role in the early detection and diagnosis of Heart Failure Detection, as well as outcome prediction and prognosis evaluation. The availability of large datasets from difference sources can be leveraged to build machine learning models that can empower clinicians by providing early warnings and insightful information on the underlying conditions of the patients

Keywords: Artificial intelligence; Machine learning; Heart failure; Matlab

Health and Biomedical Sciences
(Undergraduate Students)

Exploring QU Health Students' Experiences of Burnout, Anxiety, and Empathy during the COVID-19 Pandemic: A Mixed Method Study

Ruba Sulaiman, Sara Ismail, Maguy ElHajj, Mujahed Shraim,
Tanya Kane, Alla El-Awaisi
Qatar University, Qatar
rs1607806@qu.edu.qa

Abstract

Background Students' mental health is a growing concern. COVID-19 pandemic resulted in academic and non-academic challenges which caused students' burnout, anxiety, and reduced empathy. *Objectives* The study objectives were to assess burnout amongst QU Health students, determine the relationship between burnout and anxiety, and burnout and empathy, and to determine the students coping strategies. *Methods* A convergent mixed-methods design was used: (1) a cross-sectional survey using validated instruments. Maslach Burnout Inventory-General Students Survey (MBI-GS(S)) to measure burnout, Generalized Anxiety Disorder 7-item Scale (GAD-7) to measure anxiety, and Interpersonal Reactivity Index (IRI) to measure empathy; (2) focus groups to get a deeper insight of the students' experiences and coping strategies. Descriptive and multivariate statistical analyses were used for the survey while the focus groups were analysed using deductive thematic analysis following the coping reserve model. *Results* 21.45% of students responded to the survey. Burnout was reported according to the subscales. MBI-Exhaustion (MBI-EX) subscale (mean= 4.07, SD= 1.56), MBI-Cynicism (MBI-CY) subscale (mean= 2.63, SD= 1.53), and MBI-Professional Efficacy (MBI-PE) subscale (mean= 3.97, SD= 1.22). MBI-EX and MBI-CY were associated with GAD-7 scores. MBI-EX and MBI-CY were associated with IRI-Empathic Concern (IRI-EC) and IRI-Personal Distress (IRI-PD) while MBI-PE was associated with IRI-Perspective Talking (IRI-PT) and IRI-EC. The students used many coping strategies to build resilience. *Conclusion* QU Health students experienced burnout during the spring 2020 semester. Many burnout causes and coping strategies were identified. It is suggested for QU to start mentorship programs and mental health initiatives to promote students' resilience.

Keywords: Burnout; Anxiety; Empathy COVID-19; Healthcare students

Health and Biomedical Sciences
(Undergraduate Students)

An Examination of the Employment Preparedness, Job Satisfaction, and Impact in the Workplace of Qatar University Pharmacy Alumni: A Mixed Methods Study

Mounyah Waiel Al-Nuaimi, Ranin Abidi, Banan Mukhalalati, Alla El-Awaisi,
Ahmed Awaisu, Mohhamed Diab, Fatima Mraiche
Qatar University, Qatar
mb1702805@qu.edu.qa

Abstract

Introduction: The level of alumni's job satisfaction and preparedness has been found to affect the impact in the workplace. Little is known about alumni's employment experience in Qatar. **Objective:** The aim of this study is to explore the employment preparedness, job satisfaction and impact in the workplace of College of pharmacy graduates in Qatar. **Methods:** A sequential exploratory mixed methods study was conducted. For the qualitative phase, data were collected by focus groups and were analyzed thematically. Quantitative data collection involved administration of a validated questionnaire. **Results:** Research findings suggested that college of Pharmacy (CPH) alumni were mostly well prepared in terms of knowledge and skills. They were mostly satisfied about the curriculum and the experiential learning experience. The participants were challenged by the lack of deep knowledge and skills needed for their area of expertise. COVID-19 pandemic was associated with increased workload and stress. Being a Qatar University graduate facilitated the recruitment process. Lastly, a positive impact in the workplace was reported through implementation of NAPRA competencies and AFPC learning outcomes. **Conclusion:** This study will facilitate the understanding of factors that affect the preparedness, job satisfaction of CPH alumni and their impact in the workplace, which will ultimately enhance the learning experience in CPH.

Keywords: Pharmacy alumni; Job satisfaction; Preparedness; Impact in work place

Health and Biomedical Sciences
(Undergraduate Students)

Understanding COVID-19-related Burnout in Qatar's Community Pharmacists using the Job Demands-Resources Theory

Hiba Mohamed, Shahd Elamin, Maguy ElHajj, Alla El-Awaisi
College of Pharmacy, QU health, Qatar University, Qatar
se1508496@qu.edu.qa

Abstract

Community pharmacists are one of the most accessible front-liners against the COVID-19 pandemic. Whilst playing a vital role in medication supply and patient education, exposure to pandemic demands and prolonged stressors such as risk of infection increases their risk of burnout. Using the Job Demands-Resources theory, this research aims to identify factors affecting community pharmacists' COVID-19-related burnout, their coping strategies against it, and recommendations on interventions to mitigate it. This is a qualitative study in which Qatar community pharmacists, with informed consent, took part in semi-structured focus groups/interviews which were recorded, transcribed, and analyzed using inductive/deductive analysis. Twelve themes emerged from six focus groups, six dyadic interviews and mini focus groups, and four individual interviews. The contributing factors to community pharmacist' burnout were identified as practical job demands, and emotional demands such as fear of infection. However, government and workplace-specific resources, pharmacists' personal characteristics such as resiliency and optimism, as well as implementation of coping strategies, reduced their stress and burnout. This is the first study to explore the contributing factors to community pharmacists' COVID-19-related burnout using the job-demands resource model. In turn, individual, organizational, and national recommendations can be made to mitigate burnout in community pharmacists during the pandemic.

Keywords: Community pharmacists; COVID-19; Pandemic; Burnout; Stress

Health and Biomedical Sciences

(Undergraduate Students)

Burnout and Resilience in Community Pharmacists in Qatar during the COVID-19 Pandemic: a Cross Sectional Study

Zeana Samir Alkudsi, Nadin Hany Kamel, Alla El-Awaisi,
Mujahed M A Shraim, Maguy ElHajj
Qatar University, Qatar
za1609629@qu.edu.qa

Abstract

Objective: The main aim of this study is to illustrate the prevalence of burnout and resilience among community pharmacists in Qatar during the COVID-19 pandemic. **Methods:** This is a cross-sectional study design that included the collection and analysis of quantitative data from community pharmacists in Qatar using a cross-sectional survey. **Results:** Overall, participants had a moderate level of burnout as illustrated in the mean scores of the three dimensions; 22.11 ± 13.053 for emotional exhaustion, 7.17 ± 6.55 for depersonalization, and 35.94 ± 11.47 for personal accomplishment. The findings demonstrated that 15.2%, 15.6%, and 5.4% of community pharmacists had moderate levels of depression, anxiety, and stress, respectively. Further, they showed high resilience (35.7 ± 8.57). Mental health outcomes were statistically positively correlated with fear while age was negatively correlated with depersonalization. **Conclusion:** This study is the first study to report the prevalence of mental health outcomes among community pharmacists during COVID-19 in Qatar. The pharmacists experienced moderate burnout but high resilience which indicates their high potential to overcome difficulties. Future interventions at the personal, national and organizational levels are needed to improve mental health during this pandemic by preventing and managing stress, improving self-efficacy and resilience, and providing adequate social support.

Keywords: Burnout; Resilience; COVID-19; Community pharmacy; Qatar

Health and Biomedical Sciences
(Undergraduate Students)

Metagenomic Analysis of Oral Microbiome during pregnancy

Huda Mohamed Farah, Muram Elmubarak Elamin, Rahaf Nader Nader Nader, Rana Said Alabsi, Salma Bouazza Bouabidi, Sara Elgaili Khogali Suleiman, Shahd Mohammad Nasr, Shouq Fahad Al-Rumaihi, Zain Zaki Zakaria, Maha alasmakh Alasmakh

Qatar University, Qatar

zz1513224@qu.edu.qa

Abstract

Pregnancy is a dynamic physiological process associated with significant hormonal, immune and metabolic changes to support the growth and development of the fetus. Several studies have highlighted the role of gut microbiota during pregnancy[1]. The composition of gut microbiota changes dramatically during the course of pregnancy with an increase in Proteobacteria and Actinobacteria, a decline in butyrate-producing bacteria and a reduction in bacterial richness at the end of pregnancy[2]. These modifications were anticipated to favour the increased metabolic demand during pregnancy, which will, in turn, support healthy fetal growth[3]. Gut microbiota has also been suggested to contribute to weight gain during pregnancy via increased absorption of glucose and fatty acids, induction of catabolic pathways, increased fasting-induced adipocyte factor secretion, and stimulation of the immune system[2, 4]. The oral cavity houses the second most diverse microbiota after the gut harbouring over 700 species of bacteria. Oral microbiota plays a crucial role in maintaining oral homeostasis, protecting the oral cavity and preventing disease development[5]. Little is known about the role of the oral microbiome during pregnancy. One study examined changes in oral microbiota during pregnancy on Japanese women and found that the total viable microbial counts were higher during pregnancy, as were levels of the pathogenic bacteria Porphyromonas gingivalis, Aggregatibacter actinomycetemcomitans, and Candida[6]. Several studies have also found correlations between oral infections and pregnancy complications, further suggesting mechanisms connecting the oral microbiome with the state of pregnancy[7]. The Qatari Birth Cohort (QbiC) was successfully developed in July 2018 by Qatar Biobank. It is an epidemiological study that aims to assess the synergetic role of environmental exposure and genetic factors in the development of chronic disease. It monitors the health of women throughout their pregnancy and after birth. The present study is designed to explore changes in the salivary microbiome, using high throughput sequencing during pregnancy and to explore key microbial clades involved in pregnancy.

Keywords: Metagenomic Analysis; Pregnancy; Oral microbiota; MiSeq Sequencing.

Health and Biomedical Sciences
(Undergraduate Students)

Evaluation of a Mobile Application Tool to Assist Health Care Providers in Cardiovascular Risk Assessment and Management

Taimaa Adnan Hejazi[1], Dana Nizar Mustafa[1], Lana Kattan[1], Monica Zolezzi[1], Shimaa Ahmed Aboelbaha[1], Shorouq Homs[1], Athar Elhakim[2], Yazid Alhamarneh[3], Lily Yushko[3]

[1]Qatar University, Qatar
[2]College of the North Atlantic, Qatar
[3]University of Alberta, Edmonton, Alberta, Canada
th1802698@qu.edu.qa

Abstract

Background: Cardiovascular disease (CVD) risk assessment and management (RAM) services face many challenges and barriers in the community. Mobile technology offers the opportunity to empower patients and improve access to health prevention strategies to overcome these barriers.[1] The main goal of this study is to investigate whether the use of mobile technology for CVDRAM, combined with appropriate health care professional oversight, can improve access and management of CVD risk factors in Qatar. **Methods/Case presentation**: Pilot testing of an Arabic and English version of the online application EPIRxISK™ for CVDRAM by potential users from a sample consisting of the general population and pharmacists attending community pharmacies. Participants' feedback was gathered in a qualitative interview which was recorded and transcribed for quality assurance and for review by the research team. Responses from all interviews were analyzed and recommendations were made to finalize the application prior to phase II of the study. In phase II, quantitative and qualitative methods will be utilized to assess the feasibility of implementing a community pharmacy-based CVD risk assessment program using the English and Arabic versions of the EPIRxISK™ online application. **Results/Findings/Recommendations**: In phase I, a total of 9 pharmacists from community pharmacies and 5 general participants from the general population were interviewed. As shown in table 1 and 2, the analysis of the interviews resulted in themes related to five frameworks: engagement, functionality, aesthetics, information, and subjective quality. Overall, the themes demonstrated acceptance and satisfaction with the features of the application. Phase II is in progress now. **Conclusion**: The overall results of the pilot testing are promising and conclude an overall acceptance and satisfaction with the features of the application.

Keywords: Cardiovascular Risk; Cardiovascular Disease; Cardiovascular Disease Prevention; Website Application; Mobile Application

Health and Biomedical Sciences

(Undergraduate Students)

Pyocyanin pigment from Pseudomonas aeruginosa modulates innate immune defenses in macrophages

Yasmine Mahgoub, Rida Arif, Susu Zughaier
Qatar University, Qatar
szughaier@qu.edu.qa

Abstract

Background: *Pseudomonas aeruginosa* is a well-known opportunistic pathogen. The gram-negative bacillus, commonly associated with hospital-acquired infections, utilizes the host's impaired immune responses to establish infection. Of its many virulence factors, pyocyanin is essential for *P. aeruginosa* to establish its full infectivity. Macrophages act as sentinels of the innate immune system, as well as play other roles in homeostasis, tissue remodeling, and bridging between the innate and adaptive immune systems. **Aim**: This study aimed to investigate the effects of pyocyanin on macrophage innate immune defenses by assessing the function of macrophages treated with pyocyanin and TLR ligands. Phagocytosis of opsonized zymosan, LPS-induced nitric oxide release and cytokine release were used as measures of functional responses. **Results**: This study found that pyocyanin inhibited phagocytosis-induced ROS release in a dose-dependent manner and reduced nitric oxide release from macrophages induced with *P. aeruginosa* LPS. In addition, pyocyanin modulated cytokines and chemokines release from macrophages exposed to *P. aeruginosa* LPS in a dose-dependent manner. Pyocyanin significantly enhanced IL-1β release as well as several chemokines. Therefore, pyocyanin facilitates *Pseudomonas aeruginosa* to persevere in the immunocompromised host through modulating macrophage's innate immune defenses. **Conclusion**: Pyocyanin inhibits macrophage functional defense responses to facilitate *Pseudomonas aeruginosa* infection.

Keywords: Pseudomonas aeruginosa; Pyocyanin; Macrophages; Infection; ROS

Health and Biomedical Sciences
(Undergraduate Students)

Serum vitamin D concentrations are non-linearly related to breast cancer risk in postmenopausal women

Layan Sukik, Bushra Hoque, Linda Boutefnouchet, Vijay Ganji

Qatar University, Qatar

ls1601240@qu.edu.qa

Abstract

Background: Post-menopausal women are at high risk for breast cancer. The association between serum 25-hydroxyvitamin D [25(OH)D] concentration and breast cancer in post-menopausal women is not well understood. Objectives: The aim of this study was to investigate the association between serum 25(OH)D and breast cancer using nationally representative sample surveys. Methodology: In this cross-sectional study, we used seven cycles of National Health and Nutrition Examination Surveys from 2001 through 2014. Participants were non-institutionalized post-menopausal women (n=8100). Logistic regression was performed to determine the association between serum 25(OH)D concentrations and breast cancer prevalence. A restricted cubic spline method was used to assess the non-linear association. Results: The prevalence of breast cancer was 3.3%, 4.0%, 4.6%, 6.4%, and 6.9% in the groups with serum 25(OH)D levels of <30, 30-<50, 50-<75, 75-<100, and ≥100 nmol/L, respectively. The risk of having breast cancer was significantly higher in the serum 25(OH)D 75-<100 nmol/L category compared to the 25(OH)D <30 nmol/L concentration [OR and 95% CI; 2.21 (1.23-3.98)]. Furthermore, a significant non-linear relationship between serum 25(OH)D concentrations (when used as a continuous variable) and breast cancer in all post-menopausal women (p for non-linear trend 0.032) was observed. Overall, the risk of breast cancer was highest (OR=1.5) between 70 nmol/L and 80 nmol/L of serum 25(OH)D concentration in all post-menopausal women. Conclusion: An adverse association was observed between serum 25(OH)D concentration and breast cancer in post-menopausal women. Further research is needed to elucidate the mechanism of vitamin D in cancer pathogenesis.

Keywords: Breast Cancer; Cancer; NHANES; Post-menopausal; Serum 25(OH)D

Health and Biomedical Sciences
(Undergraduate Students)

Prevalence of Asymptomatic Hyperuricemia and its Association with Prediabetes, Dyslipidemia and Subclinical Inflammation Markers among Young Healthy Adults in Qatar

Yasemin Al Shanableh, Yehia Y. Hussein, Abdul Haseeb Said Wali,
Maryam Al-Mohannadi, Budoor Aljalham, Hamnah Nurulhoque,
Fahad Robelah, Areej Al-mansoori, Susu Zughaier
Qatar University, Qatar
szughaier@qu.edu.qa

Abstract

Aim: To investigate the prevalence of asymptomatic hyperuricemia in Qatar and to examine its association with changes in markers of dyslipidemia, prediabetes and subclinical inflammation. **Methods**: A cross-sectional study of young adult participants aged 18 - 40 years old devoid of comorbidities. Exposure was defined as uric acid level, and outcomes were defined as levels of different blood markers. De-identified data were collected from Qatar BioBank. T-tests, correlation tests and multiple linear regression were all used to investigate the effects of hyperuricemia on blood markers. Statistical analyses were conducted using STATA 16. **Results**: The prevalence of asymptomatic hyperuricemia is 21.2% among young adults in Qatar. Differences between hyperuricemic and normouricemic groups were observed using multiple linear regression analysis and found to be statistically and clinically significant after adjusting for age, gender, BMI, smoking and exercise. Significant associations were found between uric acid level and HDL-c $p = 0.019$ (correlation coefficient -0.07 (95% CI [-0.14, -0.01]); c-peptide $p = 0.018$ (correlation coefficient 0.38 (95% CI [0.06, 0.69]) and monocyte to HDL ration (MHR) $p = 0.026$ (correlation coefficient 0.47 (95% CI [0.06, 0.89]). **Conclusion**: Asymptomatic hyperuricemia is prevalent among young adults and associated with markers of prediabetes, dyslipidemia, and subclinical inflammation.

Keywords: Uric acid; Asymptomatic hyperuricemia; Subclinical inflammation; Prediabetes; Qatar Biobank

Health and Biomedical Sciences
(Undergraduate Students)

Clustering of lifestyle risk factors among Algerian adolescents: Comparison between urban and rural area

Fatima alzahra Hasan Yakti, Hissa Al-Mannai, Dana Saad,
Abdelhamid Kerkadi, Grace Attieh, Hiba Bawadi
Qatar university, Qatar
fy1702033@qu.edu.qa

Abstract

Background: Lifestyle behavior risk factors (LBRs) such as sedentary behavior, physical inactivity, smoking, unhealthy eating patterns and being overweight/obese play a major role in the development or prevention of NCDs. **Objective:** Compare the clustering of LBRs between urban and rural Algerian adolescents. We expect differences in LBRs between urban and rural area. **Design:** Data of this cross-sectional study was derived from GSHS. Self-administered, anonymous questionnaire was filled out by 4532 adolescents (11–16 years), which addressed LBRs of NCDs. LBRs clustering was measured by the ratios of observed (O) and expected (E) prevalence of one or more simultaneously occurring LBRs for urban and rural area separately. Multivariate logistic regression was performed to examine the association of LBRs as dependent variable with demographic variables (location, age, gender). **Results:** The most common LBR was physical inactivity (84.6%: 50.9% for urban and 49.1% for rural). Adolescents in urban area had a higher prevalence of two (56.8% vs. 43.2%) and three and more (61.3 vs. 38.7%) LBRs than rural. In urban area, a significant positive association was found between: (low fruits and vegetables + physical inactivity) [2.06 (1.61-2.64)] and (high SB + smoking) [2.10 (1.54-2.76)], while (physical inactivity + high SB) [0.70 (0.54-0.91)] showed a significant negative association. In rural area, (high SB + overweight/obesity) [1.49 (1.09-2.04)] had a significant positive association. While, (low fruits and vegetables + high SB) [0.75 (0.60-0.94)], (physical inactivity + high SB) [0.65 (0.49-0.86)] and (physical inactivity + smoking) [0.70 (0.49-0.99)] had a negative association. **Conclusions:** Several socio-demographic factors have been identified to play a role in LBRs clustering among Algerian adolescents. Results of the study suggest the development of intervention aiming to tackle different LBRs rather than focusing on a single LBR.

Keywords: Algerian; Lifestyle; Adolescents; Urban; Rural

Health and Biomedical Sciences
(Undergraduate Students)

Sleeping Duration, Napping and Snoring in Association with Diabetes Control among Patients with Diabetes in Qatar

Noof Al Mansoori, Hiba Bawadi, Zumin Shi, Abdelhamid Kerkadi,
Aya Hamdan, Asma Al Sada, Sharifa Al Mannai
Qatar University, Qatar
na1604572@qu.edu.qa

Abstract

Background: Poor glycemic control is associated with chronic life-threatening complications. Several studies have revealed that sleep status is associated with glycemic control. Aim: to examine the association between sleep duration, quality and glycemic control among adults with diabetes. Methods: Data on 2500 participants aged 18–60 years were collected from the Qatar Biobank (QBB). Sleep duration and quality were assessed by a self-completed health and lifestyle questionnaire, and glycemic control was assessed using HbA1c. Logistic regression was used to assess the association between sleep duration, napping, snoring and poor glycemic control. Results: After adjusting for age and gender, sleep duration was not associated with poor glycemic control. Lack of association persisted after controlling for smoking, physical activity, education, BMI, fruit and vegetable intake, insulin and medication use. However, sleeping for long hours at night (8 h) had a trend in increasing the risk of poor glycemic control (OR = 1.28; 95% CI: 0.94–1.74). Napping was positively associated with poor glycemic control. After adjusting for age and gender, patients who reported "sometimes, frequently, or always" napping had more than 30% increased risk of poor control as compared to patients who reported "never/rarely" napping. Snoring was not associated with poor glycemic control among the study sample when adjusted for age and gender (p = 0.61). Other factors were found to be associated with a better glycemic control such as female, high educational and high physical activity level. Conclusions: our results suggest that napping may be an independent risk factor for a poor glycemic control in diabetes. Further research is needed to establish the causal link between sleep and impaired glucose metabolism. These findings may open up new strategies for targeted intervention to improve the duration and quality of sleep.

Keywords: Diabetes; Sleep Duration; Napping; Qatar biobank

Health and Biomedical Sciences
(Undergraduate Students)

Nuts consumption and cognitive function

Zainab Abdulmoayed Abdulwahab, Sara Qaddourah, Hajer Nafea, Omnia Abdelmegid
Qatar University, Qatar
za1601366@qu.edu.qa

Abstract

Background: Cognitive impairments has become a global public concern. A limited number of studies suggest a positive association between nuts intake and cognitive function. **Objectives:** The aim of this study is to investigate the association between nuts consumption and cognitive function and to test whether hypertension and diabetes mediate this association among adults in Qatar. **Methods:** Data from 1000 participants aged 20 and above who attended Qatar Biobank (QBB) were used. Nuts consumption was assessed by a Food Frequency Questionnaire (FFQ). Blood samples were measured for magnesium and glucose. Cognitive function was assessed using computer self-administrated test to measure Mean Reaction Time (MRT). Linear regression was used to assess the association. **Results:** A total of 21.1% of the sample reported consuming nuts more than 4-6 times/week (high consumption) while 40.2% reported the consumption ≤1 time/month (low consumption). The mean MRT was 715.6 millisecond (SD 204.1). An inverse association was found between nuts consumption and MRT. Compared with those with a low consumption, high consumption of nuts had a regression coefficient of -36.95 (-68.09 to -5.82) after adjusting for sociodemographic and lifestyle factors. The inverse association between nuts and MRT was mainly seen among those aged >50 years. There was an interaction between nuts consumption and hypertension. The association between nuts consumption and MRT was not mediated via hypertension, diabetes, and serum magnesium. **Conclusion:** There is a positive association between nuts consumption and cognitive function, especially among old adults.

Keywords: Nuts consumption; Cognition; Mean Reaction Time; Hypertension; Diabetes and Qatar Biobank

Health and Biomedical Sciences
(Undergraduate Students)

The Association between Zinc and Copper and Cardiometabolic Risk Factors in Adults

Dana Samir Al Kudsi, Sara Zeyad Hamad, Hanan Mohamed Al Keldi,
Abdelhamid Kerkadi, Abdelali Agouni, Reem Omar Salih
Qatar University, Qatar
da1701633@qu.edu.qa

Abstract

Cardiometabolic risk (CMR) factors increase the likelihood of developing cardiovascular diseases (CVD). In Qatar, 24% of the total deaths are attributed to CVDs. Several nutritional disturbances have been linked to high risk of CVD. Many studies have discussed the effects of zinc (Zn) and copper (Cu) on CMR factors; however, evidence has been controversial. This investigated the association between CMR factors and the status of Zn, Cu, and Zn/Cu ratio. A total of 575 Qatari adults (≥ 18 years) were obtained from Qatar Biobank. Plasma levels of Zn and Cu were determined using inductively coupled plasma mass spectrometry (ICP-MS). Anthropometric data and CMR factors were determined using standard methods. Adjusted associations between minerals and CMR were estimated by logistic regression. The associations' strength was tested using partial correlation. Zn was not strongly correlated (p-value>0.01) or significantly associated with CMR factors and metabolic syndrome (MetS). Cu levels correlated positively with body mass index (BMI) (0.23; p<0.001), pulse rate (PR) (0.18; p<0.001), total cholesterol (0.13; p=0.01), and high-density lipoproteins (HDL) (0.27; p<0.001); and negatively with diastolic blood pressure (DBP) (-0.13; p=0.01). High Cu significantly decreased the risk of MetS (0.121; p<0.001). Furthermore, Zn/Cu ratio positively correlated with waist circumference (0.13; p=0.01), systolic blood pressure (0.13; p<0.01), and DBP (0.14; p<0.01); and negatively with BMI (-0.19; p<0.001), PR (-0.17; p<0.001), and HDL (-0.27; p<0.001). High Zn/Cu ratio increased the prevalence of low HDL (4.508; p<0.001) and MetS (5.570; p<0.01). These findings suggest that high Cu levels are associated with a protective effect on DBP, HDL, and MetS and that high plasma Zn/Cu ratio is associated with the risk of low HDL and MetS. We recommend future studies to focus on minerals status among abdominally obese and prediabetic subjects because of the probable link between low serum Zn and Cu and insulin resistance and CVD.

Keywords: Zinc; Copper; Zn/Cu ratio; Cardiometabolic risk; Metabolic syndrome

Health and Biomedical Sciences
(Undergraduate Students)

Mental health problems in adults with diabetes: prevalence and potential determinants

AlAnood Al-Shahwani[1], Dana Arafeh[1], Daniah Al-Asmar[1], Hiba Bawadi[2],
Suhad Daher-Nashif[1], Joyce Moawad[1]

[1]Qatar University, Qatar
[2]Qatar BioBank, Qatar
da1609127@qu.edu.qa

Abstract

Depression is associated with several chronic diseases such as diabetes. Diabetes is a long-term health disorder that have many health complications such as mental health problems, if left untreated. Our study aimed to determine the prevalence of depression among Qatari patients with diabetes, and to investigate the potential determinants of depression. Our results revealed that the prevalence of depression among the target population was 15.4%. Females, younger adults, smokers and patients with higher education had more depressive symptoms.

Keywords: Diabetes; Depression; Qatar Biobank; Adults

Health and Biomedical Sciences
(Undergraduate Students)

Harm Perception and Attitudes towards E-cigarette Use Among Qatar University Students: A Cross-Sectional Study

Rana Kurdi, Hanan Abdul Rahim, Ghadir Al-Jayyousi,
Manar Yaseen, Aetefeh Ali, Naema Mosleh
Qatar University, Qatar
rana.kurdi@qu.edu.qa

Abstract

Background: Electronic cigarette (e-cigarette) use is becoming popular worldwide especially among youth. Research reported that university students have poor knowledge and misconceptions about the health risks of e-cigarettes, which may lead students to use them even in populations where prevalence of cigarette smoking is relatively low. At this age, the influence of peers is also significant. In this study, we assessed the prevalence of e-cigarette use among university students as well as their knowledge and attitudes towards e-cigarettes. Methodology: We conducted a cross-sectional study among Qatar University students using a self-administered online questionnaire. Descriptive univariate analysis of all variables was conducted as well as a bivariate analysis to check the association of e-cigarette use with selected variables. A binary logistic regression was conducted to assess predictors of e-cigarette use. Results: The prevalence of e-cigarette use among students was found to be 14% where 32% of them were daily users. Approximately 42% of the participants agreed that 'e-cigarettes are less harmful to health compared to traditional cigarettes, and 45.7% of them agreed that 'e-cigarettes can prevent smoking traditional cigarettes. The prevalence of e-cigarettes use was 16.2% among males and 12.8% among females, which showed no significant difference between the two genders. Females were more likely to use e-cigarettes because they "don't smell" (P-value=0.023). The study showed a significant association between e-cigarette use and knowledge items (P-value < 0.05) and having a smoker among siblings or friends. At the multivariate analysis level, only the friends' effect remained significant after controlling for the other variables (OR= 7.3, P-value=0.000). Conclusion: Our research found that university students have inadequate knowledge and misconceptions in regards to e-cigarettes use, especially among users. Effective smoking prevention policy and educational interventions are needed to enhance awareness among university students about the health effects associated with e-cigarettes use.

Keywords: Electronic cigarette; Prevalence; knowledge; Attitude; Qatar

Health and Biomedical Sciences

(Undergraduate Students)

The prevalence of adaptive immunity to COVID-19 and reinfection after recovery – a comprehensive systematic review and meta-analysis of 12 011 447 individuals

Rafal Alshibly[1], Rana Shalaby[1], Omran A. H. Musa[1], George Hindy[1], Nazmul Islam[1], Mohammed Habibullah[1], Talal Al-Marwani[1], Rizeq F. Hourani[1], Ahmed D. Nawaz[1], Mohammad Z. Haider[1], Mohamed M. Emara[1], Farhan Cyprian[1], Suhail A. R. Doi[1], Tawanda Chivese[1], Joshua T. Matizanadzo[2], Luis Furuya-Kanamori[3]

[1]Qatar University, Qatar
[2]Brighton and Sussex Medical School, Qatar
[3]The University of Queensland, Australia
ra1402890@qu.edu.qa

Abstract

Research purpose: The research aims to estimate the prevalence of detectable SARS-CoV-2 antibodies, T and B memory cells after recovery, to determine the prevalence of SARS-CoV-2 reinfection, and to investigate the protective efficacy of infection with SARS-CoV-2 against reinfection. Methodology: Several online databases were searched for studies conducted between 1 January 2020 to 1 April 2021. Studies which compared COVID-19 infection between individuals with and without prior infection were included and assessed for quality and risk of bias. Pooled estimates of the prevalence of humoral and cellular immunity parameters and reinfection were obtained in a meta-analysis using bias adjusted synthesis methods. Findings: At ≥ 6 months after recovery, the prevalence of SARS-CoV-2 specific immunological memory remained high; IgG – 90.4% (95%CI 72.2-99.9, I^2=89.0%, p<0.01, 5 studies), and CD4+ - 91.7% (95%CI 78.2 – 97.1, one study). The pooled prevalence of reinfection was 0.2% (95%CI 0.0 – 0.7, I^2 = 98.8, 9 studies). Individuals previously infected with SARS-CoV-2 had an 81% reduction in odds of a reinfection (OR 0.19, 95% CI 0.1 - 0.3, I^2 = 90.5%, 5 studies). Research value: This review of 12 million individuals presents evidence that most individuals who recover from COVID-19 develop immunological memory to SARS-CoV-2, thus, reinfection after recovery was rare.

Keywords: COVID-19; SARS-CoV-2; Adaptive immunity; Antibodies; Reinfection; Brighton and Sussex Medical School; United Kingdom

Health and Biomedical Sciences
(Undergraduate Students)

Proteomic profile in congenital microcephaly

Khaled Ramadan Ferih[1], Ahmed Adel Elsabagh[1], Sami Ismail Zaqout[1], Angela M. Kaindl[2]

[1]Qatar University, Qatar
[2]Berlin Institute of Health, Germany
kf1800857@qu.edu.qa

Abstract

Autosomal recessive primary microcephaly (MCPH) consists of a group of disorders characterized by microcephaly and intellectual disability. This study is essential to complement previous findings of MCPH as it helps clarify the role of different genes and proteins involved in the underlying pathophysiology of MCPH. To date, 27 different mutations have been identified. This study defines a number of changes in gene expression occurring in MCPH. This helps deepen our understanding of the effect of MCPH mutations on gene expression. This study also shows the functions of proteins that increase, are unaffected or become dysfunctional due to MCPH. We identified a marked reduction of about 30 proteins with vital roles in several processes including cell cytoskeleton dynamics, cell cycle progression, ciliary functions, and apoptosis. We used Cdk5rap2 (Hartwig's anemia mice (an/an)), which is a model that closely represents MCPH3. Gel electrophoresis was utilized in order to separate brain proteins. Fixation and protein identification was then done in order to detect changes in the level of the tested proteins

Keywords: Cdk5rap2; Microcephaly; MCPH; Brain; Proteome

Health and Biomedical Sciences
(Undergraduate Students)

Conjugated Linoleic Acid (CLA) co-treatment alleviates antidiabetic drug, rosiglitazone associated deterioration of bone remodeling

Khadega Ibrahim[1], Chiara Cugno[2], Md Mizanur Rahman[1]

[1]Qatar University, Qatar
[2]Sidra Medicine, Qatar
mrahman@qu.edu.qa

Abstract

Diabetes mellitus (DM) is a chronic metabolic disease characterized by hyperglycemia due to decreased insulin secretion, defective action or both. The rosiglitazone (RSG) is one of the oral antidiabetic drug used in type 2 (T2) DM and has a unique insulin-sensitizing capacity. However, RSG has a negative side effect on the bone as it stimulates the differentiation of bone marrow-mesenchymal stromal cells (BM-MSCs) into adipocytes at the expense of osteoblasts in the bone marrow microenvironment, disturbing the normal balance of bone remodeling and causing BM adiposity. On the other hand, the trans-10,cis-12 conjugated linoleic acid (CLA), a fatty acid is known as anti-adipogenic, pro-osteogenic. Therefor, this study was designed to assess whether CLA can alleviate the negative effect of RSG on bone. We used adipose tissue derived-mesenchymal stem cells (AT-MSCs) as a human in vitro model to study the effect of CLA, RSG and combined treatment (RSG+CLA) on the osteoblastogenic and adipogenic differentiation of AT-MSCs. Osteoblastogenesis was assessed by

Alizarin Red Staining and bone mineralization was assessed by $〚"OsteoImage"〛^{TM}$assays, whereas adipogenesis was assessed by Oil Red O Staining and LipidTOX assays. Besides, the level of expression of osteogenic and adipogenic markers was measured on treated osteo- and adipo-differentiated MSCs using real time RT-PCR, immunohistochemistry (IHC) and western blot analysis. Compared to RSG group, the combined treatment group stimulates osteoblastogenesis, as evidenced by increased mineralization and upregulation of osteogenic markers OPN and RUNX2 and inhibits adipogenesis in osteogenic media as showed by decreased lipid content and downregulation of adipogenic markers FABP4, LPL and adipsin. In conclusion, the use of CLA as an adjunctive treatment reversed the effects of RSG on osteogenesis and adipogenesis. Further preclinical and clinical studies will be undertaken to establish this treatment regimen for the successful treatment of diabetic patients with rosiglitazone without adverse side effects on bone.

Keywords: Type 2 Diabetes; Rosiglitazone; Osteogenesis; Adipogenesis; Conjugated Linoleic Acids

Health and Biomedical Sciences
(Undergraduate Students)

Ecotoxicological assessment of two surfactant on the emryonic development

Aldana Al-dosari, Nadin Younes, Gheyath Nasrallah
Qatar university, Qatar
aa1605573@qu.edu.qa

Abstract

In this study, zebrafish (Danio rerio) embryos was served as a model for marine fauna to determine if there is any potential of organ-specific toxicity (neuromuscular, hepatic, cytotoxic, and cardiac) caused by Silicone-Q-22 and Ploy-Q-47. as both surfactants are considered eco-friendly corrosion inhibitors. The calculated LC50 of Silicon-Q-22 and Poly-Q-47 was 22.36 and 8.28 mg/L, respectively. At NOEC both surfactants had resulted in teratogenic defects and cardiotoxicity, but only poly Q-47 resulted in neurotoxicity.

Keywords: Toxicological; Surfactant; Zebrafish; Silicone-Q-22; poly-Q-47

Health and Biomedical Sciences
(Undergraduate Students)

Profile Of Oxidative Stress Genes In Response To Obesity Treatment

Amira Ahmed, Huda Farah, Omnia Ahmed, Dina Elsayegh,
Abdelrahman Elgamal, Nasser Moustafa Rizk
Qatar university, Qatar
nassrizk@qu.edu.qa

Abstract

Background: Oxidative stress (OS) is an imbalance between free radical production and the antioxidants defense in the body. Previous studies demonstrated the correlation of OS to the increased risk of developing metabolic disorders such as obesity. Sulforaphane (SFN), a bioactive compound, can protect against inflammation and OS, thus an effective anti-obesity supplement. **Aim**: This study explores the impact of SNF on OS in diet induced obese (DIO) mice via profiling of OS genes and pathways in skeletal muscles related to the anti-obesity effect. **Methods**: Wild-type CD1 male mice and the knockout of nuclear factor (erythroid-derived 2) like 2 (NrF2) mice were fed a high-fat diet (HFD) for 16 weeks; to induce obesity. Subsequently, each group was subdivided into two subgroups and received either Vehicle (25μl) or SFN (5 mg/kg BW) for four weeks. Body weight was measured daily, and a glucose tolerance test (GTT) was performed after 21 days of treatment. Afterward, mice were decapitated, blood and tissue samples were collected and snap-frozen immediately. Total RNA was extracted from Skeletal muscle and epididymal white adipose tissue (eWAT), leptin expression was measured in (eWAT), and 84 OS genes in skeletal muscle were examined using RT-PCR. **Results:** Significant reduction in body weight in SFN treated WT mice, while no change in KO mice. Plasma glucose, leptin, and leptin gene expression (eWAT) were significantly reduced in the WT-DIO SFN treated group, while no changes were detected in KO mice. SFN decreases OS damage in skeletal muscles, such as lipid peroxidation and production of reactive oxygen species (ROS). **Conclusion:** This study demonstrated that SFN had lowered body weight in WT-DIO mice by decreasing OS damage in skeletal muscles through the NrF2 pathway and can be a potential anti-obesity drug.

Keywords: Obesity; Oxidative Stress; Diet induced obesity (DIO); Knockout mice.

Health and Biomedical Sciences
(Undergraduate Students)

Association between pre-existing conditions and hospitalization, intensive care services and mortality from COVID-19 – a cross sectional analysis of an international global health data repository

Basant Moustafa Elsayed, Lina Altarawneh, Suhail Doi, Tawanda Chivese
Qatar University, Qatar
be1802020@qu.edu.qa

Abstract

Objective: To investigate the association between pre-existing conditions and hospitalization, need for intensive care services (ICU) and mortality due to COVID-19. Methods: We used data on all cases recorded in the Global Health Data repository up to the 10th of March 2021 to carry out a cross-sectional analysis of associations between cardiovascular diseases (CVD), hypertension, diabetes, obesity, lung diseases and kidney disease and hospitalization, ICU and mortality due to COVID-19. We included data from Brazil, Mexico and Cuba only as they were the only countries where preexisting conditions were reported. We used multivariable logistic regression to compute adjusted and unadjusted odds ratios (OR) of the three outcomes for each pre-existing condition in ten-year age groups from 0-9 years and up to 110-120 years. Results: As of the 10th of March 2021, the Global Health repository held 25 900 000 records of confirmed cases of COVID-19, of which 2 900 000 cases from Brazil, Mexico and Cuba had data on preexisting conditions. The overall adjusted odds of hospitalization for each pre-existing condition were; CVD (OR 1.7, 95%CI 1.7-1.7), hypertension (OR 1.5, 95%CI 1.4-1.5), diabetes (OR 2.2, 95%CI 2.1-2.2), obesity (OR 1.7, 95%CI 1.6-1.7), kidney disease (OR 5.5, 95%CI 5.2-5.7) and lung disease (OR 1.9, 95%CI 1.8-1.9). The overall adjusted odds of ICU for each pre-existing condition were; CVD (OR 2.1, 95%CI 1.8-2.4), hypertension (OR 1.3, 95%CI 1.2-1.4), diabetes (OR 1.7, 95%CI 1.5-1.8), obesity (OR 2.2, 95%%CI 2.1-2.4), kidney disease (OR 1.4, 95%CI 1.2-1.7) and lung disease (OR 1.1, 95%CI 0.9-1.3). The overall adjusted odds of mortality for each pre-existing condition were; CVD (OR 1.7, 95%CI 1.6-1.7), hypertension (OR 1.3, 95%CI 1.3-1.4), diabetes (OR 2.0, 95%CI 1.9-2.0), obesity (OR 1.9, 95%CI 1.8-2.0), kidney disease (OR 2.7, 95%CI 2.6-2.9) and lung disease (OR 1.6, 95%CI 1.5-1.7). The odds of each outcome were considerably larger in children and young adults with these preexisting conditions than for adults, especially for kidney disease, CVD and diabetes. Conclusion: Individuals with CVD, hypertension, diabetes, obesity, lung diseases and kidney diseases have high odds of hospitalization, ICU and mortality from COVID-19. The odds of these outcomes are especially elevated in children and young adults with these preexisting conditions

Keywords: COVID-19; Pre-existing conditions; Mortality; ICU; Hospitilzation

Health and Biomedical Sciences

(Undergraduate Students)

The risk of severe COVID-19 and mortality from COVID-19 in people living with HIV compared to individuals without HIV - a systematic review and meta-analysis of 1 268 676 individuals

Rida Arif[1], Asmaa Abdelmaksoud[1], Lovemore Mapahla[2], Albert Chinhenzva[2], Nazmul Islam[3], Sohail Doi[1], Tawanda Chivese[1]

[1]Department of Population Medicine, College of medicine, QU HealthQatar University, Qatar
[2]Division of Epidemiology and Biostatistics, Department of Global Health, Faculty of Medicine and Health Sciences, Stellenbosch University, Cape Town, South Africa
[3]Department of Public Health, College of Health Sciences, QU Health, Qatar University, Doha, Qatar
ra1605167@student.qu.edu.qa

Abstract

Research Purpose: Findings from existing studies have shown conflicting evidence concerning the risk of severe COVID-19 and death from COVID-19 in people living with HIV (PLHIV) compared to people without HIV. The aim of our review is to compare mortality, hospitalization, and the need for intensive care services due to COVID-19 between PLHIV and individuals without HIV based on data from the existing literature. Methods: A search in major databases of preprints was carried out and eligible studies were screened and selected. From each study, data on numbers of PLHIV and individuals without HIV were extracted. Study quality was assessed using the MethodologicAl STandard for Epidemiological Research (MASTER) scale. Data synthesis used a bias adjusted model where age and geographical subgroups were analysed. Results: From the 2757 records identified, 11 studies were included. The total participants were 1 268 676, of which 13 886 were PLHIV. Overall, the estimated effect of HIV on mortality suggested some worsening (OR 1.3, 95% CI: 0.9 – 2.0, I^2 = 78.6%) with very weak evidence against the model hypothesis at this sample size. However, in individuals aged <60 years, the estimated effect on mortality suggested more worsening in PLHIV (OR 2.7, 95% CI: 1.1 -6.5, I^2 = 95.7%) with strong evidence against the model hypothesis at this sample size. HIV was also associated with an estimated effect on hospitalization for COVID-19 that suggested worsening (OR 1.6, 95% CI: 1.3-2.1, I^2 = 96.0%) with strong evidence against the model hypothesis at this sample size. Conclusion: People living with HIV have higher risk of death and hospitalisation from COVID-19, compared to individuals without HIV with the difference exaggerated in those younger than 60 years old. Our findings suggest that PLHIV are at higher risk than the general population and should be prioritized for vaccine coverage and monitoring if diagnosed with COVID-19.

Keywords: HIV; COVID-19; Mortality; Hospitalization; Intensive care services

Health and Biomedical Sciences
(Undergraduate Students)

Validation of Novel Transcriptional Targets that Underpin CD44-promoted breast cancer cell invasion

Salma Ahmad, Hanan Nazar, Nouralhuda Alatieh, Maryam Al-Mansoob,
Zainab Farooq, Muna Yusuf, Allal Ouhtit
Qatar University, Qatar
aouhtit@qu.edu.qa

Abstract

   Introduction: Breast cancer (BC) is the most common cancer worldwide, and metastasis is its worst aspect and the first cause of death. Metastasis is a multistep process, where an invasion is a recurring event. The process of BC cell invasion involves three major factors, including cell adhesion molecules (CAM), proteinases and Growth factors.CD44, a family of CAM proteins and the hyaluronic acid (HA) cell surface receptor, acts as cell differentiation, cell migration/invasion and apoptosis regulator. **Rationale:** We have previously established a tetracycline (Tet)-OFF-regulated expression system, both in vitro and in vivo (Hill et al, 2006). As a complementary approach, the highly metastatic MDA-MB-231 BC cells expressing high levels of endogenous CD44s (the standard form of CD44), was cultured in the presence and absence of 50 µg/ml of HA. RNA samples were isolated from both cell experimental models, and microarray analysis (12K CHIP from Affymetrix) was applied. More than 200 CD44s transcriptional target genes were identified and were sub-divided into groups of genes based on their function: cell motility, cytoskeletal organization, ability to degrade ECM, and cell survival. **Hypothesis:** Among these 200 identified genes, we selected seven genes (ICAP-1, KYNU, AHR, SIRT1, SRSF8, PRAD1, and SOD2) and hypothesized that based on evidence from literature, these genes are potential novel targets of CD44-downstream signaling mediating BC cell invasion. **Specific Aims**: Pursuant to this goal, we proposed the following objectives: **1-** Structural validation of ICAP-1, KYNU, AHR, SIRT1, SRSF8, PRAD1 and SOD2 as novel transcriptional targets of CD44/HA-downstream signaling at both RNA and Protein level using reverse transcription polymerase chain reaction (RT-PCR) and Western Blot respectively. **2-**Functional validation of ICAP-1, KYNU, AHR, SIRT1, SRSF8, PRAD1and SOD2 as novel transcriptional targets that underpin CD44-promoted BC cell migration using wound healing assay after the transfection with siRNA.
Innovation/Consclusion: This study validated seven transcriptional targets of CD44/HA-downstream signaling promoting BC cell invasion. Ongoing experiments aim to dissect the signaling pathways that link CD44 activation by HA to the transcription of these seven genes.

Keywords: Breast cancer; Tumor invasion and metastasis; CD44; Hyaluronan; Microarray

Health and Biomedical Sciences

(Undergraduate Students)

Anti-cancer properties of Microalgae (T1) Extract in Breast Cancer Cell Lines

Noor Al-Atieh, Salma Ahmad, Hanan Nazar, Allal Ouhtit

Qatar University, Qatar

aouhtit@qu.edu.qa

Abstract

Breast cancer (BC), a worldwide health issue, is the most common malignant cancer in women in Gulf region, including the State of Qatar. Unfortunately, malignant tumors has the capability to metastasis, which involves both migration and invasion of cancer cells which are the most threatening aspects of cancer (McSherry et al., 2007). Consequently, researchers have concentrated on Complementary and Alternative medicine (CAM) modalities, as conventional medicine has been facing various challenges such as; poor understanding of the mechanisms with BC proliferation and invasion within various groups of patients, drug resistance, and the failure of current therapies to completely cure the disease. A significant CAM method have been raised which is the treatment with herbs and extracts derived from seeds, leaves, fruits and roots of plants; each of these invariably represents a combination of several bioactive compounds. Our biofuel has provided us with a crude extract of a microalgae coded as T1 that consist of carotenoids, chlorophyll a, and chlorophyll b. Carotenoids is a bioactive molecule that inhibits the proliferation, migration, invasion and induce apoptosis to tumor cells.

Keywords: Anticancer properties; Microalgae extract; Bioactive; Invasion; Proliferation

Information and Communications Technologies
(Faculty and Postdoc)

Stego-eHealth: An eHealth System for Secured Transfer of Medical Images using Image Steganography

Nandhini Subramanian[1], Jayakanth Kunhoth[1], Somaya Al-Maadeed[1], Ahmed Bouridane[2]

[1]Qatar University, Qatar
[2]Northumbria University, United Kingdom
ns1808900@qu.edu.qa

Abstract

COVID pandemic has necessitated the need for virtual and online health care systems to avoid contacts. The transfer of sensitive medical information including the chest and lung X-ray happens through untrusted channels making it prone to many possible attacks. This paper aims to secure the medical data of the patients using image steganography when transferring through untrusted channels. A deep learning method with three parts is proposed – preprocessing module, embedding network and the extraction network. Features from the cover image and the secret image are extracted by the preprocessing module. The merged features from the preprocessing module are used to output the stego image by the embedding network. The stego image is given as the input to the extraction network to extract the ingrained secret image. Mean Squared Error (MSE) and Peak Signal-to-Noise Ratio (PSNR) are the evaluation metrics used. Higher PSNR value proves the higher security; robustness of the method and the image results show the higher imperceptibility. The hiding capacity of the proposed method is 100% since the cover image and the secret image are of the same size.

Keywords: Image steganography; Autoencoders; Deep-learning; Secure-eHealth

Information and Communications Technologies
(Faculty and Postdoc)

Artificial Intelligence assisted Prediction of COVID-19 Hotspots in Third Wave using EHTERAZ

Mustafa Ahmed, Mohammed Houkan, Kishor Kumar Sadasivuni
Center for Advanced Materials, Qatar University
kishorkumars@qu.edu.qa

Abstract

The present study conceptualizes fusion of artificial intelligence and contract tracking mobile application for predicting the COVID-19 hot spots. The findings suggest that mobile technology can be used to provide real-time data on the national and local state of the pandemic, enabling policy makers to make informed decisions in a quickly moving pandemic.

Keywords: Artificial Intelligence; COVID-19 hotpot; Third wave; Ehteraz

Information and Communications Technologies
(Faculty and Postdoc)

Enhancing Pedestrian Safety through the Development of Advanced Operational Strategies for Crosswalks in Residential Areas

Qinaat Hussain, Wael Alhajyaseen, Mohamed Kharbeche
Qatar Transportation and Traffic Safety Center, College of Engineering
qinaat.hussain@qu.edu.qa

Abstract

Pedestrians are the most vulnerable group in the traffic. Every year approximately 40,000 pedestrians are killed in the world due to road traffic crashes. In the state of Qatar, the situations are even worse with around one-third of the total road traffic deaths coming from pedestrians. The main aim of this driving simulator study was to investigate the impact of different measures on driving behavior. To this end, five different treatments were tested and compared with the untreated condition. The treatment conditions included two detection-based measures (i.e., Variable Message Sign VMS and LED), two different road-marking conditions (i.e., Zigzag marking and road narrowing marking) and a physical road narrowing condition. Each condition was tested with a yield/stop controlled marked crosswalk for two situations. In the first situation (Situation PA) there was no pedestrian at the crosswalk, while the second situation was based on the presence of a pedestrian (Situation PP). The experiment was conducted using the driving simulator at Qatar University. Sixty-one volunteers possessing a valid Qatari driving license participated in the study. The collected data was analyzed for drivers' yielding rates, vehicle-pedestrian interactions, and driving speed. The results showed that the three conditions, i.e., VMS, Narrowing and Physical were effective in improving drivers' yielding rate up to 98.2%. In addition, we found that all the treatment conditions were effective in reducing drivers' travel speed in Situation PP. Nevertheless, in the situation with no pedestrian present, the physical road narrowing outperformed the other conditions in terms of reducing travel speed. Taking into account the results from this study, we recommend Physical condition as a potentially effective and low-cost treatment for improving safety at yield/stop controlled crosswalks.

Keywords: Crosswalk; Detection-based strategies; Variable message sign; LED lights; Pedestrian safety

Information and Communications Technologies
(Graduate Students)

M-Service Quality of Telecom Companies in Qatar

Abdulla Nasser Alemadi, Emad Abushanab
Qatar University, Qatar
200100440@qu.edu.qa

Abstract

Today, although mobile applications make our lives easier, the service quality provided by such applications has become a vital element in increasing customer satisfaction. This research paper aims to identify the significant mobile service quality factors (Application Design, Ease of Use, Information Content, Reliability, Responsiveness, Empathy, Security and Prices and offers) that influence customer satisfaction and loyalty in Qatar's telecommunications sector.

To answer the research question and test the hypotheses that form the study model, data were collected through an online questionnaire of 195 random customers who use Ooredoo or Vodafone mobile applications in Qatar. The proposed model was evaluated using partial least squares structural equation modeling (PLS-SEM). The results show that Ease of Use, Information Content, Responsiveness, and Security are the most significant factors that affect M-Customer Satisfaction. Also, there is a strong relationship between M-customer Satisfaction and M-loyalty. On the contrary, Application Design, Reliability, Empathy, and Prices and offers did not affect M-customer satisfaction.

Thus, the managers in telecommunication companies should adopt a strategy that focuses on the M-service quality factors that most influence M-customer satisfaction to increase customer satisfaction rates and loyalty to their products and services. It will also help reduce overall costs by delivering those products and services to a higher proportion of customers through the mobile application rather than physical branches. This paper also helps the researchers use the proposed model in future research to understand these relationships in other countries better.

Keywords: M-service quality; M-customer satisfaction; M-loyalty; Telecommunication; Mobile application

Information and Communications Technologies
(Graduate Students)

The impact of Risk Identification on IT Project Delivery in Qatar Public Sector

Mutaz Oshi, Emad Abushanab
Qatar University, Qatar
moshi@qu.edu.qa

Abstract

Unmanaged project risks can jeopardize the project's success and outcome. To assist project managers in overcoming or reducing the impact of project risk, several risk management models and standards have been established. This study is aimed to assess the impact of identified IT project risk factors on project delivery (satisfaction) in Qatar's public sector. A questionnaire consisting of identified risk factors was developed by reviewing related literature. Data were collected from the target sample and analyzed using SPSS and SmartPLS. The results demonstrated the impact of each of the nine identified risk factors with the dependent variable project delivery (satisfaction).

The hypotheses analysis showed five hypotheses H1, H2, H5, H6, and H8 supporting the literature with a positive impact on project delivery (satisfaction). Those factors are namely, the Stakeholders, Business Process, Organizational, Technical, and Schedule with significant P-values of 0.030, 0.002, 0.028, 0.023, and 0.001, respectively. The other four hypotheses H3, H4, H7, and H9 are inconsistent with the literature, with (insignificant) high P-values resulting in a negative impact on project delivery (satisfaction). Those factors are namely, Project Management, Human resources, Budget, and External with P-values 0.164, 0.605, 0.096, 0.225, respectively. The researcher recommends that project management professionals consider the five identified risk factors with a positive impact as the most critical IT risk factors; the research findings serve as a foundation and guideline to help the project management community avoid project pitfalls commonly associated with poor risk management and project failure.

Keywords: Project management; Risk management; Project success; IT in public sector

Information and Communications Technologies
(Graduate Students)

Effective Smart Contracts for Supply Chain Contracts

Bajeela Aejas, Abdelaziz Bouras
Qatar University, Qatar
ba1901053@qu.edu.qa

Abstract

Blockchain is in its way of revolutionizing different sectors with its decentralized peer-to-peer networking. Smart contracts are the piece of software that have written rules to be executed automatically to update the state of the block chain in a systematic way. One of the main use of Smart contract is in Supply Chain management. Supply Chain management deals with lot of legal contracts at a time. Contracts are agreements between two or more parties that define the duties and obligations for execution of any kind of activities. In this research, we are trying to automate the supply chain related contracts by identifying the important entities such as contract type, start date, end date etc., by using Natural Language Processing methods, then convert the contract to smart contract. This provides an efficient template for creation of smart contracts from natural language contracts and thereby offer best smart contract template for a given type of contract in Supply Chain.

Keywords: Blockchain; Smart contract; Supply chain; BERT; NLP

Information and Communications Technologies
(Graduate Students)

Intelligent Edge-based Recommender System for Internet of Energy Applications

Aya Nabeel Sayed, Faycal Bensaali, Yassine Himeur

Qatar University, Qatar

as1516645@qu.edu.qa

Abstract

When investigating how people conserve energy, most researchers and decision-makers render a conceptual distinction between prevention (e.g. unplugging devices) and productivity measures. Nevertheless, such a two-dimensional approach is inefficient from both a conceptual and policy standpoint, since it ignores individual differences that influence energy-saving behavior. Preserving electricity in homes and buildings is a big concern, owing to a scarcity of energy resources and the escalation of current environmental issues. Furthermore, the COVID-19 social distancing policies have resulted in a temporary transition of energy demand from industrial and urban centers to residential areas, resulting in greater consumption and higher costs. In order to promote the sustainability and preservation of resources, the use of new technologies to increase energy efficiency in homes or buildings becomes increasingly necessary. Hence, the goal of the project is to provide consumers with evidence-based data on the costs and advantages of ICT-enabled energy conservation approaches, as well as clear, timely, and engaging information and assistance on how to realize the energy savings that are attainable, in order to boost user uptake and effectiveness of such techniques. End-users can visualize their consumption patterns as well as ambient environmental data using the Home-assistant user interface. More notably, explainable energy-saving recommendations are delivered to end-users in form of notifications via the mobile application to facilitate habit change. In this context, to the best of the authors' knowledge, this is the first attempt for developing and implementing an energy-saving recommender system on edge devices. Thus, ensuring better privacy preservation since data are processed locally on the edge, without the need to transmit them to remote servers, as is the case with cloudlet platforms.

Keywords: Energy efficiency; Internet of things; Data visualization; Recommender system

Information and Communications Technologies

(Graduate Students)

Factors affecting Students' Satisfaction with Online Learning in Higher Education in Qatar

Alaa Abuhzaimah, Emad Ahmed Abushanab
Qatar University, Qatar
aa099647@qu.edu.qa

Abstract

This effort seeks to explore the major factors that play an essential part in enhancing students 'satisfaction with online learning experience in higher education in Qatar, before and during the COVID-19 pandemic. The Unified Theory of Acceptance and Use of Technology (UTAUT) model was expanded by integrating three new components to study student's satisfaction with online learning such as course design, student engagement and assessment method. Quantitative research methods were adopted, and data were collected from 750 students at four Universities in Qatar through an online survey questionnaire. The SPSS statistical software was applied to test the research model and to examine the reliability and validity of the data obtained from the questionnaire. Based on the findings, student engagement, assessment method, course design and continuance in the use of online learning were shown to have a substantial influence on students' satisfaction. Performance expectancy and social influence were exhibited to have a considerable impact on continuance in the use of online learning. Nevertheless, the influence of effort expectancy and facilitating conditions on continued use of online learning was found to be statistically insignificant. Moreover, the effects of age, gender, educational level, and nationality were also explored. It was found that there was a considerable discrepancy among the two genders, the different ages, educational level and nationalities on the different constructs of the model. The results of this study offer many academic institutions the opportunity to understand the factors affecting students' satisfaction with online learning in Qatar. The findings definitely, provide insight into how colleges and universities in Qatar can effectively improve online students' experience with online learning. Moreover, this research presented a conceptual model to shed the light on the shortness and provide a better explanation and understating of the factors affecting students' overall satisfaction and the relationships between them.

Keywords: Online learning; COVID-19 pandemic; Assessment method; Course design; Student engagement

Information and Communications Technologies
(Graduate Students)

Vehicle Identification using Optimized ALPR

Najmath Ottakath, Abdulla Al-Ali, Somaya Al Maadeed
Qatar University, Qatar
no1912348@qu.edu.qa

Abstract

Vehicles are a common sight on the road. Tracking and monitoring suspicious vehicles for identification due to high similarity in structure and form leads to difficulties in differentiating between them. The unique identity of a vehicle, the license plate is used here for this purpose. License plate detection is considered as an object detection task. Transfer learning on pre-trained state of art object detection models is an approach, which can perform this with better accuracy in terms of mean average precision. However, setting the right hyper-parameters needs multiple experiments. In this research, an evolutionary algorithm, genetic algorithm is used, which can optimize the hyper-parameters to achieve the best accuracy for the object detection model, YOLOv5. Further, the license plate was identified using OCR. This study concluded that hyper-parameter tuning achieved high accuracy in terms of mean average precision, achieving 98.25%, compared to 80% in initial parameter set providing an automated optimization. This license plate detected can be stored in a secure location and retrieved for re-identification. A decentralized storage or a secure cloud can be used to store the license plate. The application of this is most relevant to surveillance in high security locations where suspicious vehicles must be tracked.

Keywords: Vehicle re-identification; Automatic license plate detection; Genetic algorithm; Intelligent multi-surveillance system

Information and Communications Technologies
(Graduate Students)

Machine Learning Approach to predict Metro Ridership based on Land Use Densities

Aya Hasan Alkhereibi, Tadesse Wakjira, Murat kucukvar,
Uvais Qidwai, Deepti Muley, Abdalla Siam
Qatar University, Qatar
aalkhereibi@qu.edu.qa

Abstract

Predicting metro ridership is an essential requirement for efficient metro operation and management. The dependence of metro ridership on the land use densities entails a need for an accurate predictive model. To this end, the current study is aimed to develop a novel machine learning (ML) based model to predict the metro station ridership utilizing the land use densities near metro stations. The ridership data was obtained from Qatar Rail, and the land use data were obtained from the Ministry of Municipality and Environment in Qatar. The land use densities in the catchment area of 800 m around the metro stations have been considered in this study. The non-linear relationship between the metro ridership and land use densities has been captured through different ensemble ML models including random forests, extremely randomized trees, and gradient tree boosting. Results showed that the ML models, once meticulously optimized and trained are capable of producing an accurate prediction for metro ridership. Among the ML models, gradient tree boosting showed the highest prediction capability. The authors concluded that the proposed prediction model can be utilized by both urban and transport planners in their processes to plan the land use around metro stations, predict the transit demand from those plans, and ultimately achieve the optimal use of the transit system i.e., Transit-Oriented Developments.

Keywords: Metro ridership; Machine learning; Transportation planning; Land use

Information and Communications Technologies
(Graduate Students)

Optimization Models for Multiple Resource Planning

Norah Mohammed Z. Al-Dossari, Mohamed Haouari, Mohamed Kharbeche
Qatar University, Qatar
na1605829@qu.edu.qa

Abstract

Multiple resource planning is a very crucial undertaking for most organizations. Apart from reducing operational complexity, multiple resource planning facilitates efficient allocation of resources, which reduces costs by minimizing the cost of tardiness and the cost for additional capacity. The current research investigates multiple resource loading problems (MRLP). MRLPs are very prevalent in today's organizational environments and are particularly critical for organizations that handle concurrent, time-intensive, and multiple-resource projects. Using data obtained from the Ministry of Administrative Development, Labor and Social Affairs (ADLSA), a MRLP is proposed. The problem utilizes data regarding staff, time, equipment, and finance to ensure efficient resource allocation among competing projects. In particular, the research proposes a novel model and solution approach for the MRLP. Computational experiments are then performed on the model. The results show that the model performs well, even for higher instances. The positive results attest to the effectiveness of the proposed MRLP problem.

Keywords: Optimization; Models; Multiple resource; Planning

Information and Communications Technologies
(Graduate Students)

Investigating the impact of Innovative Treatments on Driving Behavior at School Bus Stops: A Driving Simulator Study

Mustafa Suhail Almallah[1,2], Shabna SayedMohammed[2], Qinaat Hussain[1], Wael K. M. Alhajyaseen[1]

[1]Qatar Transportation and Traffic Safety Center, College of Engineering, Qatar University, Qatar
[2]Department of Civil & Architectural Engineering, College of Engineering, Qatar University Qatar
ma1404815@qu.edu.qa

Abstract

The illegal overtaking/crossing of stopped school buses has been identified as one of the leading causes of students' injuries and fatalities. The likelihood of students in getting involved in a school bus-related crash increases during loading/unloading. The main objective of this driving simulator study was to study the effectiveness of different treatments in improving students' safety by reducing the illegal overtaking/crossing of stopped school buses. Treatments used in this research are LED, Road Narrowing and Red Pavement. All proposed treatments were compared with the control condition (i.e., typical condition in the State of Qatar). Seventy-two subjects with valid Qatari driving license were invited to participate in this study. Each subject was exposed to three situations (i.e., Situation 1: the school bus is stopped in the same traveling direction, Situation 2: the school bus is stopped in the opposite traveling direction, Situation 3: the school bus is not present at the bus stop). Results showed that LED and Road Narrowing treatments were effective in reducing the illegal overtaking/crossing of stopped school buses. Moreover, the stopping behavior for drivers in LED and Road Narrowing was more consistent compared to the Red Pavement and control conditions. Finally, LED and Road Narrowing treatments motivated drivers to reduce their traveling speed by 5.16 km/h and 5.11 km/h, respectively, even with the absence of the school bus. Taking into account the results from this study, we recommend the proposed LED and Road Narrowing as potentially effective treatments to improve students' safety at school bus stop locations.

Keywords: Driving simulator; School bus; Bus stop; Driving behavior

Information and Communications Technologies
(Graduate Students)

Performance Analysis of DCT and DWT Algorithms in Image Steganography

Al Anood Najeeb, Somaya Al Maadeed, Noor Al Maadeed

Qatar University, Qatar

an1912824@qu.edu.qa

Abstract

Frequency domain techniques such as Discrete Cosine Transform (DCT) and Discrete Wavelet Transform (DWT) ensures high accuracy when compared with the spatial domain techniques. Therefore, these image steganographic methods were evaluated using public datasets to compare the performance of DCT and DWT. After performing different tests using the datasets in each of the algorithms, a comparative analysis is made in terms of the Peak Signal-to-Noise Ratio (PSNR) metrics. The results indicate that the stego image generated after embedding the secret acquires high imperceptibility and robustness. The performance of the DWT algorithm is higher as compared to the DCT algorithm and the resultant images produced are very less prone to noise attacks. In DCT and DWT algorithms, the cover image will be split based on 8×8 pixel blocks and 2D DCT is applied on each pixel. The secret will be embedded inside DCT coefficient and inverse 2D DCT is applied to recover the secret. Therefore, these image steganographic techniques can be adopted to transfer the confidential messages in different sectors. In the future, other data hiding methods using deep learning could be implemented to increase the robustness and imperceptibility of covert messages.

Keywords: DCT; WDCT; Steganography; Comparison; PSNR

Information and Communications Technologies
(Graduate Students)

Blink Rate vs Inner Self-perceived Cognitive State while using Virtual Reality Applications with Haptic Devices

Najmath Ottakath, Somaya Al Maadeed, Jihad Al Jaam, Moutaz Saleh

Qatar University, Qatar
no1912348@qu.edu.qa

Abstract

On average, humans blink between eight and 21 times per minute while resting. Eye actions are influenced by external and internal stimuli. This can be utilized to measure internal cognition specifically focus and attention while performing tasks. In this experiment, an individual's self-perceived focus, attention and interaction level is collected and then correlated with eye blinks rate. The subjects are observed while performing experiments using haptic devices in a virtual environment. The experiment was modulated based on network quality and hardware quality to further quantify the effect of each scenario on subjects' intrinsic and extrinsic focus indicators. The experiment quantified the blinks and formulated a correlation between subjects' own perception of the event using statistical analysis. It can be found that there is an acceptable correlation between certain indicators, network quality, fatigue, stress, focus and enjoyability of the experiments. A good quality hardware and network did enhance the experience in all the subjects indicating a need for enhanced services for haptic and immersed mixed reality activities directly affecting the cognition especially in education tools. It can be inferred that eye blink rate can be used as an additional tool for measuring the cognition of individuals experience using haptic and virtual reality tools.

Keywords: Virtual reality; Haptic devices; Eyeblink rate; Self-perceived cognition; Virtual education

Information and Communications Technologies
(Graduate Students)

Anomaly Detection in Blockchain-enabled Supply Chain: An Ontological Approach

Tahani Hussein Abu Musa, Abdelaziz Bouras
Qatar University, Qatar
ta090001@student.qu.edu.qa

Abstract

In our proposed work, we propose an anomaly detection framework, for detecting anomalous transactions in business processes from transaction event logs. Such a framework will help enhance the accuracy of anomaly detection in the global Supply Chain, improve the multi-level business processes workflow in the Supply Chain domain, and will optimize the processes in the Supply Chain in terms of security and automation. In the proposed work Ontology is utilized to provide anomaly classification in business transactions, based on crafted SWRL rules for that purpose. Our work has been evaluated based on logs generated from simulating a generic business process model related to a procurement scenario, and the findings show that our framework can detect and classify anomalous transactions form those logs.

Keywords: Anomaly detection; Business process; Supply chain; Blockchain

Information and Communications Technologies
(Underraduate Students)

Development of an Immersive Cultural Game using Mixed Reality

Yahia Boray, Hesham Zaky, Omar Osman, Noora Fetais
Qatar University, Qatar
yahiaboray@icloud.com

Abstract

This game aims to preserve and spread cultural practices. It introduces new gaming mechanics, which allows user interaction with virtual game objects using hand gestures. The user's objective is to hunt prey in their natural habitat, which means that the player will physically change his location to hunt a specific prey using his falcon to mimic how the falcon hunts for its prey in the real world. This interaction with the real world, along with incorporation of realistic graphics and mixed reality features, enhances the user's experience and helps in preserving cultural practices. Previous work tried to achieve the same goal by different approaches that led to different user segments and different usability cases. One major limitation in that work was the accessibility due to the use of specialized hardware. The hardware is accessible to a small segment of users; however, given the new limitations forced by the COVID-19 situation reusing the hardware is prohibited ; and as a result, not many will have access to the developed solution. The current implementation was designed to work on both Android and IOS to have a social interaction between the largest possible numbers of players. Other features that could also contribute to the goal of the project include building a virtual museum and displaying real falcons using the capabilities mixed reality has to offer.

Keywords: Mixed reality; Augmented reality; Software engineering; Unity; Flutter

Social Sciences and Humanities
(Faculty and Postdoc)

The Gravity of Distance: Evidence from a Trade Embargo

Afnan Al-Malk[1], Jean-Francois Maystadt[2], Maurizio Zanardi[3]
[1]Qatar University, Qatar
[2]UCLouvain, Belgium
[3]University of Surrey, UK
aa16681@qu.edu.qa

Abstract

On June 5, 2017, an airspace blockade was imposed on the State of Qatar by four of its neighbors: Saudi Arabia, Bahrain, United Arab Emirates, and Egypt. We study the exogenous increase in air transportation costs with non-blockading countries to examine the effect of increased travel distance on bilateral trade. Based on a gravity model estimated with a Poisson pseudo-maximum likelihood, we find a distance elasticity of trade between -0.3 and -0.5. Our findings revise downwards cross-sectional estimates of the distance elasticity of trade and confirm more recent estimates exploiting similar time-varying shocks to distance.

Keywords: International trade; Gravity model; Economics; GIS

Social Sciences and Humanities
(Faculty and Postdoc)

Social Attitudes, Behavior, and Consequences surrounding COVID-19 in Qatar: Findings from a Large-scale Online Survey V2H Operations

Justin Gengler[1], Noora Lari[1], Buthaina Al-Khelaifi[1], Maryam F. Al Thani[1],
Rima Charbaji El-Kassem[1], Fatma Almoghunni[2]

[1]Social and Economic Survey Research Institute (SESRI), Qatar University, Qatar
[2]Independent scholar, Qatar
jgengler@qu.edu.qa

Abstract

Amid the outbreak of the contagious novel Coronavirus (COVID-19), states were put in an unprecedented situation never encountered before. Qatari authorities applied certain preventive measures to contain the spread of the virus. Still, knowledge of public risk perceptions and behavioral responses surrounding the COVID-19 epidemic is emerging, and clear quantitative data remain limited. This poster summarizes the results of a SESRI study that investigated social attitudes, behavior, and consequences surrounding COVID-19 in Qatar. An original online survey was conducted in both Qatar and a comparison case (Kuwait) during a 3-month period from November 2020 to January 2021. A total of 4,597 citizens and residents of Qatar aged 18 years and older were recruited to participate in the study, with 2,282 completing the full interview schedule. A total of 2,671 citizens and residents of Kuwait (1,184 completed) also took part in the survey to provide a regional baseline. The study produced many previously unavailable insights. Attitudes on risk perception, behavioral responses, and psychological distress were examined, along with individual-level determinants of intentions to comply as well as actual compliance with mandated preventive measures. The study findings suggest that authorities in Qatar should prioritize increasing public knowledge about COVID-19, present clear explanations of important changes in public policy surrounding COVID-19, spread accurate information about COVID-19 to combat the global online misinformation and debunk conspiracy theories and perpetuating myths. Redouble efforts to ensure public compliance with COVID-19 preventative measures, particularly among Qatari citizens and in relation to social gatherings, continue the transparent communication about its approach of handling the crisis with the public and effectively communicate the dangers of COVID-19 in order to encourage citizens and residents to comply with restrictions and to take the vaccine.

Keywords: COVID-19; Social behavior; Survey research; Qatar; Kuwait

Qatar University Annual Research Forum & Exhibition 2021

Building Resilience at Universities:
Role of Innovation and Entrepreneurship

Social Sciences and Humanities
(Faculty and Postdoc)

مصداقية وفاعلية الاتصال الرقمي أثناء الأزمات ـ دراسة تطبيقية على جائحة كورونا في قطر

أشرف جلال حسن بيومي
كلية الآداب والعلوم، جامعة قطر
a.galal@qu.edu.qa

ملخص

تزداد الحاجة للاتصال أثناء الازمات خاصة الأزمات الجديدة، وهو ما ينطبق على جائحة كورونا التي تعد مثالًا واختبارًا واضحًا لطبيعة ودور الإعلام الرقمي سواء كان في المواقع الإلكترونية، أو في منصات التواصل الاجتماعي، أو التطبيقات الإلكترونية التي سارعت الدول بإطلاقها لمتابعة كل ما يتعلق بالأزمة؛ نظرًا لما يتسم به الإعلام الرقمي من تعدد، وتنوع، وسرعة، ومرونة في مواكبة الأحداث ومتابعتها الفورية في أزمة تتطور وتنتشر بسرعة، وتحصد مع انتشارها كل لحظة ضحايا جددًا، سواء من المصابين أم الوفيات، ويبقى الأسلوب الأساسي لتجنب الإصابة بالمرض مشروطا ومرتبطًا بوعي الجمهور وقدرته على الالتزام بتعليمات تتحدى ليس فقط سلوكه الشخصي، بل وتعتمد في الوقت نفسه على طبيعة ومدى التزام الآخرين بتلك التعليمات.

ولاختبار دور الإعلام الرقمي وفاعليته ومصداقيته أثناء الأزمة جاءت هذه الدراسة التي افترضت أن للإعلام الرقمي في أزمة كورونا دورًا كبيرًا في إمداد الجمهور بالمعلومات، وتكوين وعيه كأحد أهم الأسلحة في مواجهة فيروس لا يتوافر له علاج حتى الآن، واستطاع أن يشل الحياة البشرية، ويعيد تغيير نظرة العالم وأولوياته في العديد من الأمور، فانتشار الأخبار الكثيف قد يؤدي إلى حالة من الهلع الكبير الذي من الممكن أن تؤثر على جهازنا المناعي، وبالتالي تتسبب في حالات أكبر للعدوى، كما أن المبالغة في نقل أخبار انتشار وباء كورونا أو أسلوب التجاهل والاستهزاء من الإجراءات الاحترازية كلاهما ينبعان من جهل وعدم معرفة علمية حقيقية بكارثية الوباء. وقد اعتمدت الدراسة على المنهج المسحي لعينة عشوائية من 500 مفردة من الجنسيات العربية والأجنبية، واستطلاع آرائهم حول فعالية ومصداقية الإعلام الرقمي باستخدام استمارة استقصاء مقننة بالاعتماد على مقايس مقننة لكل من المصداقية والفاعلية. وقد انتهت الدراسة إلى أن الإعلام الرقمي كان أهم الأدوات التي اعتمد عليها الجمهور في متابعة الأزمة واستقاء الأخبار والمعلومات والتوجيهات الإرشادية؛ بما يثبت مصداقيته وفاعليته، كما ثبت وجود فروق نسبية بين وسائل الاتصال الرقمي ذاتها.

الكلمات المفتاحية: مصداقية الاتصال، كفاءة الاتصال، اتصالات الأزمات، وسائل التواصل الاجتماعي

Qatar University Annual Research Forum & Exhibition 2021

Building Resilience at Universities:
Role of Innovation and Entrepreneurship

Social Sciences and Humanities
(Faculty and Postdoc)

QUYSC STEM Digilearning Model

Nitha Siby, Enas Elhawary, Jolly Bhadra, Noora Al-thani, Azza Abouhashem, Rana Magdy
Qatar University Young Scientists Center (QUYSC), Qatar
jollybhadra@qu.edu.qa

Abstract

Covid-19 and the unprecedented shift in educational delivery, has revealed multiple perforations in the science-learning pedagogies. The technological replacements for a physical presence of an instructor and peer collaborated classroom could not retain student interaction and positive learning attitude as in the pre-Covid period. YSC STEM Digilearning Model, is an online voluntary summer course that was created to combat the respective hitches and was successfully implemented on 38 primary-preparatory students from diverse schools promising an active learning environment. Student Feedback mechanism approach was implemented throughout the course thereby providing voice to the students in the learner centered approach adopted by the STEM course. The course carried out diverse synchronous and asynchronous activities with positive student response as the study witnessed minimal student withdrawals and presentation of completed student assignments.

Keywords: STEM learning; Virtual learning; ICT; Digitalization

Social Sciences and Humanities
(Faculty and Postdoc)

Qatar's Labor Law changes and Workers' Welfare: Attitudes & Perceptions for a Sustainable Future

Abdoulaye Diop, Le Trung Kien, Buthaina AL Khelaifi, Haneen Al Qassass,
Lina Bader, Engi El-Maghraby, Semsia Al-Ali Mustafa
Qatar University, Qatar
engi.elmaghraby@qu.edu.qa

Abstract

From September 22 2020 to January 19 2021, the Social and Economic Survey Research Institute (SESRI) at Qatar University surveyed 2,760 individuals, including Qatari nationals, higher-income and lower-income expatriates about Qatar's recent Labor Law changes. The survey is based on a nationally representative sample interviewed by telephone in nine different languages. The survey shows that both Qataris and resident expatriates have a mostly positive perception of the recent Labor Law changes and their impact on Qatar's economy and the working and living conditions of expatriates. However, the findings also indicate that public awareness surrounding the new legislative reforms remains low.

Keywords: Perceptions; Attitudes; Qatar Labor Law; Reforms; Workers welfare

Social Sciences and Humanities
(Faculty and Postdoc)

A STEM Model to engage Students in Sustainable Science Education through Sports: A Case Study in Qatar

Ruba Ali, Jolly Bhadra, Nitha Siby, Zubair Ahmad, Noora Al-Thani

Qatar University, Qatar

ruba.ali@qu.edu.qa

Abstract

Sports is a powerful tool to make deeper connections, stimulations, and understanding of STEM (science, technology, engineering, and mathematics) education. Science in sports is a unique program established to present sports as a medium for STEM education. The program included 248 students (112 females and 136 males) from 15 secondary schools in the State of Qatar. The participants took part in interactive, hands-on learning workshops where they were challenged to design sports equipment from innovative materials while adhering to specific design criteria. Quantitative and t-test analysis were performed on data collected over five years from 2012 to 2017 of the program to analyze its effectiveness, along with the Research and Development (R&D) study obtained from pre and post-surveys of students, teachers, and facilitators to further analyze participants' behaviors and attitudes.

Keywords: Sports; STEM; Sustainability; Education

Social Sciences and Humanities
(Faculty and Postdoc)

Depression-anxiety in Adult Population of Qatar during the First Year of COVID-19

Salma Mawfek Khaled[1], Iman Amro[1], Lina Bader[1], Tarek Bellaj[2], Yousri Marzouki[2], Youssef Hasan[2], Ibrahim Mohamed AA Al-Kaabi[2], Peter Woodruff[3], Majid A Alabdulla[4], Peter Haddad[4]

[1]Social & Economic Survey Research Institute, Qatar University, Qatar
[2]College of Art and Sciences, Qatar University, Qatar
[3]Department of Neurosciences, Sheffield University, UK;
[4]Department of Psychiatry, Hamad Medical Corporation, Qatar;
skhaled@qu.edu.qa

Abstract

There is limited data from Arabic-speaking countries on risk factors for depression and anxiety during the COVID-19 pandemic. Country-specific data is necessary given differences in culture, demographics, and COVID-19 infection and mortality rates. This study intended to identify the factors associated with symptoms of depression-anxiety in the adult population of Qatar during the first year of the COVID-19 pandemic. We conducted a cross-sectional online survey in Qatar between July and December 2020 after Qatar's first COVID-19 wave and before the beginning of the second wave. Depression-anxiety was defined as a cut-off of 20 or higher on the PHQ-ADS scale. Of 1138 participants, 71.05% were female, 69.0% Arabs, and 70.0% Non-Qataris. 77 % were < 40 years (the median age in Qatar is 32 years). In a fully-adjusted model, six variables were significantly associated with PHQ-ADS; Arab ethnicity (OR=1.67, p=0.026), never married (OR=1.69, p < 0.015), prior psychiatric history (OR=1.80, p=0.009), Social Media induced worries (OR=1.72, p=0.003), history of COVID-19 (OR=1.76, p=0.039), loneliness (OR=1.91, p < 0.001), and lower levels of religiosity (OR=0.96, p=0.039). The potential risk factors identified may assist with anxiety and depression prevention in future COVID-19 waves, similar national events and assist with early intervention to treat sufferers.

Keywords: Depression; Anxiety; Associated factors; COVID-19 pandemic; Qatar

Social Sciences and Humanities
(Faculty and Postdoc)

### Agriculture Census in Qatar (2021): Towards Sustainable Food Security

Elmogiera Elawad, Mohamed Agied, Rima Charbaji El-Kassem
Social & Economic Survey Research Institute, Qatar University, Qatar
rima.charbaji@qu.edu.qa

Abstract

The Social and Economic Survey Research Institute (SESRI) at Qatar University is implementing the agricultural census in Qatar (2021), which is funded by the Ministry of Municipality and Environment. Agricultural census is a statistical process based on collecting, processing, and disseminating data on the structure of agriculture, which often covers the whole country or a large part of it. It usually involves collecting agricultural data such as the size of properties, land usage, cropping areas, irrigation, number of farm animals, resources, and manpower. Censuses are conducted regularly every ten years to provide more recent data for agricultural policy purposes. The data provided by the census is important for food security policies and Qatar National Vision 2030, which aims at the development and expansion of the agricultural sector. This requires the introduction of "finest practices" and an agricultural business model focused on economic efficiency, profitable and sustainable agriculture, optimal use of scarce resources, and a minimal impact on the environment. The objectives of the project are summarized as follows:

- Provide sample frame for agricultural surveys.
- Provide data of agriculture structure in the State of Qatar, which include properties, resources, production, and cost.
- Provide up-to-date data for crops, vegetables, livestock, and used areas.

Keywords: Agriculture; Census; Livestock; Plant

Social Sciences and Humanities
(Faculty and Postdoc)

الصورة المعيارية للمجتمع القطري: دراسة في تصورات المقيمين

أسماء حسين ملكاوي، الشاذلي بية الشطي، أفراح العتيبي، المهدي لحمامد
جامعة قطر، قطر
amalkawi@qu.edu.qa

ملخص

تتمتع دولة قطر بإمكانيات إضافية في مجال القوة الناعمة، باعتبارها من الدول التي تستقطب أعدادًا كبيرة من المهاجرين، يمكنهم الإسهام في تعزيز جهودها في صنع صورة الدولة. تهدف الدراسة إلى فهم تصورات المقيمين تجاه الدولة والثقافة والمجتمع القطري، اعتمدت الدراسة المنهج الكيفي وجمعت بيانات من عينة قصدية قوامها (111) مقيمًا من مختلف الجنسيات. أجري تحليل موضوعاتي باستخدام MAXQDA. وخلصت الدراسة إلى أن لدولة قطر ميزات ثقافية إيجابية وبعضها سلبية، إلا أن تصورات المقيمين في مجملها إيجابية تُجاهها، وتَخضع لشروط؛ الخبرة الشخصية، والأطر المرجعية الثقافية. وتبعًا للمقيمين، فإن قطر سوف تواجه تحديات ثقافية أبرز ها يرتبط باستحقاقات تتعارض مع الثقافة المحلية والمعتقدات الدينية، وأخرى ذات طابع حقوقي.

الكلمات المفتاحية: التصورات الاجتماعية، الثقافة، الشخصية، كأس العالم، قطر

Social Sciences and Humanities
(Faculty and Postdoc)

A Comparative UG Near-peer Mentoring Model for Motivating School Students towards Innovations during E-STEM Education: A Case Study of Qatar

Malavika Elaveetil Santhosh, Dr. Jolly Bhadra, Azza Saad, Rana Magdy,
Shahad Alkhair, Ruba Ali, Enas Ehalwary, Dr. Noora Al-Thani
Qatar University, Qatar
malavikae.santhosh@qu.edu.qa

Abstract

The importance of online education and online learning has gained colossal importance during the present era. Despite online education being the savior during the current pandemic, its implementation was/has been quite puzzling. This article describes a novel approach to the execution of an E-STEM (online- Science, technology, engineering, mathematics) course for school students by integrating the near-peer mentoring approach. Wherein, the undergraduate (UG) students were the near-peer mentors, who had mentored/guided the school students (middle school & high school). Even though the E-STEM course was developed & presented by the STEM professionals, it was the near peer-mentors who were responsible for the constant motivation & assessment of the school students. The paper displays several roles of the UG mentors, predominantly aiding the students' motivation and also their assessment via a triangulation assessment approach: with the UG mentors being responsible for the indirect and embedded assessment of the students. The STEM course was efficaciously conducted for 56 students of high school and middle school students, involving 16 undergraduate near-peer mentors. Various E-tools and student-feedback mechanisms were used to implement the E-STEM course in a student-centered manner. Thereby, to reveal the success of the model, the student's feedback, pre-post questionnaires, and text message transcripts were investigated. The constructive roles of undergraduate mentors, in aiding the school students towards their active engagement, and STEM innovations, during E-learning, have been validated. A clear comparison had been made between the behavioral aspect of the high school students and middle school students with the UG mentor. Therefore, unlike many studies that had shown the success of the near-peer mentoring model, our article addresses the underlying process, that contributes to the success with a distinct comparison between the two (prior mentioned aspect).

Keywords: UG near-peer mentoring; Undergraduate student mentor; Student motivation & assessment; E-STEM

Social Sciences and Humanities
(Faculty and Postdoc)

A STEM Model to engage students in Environmental Sustainability Program through Collaborative Problem-solving Approach: A Case Study in Qatar

Rania Mohammed Aledamat, Azza Abouhashem, Ruba Ali, Shahad AlKhair, Jolly Bhadra, Dr. Noora Jabor Al-Thani

Qatar University, Qatar
rania.aledamat@qu.edu.qa

Abstract

Following the launch of Qatar's National Vision 2030, environmental development was highlighted as one of the Vision's four pillars, emphasizing the importance of developing people's awareness of their duty in maintaining the country's environment for future generations. In addition, environmental education can be combined with various approaches, such as STEM and problem-solving skills, making it an excellent way to engage students in a sustainable program. A distinctive E-STEM program titled "Problem-Solving" (PS) was developed in Qatar amid regular educational reforms to improve primary school pupils' problem-solving abilities. During this study, 346 kids (202 females and 144 males) from 14 different public and private primary schools were involved in STEM workshops on environmental issues, encouraging them to develop solutions to the problem. The study used a mixed-method approach to measure program efficacy, with a statistical analysis performed using data collected from four separate workshops over two years from 2018 to 2019. This research and development project used pre and post-questionnaires and a qualitative method for evaluating student problem-solving skills. The outcomes of the SWOT analysis also provided an overview of the program's efficacy in involving students by demonstrating their collaborative problem-solving skills about environmental issues.

Keywords: Environmental education; STEM education; Problem-solving; Elementary school students

Social Sciences and Humanities
(Faculty and Postdoc)

استخدامات وسائل الاتصال الحديثة والتقليدية وتأثيراتها المحتملة: دراسة استكشافية
على عينة عمدية من الجمهور العربي

عبد الرحمن محمد الشامي
Qatar University, Qatar
aalshami@qu.edu.qa

ملخص

سعت الدراسة إلى رصد مظاهر الاتصال والتواصل في عصر المعلومات اللحظية، والتأثيرات المتبادلة بين وسائل الاتصال الجديدة والقديمة، وذلك بالتطبيق على عينة بلغت 400 مستجيبا ومستجيبة من الجمهور العربي راوحت أعمارهم بين 20 وأكثر من 50 سنة. وقد استخدمت الاستبانة أداة رئيسية للدراسة. وشملت الاستمارة ثلاثة أجزاء: الأول تمثل في المعلومات والبيانات الأولية للمستجيب، والجزء الثاني جاء مكونا من 14 سؤالًا، توزعت على أربعة محاور؛ وهي: معدل استعمال شبكات التواصل الاجتماعي وكثافته، ونشاط المبحوثين، ومدى ثقتهم في المواد المنشورة على هذه الشبكات، وتأثيرها على مشاهدة التليفزيون، والجزء الثاني جاء مكونًا من مقياس تألف من 18 عبارة لمعرفة اتجاهات المبحوثين نحو شبكات التواصل الاجتماعي كوسيلة تواصل لحظي، وآثارها المحتملة في الجوانب: المعرفية، والوجدانية، والسلوكية. أدخلت البيانات وحللت بواسطة البرنامج الإحصائي SPSS (نسخة 23). ومن أهم ما توصلت إليه الدراسة: ارتفاع معدل وكثافة استعمال واتس آب، وفيس بوك على نحو منتظم، كما ارتفعت نسبة قراءة المواد المنشورة على فيس بوك وتويتر، ومن يقومون بإرسال رسائل بواسطة واتس آب، أو يشاهدون الرسائل والفيديوهات التي تصلهم بواسطة هذه الوسائل. وأكدت النتائج على نشاط المبحوثين، وتأثير استعمال شبكات التواصل الاجتماعي على تعرض الجمهور العربي للتليفزيون، وعبّر المبحوثون عن اتجاهات إيجابية إزاء هذه الشبكات، وبخاصة ما يتعلق بكونها وسيلة سريعة للتواصل بين الناس حول الموضوعات الهامة، وفي أوقات الكوارث والأزمات، كما تعتبر وسيلة سهلة وسريعة لتبادل المعلومات والأخبار بين مستخدميها، كما تتيح مشاركة المعلومات والخبرات على أوسع نطاق بينهم، بالإضافة إلى كونها وسيلة سريعة لمعرفة الأخبار بمجرد حدوثها. وخلصت الدراسة إلى أن شبكات التواصل الاجتماعي تحقق مفهوم الاتصال اللحظي للأفراد المستخدمين لهذه الشبكات، وبالرغم من أهمية هذه الشبكات على كافة الصعد الاتصالية؛ إلا أن ثقة المبحوثين فيما ينشر أو يبث على هذه المنصات لا يزال محدودًا.

الكلمات المفتاحية: وسائل الاتصال الحديثة، وسائل الاتصال التقليدية، شبكات التواصل الاجتماعي، الاستخدامات، التأثيرات

Social Sciences and Humanities
(Faculty and Postdoc)

Development and Productive use of Virtual Pandemic Awareness Course during COVID-19 Outbreak to Stimulate STEM Curiosity in High School Students

Shahad Alkhair, Enas Elhawary, Ruba Ali, Nitha Siby, Rania Aledamat,
Maryam AlEjji, Jolly Bhadra, Zubair Ahmed, Noora Al-Thani
Qatar University, Qatar
shahad.alkhair@qu.edu.qa

Abstract

In early 2020 when Covid-19 hit the globe, it caused significant destruction to the educational process. Schools were shut down, teachers and students struggled to adapt to the new method of learning. Meanwhile, Students were subjected to numerous misinformation circulating about the virus. Thereby it was crucial to develop an interactive virtual health awareness course addressing Covid-19 and utilizing STEM learning in the content of the course. Twenty students (12 Females and 8 Males) from secondary schools inside Qatar participated in the course. Diverse digital tools were integrated into the course contents, such as interactive quizzes, online games, videos, and PowerPoint presentations to increase student's interest in STEM. Furthermore, discussions with experts in various fields were held during the course to equip students with the knowledge and competencies needed to meet course outcomes. A feedback mechanism evaluated the course content design and delivery. The results indicated student's positive responses to the STEM learning experience and the activities implemented in the course. The students exhibited high attendance throughout the course, and they completed their assigned projects voluntarily. The course effectively achieved desired outcomes of the study. The design of the course content integrated various digital tools that address STEM learning and motivate students to join and retain three weeks course duration. The course effectively achieved desired outcomes of the study. The design of the course content integrated various digital tools that address STEM learning and motivate students to join and retain three weeks duration. Consequently, students' competencies, and innovation capabilities were improved.

Keywords: Pandemic; Covid-19; STEM; ICT tools; Health awareness

Social Sciences and Humanities
(Faculty and Postdoc)

How News affects Stock Prices of Olympics and FIFA host countries

Alanoud Al-Maadid[1], Nicola Spagnolo[2], Omer Akbar[1]

[1]Qatar University, Qatar
[2]Brunel University, UK
a.almaadeed@qu.edu.qa

Abstract

As the sports industry continues to grow, mega sports events can have a significant impact on the financial markets. Stock market performance is influenced by sports-related news, however, very few studies have been undertaken to examine the impact of sports events on the stock market. Results of econometric analysis, controlling for potential endogeneity of the stock returns variables, show that news index has a positive and significant impact on stock returns. The results also show that interest rate and oil prices have a positive and significant impact on stock returns, whereas, VIX index has a negative and significant impact on stock returns.

Keywords: FIFA; Olympics; GCC; Finance; Economics

Social Sciences and Humanities
(Graduate Students)

Tod's role in enhancing urban quality of life and preserving built heritage: The case of Msheireb Downtown Doha

Sarah M. Al-Thani
Qatar University, Qatar
althanism@gmail.com

Abstract

The term 'Transit-Oriented Development' or TOD was firstly used by the American planner Peter Calthorpe in 1993. To address the urban sprawling caused by extensive car use and the disappearance of historical community centers, the strategy for TOD is based on planning land use on a regional scale integrated to public transport systems. TOD became part of the movement known broadly as 'new urbanism'. Lately, Doha faced rapid growth in social, economic, and built environmental aspects that shaped its current and future urban planning. TOD is seen as an efficient and energetic approach to resolve the existing challenges in urban planning of the city through a sustainable strategy in urban developmental planning. Msheireb Downtown, the heritage district of Doha, is the selected case study under investigation. The research study focuses on modeling a new pattern of sustainable traditional urban developmental planning, which supports integration of transportation planning, land use and cultural/identity heritage. The study intends to explore "new urbanism" theories, which are the basis for TOD, while investigating the role of TOD in enhancing urban quality of life by following a number of principles that address physical, social, economic, environmental and mobility concerns. The research study adopts a qualitative approach. Oral and visual data are collected via (i) interviews with urban planners and consultants from Msheireb Properties, the Ministry of Municipality and Environment and Qatar Rail; (ii) walk- through studies; (iii) site visits and observations about the spatial form of buildings, streets and open spaces; (iv) on-site interviews; and (v) a survey conducted during the walk-through studies. The study aims at revealing the extent to which the TOD principles can be implemented in the selected study area, by exploring (i) its conditions [site analysis] and (ii) how the urban quality of life in the vernacular urbanism is achieved in modern times.

Keywords: Sustainable urbanism; TOD; Msheireb [Downtown Doha]; Urban quality of life; Built heritage

Social Sciences and Humanities
(Graduate Students)

Case Study of Teachers' and Students' Perspectives on Co-teaching Models used in Qatar's Middle Schools

Hamda Ali Mohamed
Qatar University, Qatar
hm1105898@qu.edu.qa

Abstract

This research aims to have a substantial glance at the middle schools in Qatar, which adopted co-teaching models, where special education teachers and general education teachers collaborate to teach students in an inclusive environment. Therefore, we want to recognize the problems faced by teachers, along with students, in terms of the efficacy of the co-teaching model as a way of learning, and even though the model is successful globally, it is better to determine if there are any concerns locally about the model, so that we implement it locally with an efficient approach.

Keywords: Co-teaching; Inclusive; Education; Models

Social Sciences and Humanities
(Graduate Students)

Influence of Critical Success Factors over the Performance of Infrastructure Projects in Qatar

Maryam Hussain Abal-Seqan, Shaligram Pokharel, Khalid Kamal Naji

Qatar University, Qatar

ma1004037@qu.edu.qa

Abstract

This thesis focuses on developing an understanding of factors that can help in increasing the project performance in Qatar and elsewhere. The understanding leads to focus on factors in the design, development and operation of the project. This research identifies 23 critical success factors in four different groups: top management support, project manager's skills, project team's skills, and stakeholder management knowledge. The work also identifies four main project success criteria: project delivery on time, within the budget, with the expected quality, and meeting stakeholder's satisfaction.

Keywords: Project management; Success factors; Construction projects; Project managers

Social Sciences and Humanities
(Graduate Students)

The Transformation of Language Policy in Qatar's Educational Reform

Hanan Abdulrahman, Mi Saif
Qatar University, Qatar
wojood120@yahoo.com

Abstract

This paper discusses the relationship between the language policies reform in Qatar's educational policy since 2012 on the students, performance, ideologies. Furthermore, most of the conducted studies show a greater implementation on the first language "Arabic" as a medium of instruction and teaching school subjects such as, science and math. Many variables were examined such as the country's economic and developmental needs and the demographic changes in Qatar that occurred as a result of globalization. Moreover, the new approach to achieve Qatar's vision of 2030 was employed in many industrial and educational reforms. The analyzed studies show the stages of this reform, and its disappointment results and how Qatar is still working on its educational policy towards its 2030 vision, in comparison, to the results of other countries like the Kingdom of Saudi Arabia who adopted English language in their educational methods.

Keywords: Language and identity; Language policy; Educational forum; Educational policy

Social Sciences and Humanities
(Graduate Students)

**العلاقة بين تصور مقترح لبرنامج علاجي معرفي سلوكي لأطفال ذوي الإعاقة
والمشاركة الوالدية في المجتمع القطري**

إسراء حسين
جامعة قطر، قطر
es1508519@qu.edu.qa

ملخص

يهدف البحث الحالي إلى التعرف على العلاقة بين تصور مقترح لعلاج معرفي سلوكي لذوي الإعاقة وبين المشاركة الوالدية، وتم استخدام المنهج الوصفي الارتباطي، واستخدام مقياس التعاون والشراكة بين الأسرة والمدرسة كأداة للبحث، وتكونت العينة من عشرة أفراد في المجتمع القطري، خمسة من الذكور، وخمسة من الإناث. وأظهرت نتائج البحث وجود علاقة ترابطية طردية بين نجاح التصور المقترح لبرنامج علاجي معرفي سلوكي لدى ذوي الإعاقة وبين المشاركة الوالدية، كما أظهرت وجود تأثير إيجابي للبرنامج العلاجي المعرفي السلوكي في حل المشكلات لدى ذوي الإعاقة، أيضًا أشارت إلى وجود تعاون ما بين الأسرة والمدرسة في المجتمع القطري.

الكلمات المفتاحية: العلاج المعرفي السلوكي، المشاركة الوالدية، أطفال ذوي الإعاقة، التعاون، الأسرة

Social Sciences and Humanities
(Graduate Students)

مستوى مفهوم الذات لدى المراهقين من ذوي الإعاقة البصرية

فاطمة محمد اليزيدي؛ ميسون إسماعيل أبو حمدة
جامعة قطر، قطر
fa090307@qu.edu.qa

ملخص

هدفت الدراسة الحالية إلى التعرف على مستوى مفهوم الذات لدى عينة من المراهقين من ذوي الإعاقة البصرية، تبعًا لمتغير الجنس، من خلال مراجعة تحليلية للدراسات السابقة التي أجريت في الفترة الزمنية ما بين 2001-2020 م؛ للوقوف على مستوى مفهوم الذات لدى المراهقين من ذوي الإعاقة البصرية، على عينات متنوعة من الذكور والإناث المراهقين، تراوحت أعمارهم ما بين 11-20 عامًا، في مختلف البلدان العالمية والعربية كفلسطين، ومصر، والمغرب، والسودان، والأردن، والجزائر، وإسبانيا، والصين، وأستراليا. استخدمت الدراسات السابقة أداة الاستبانة من خلال مقاييس متنوعة؛ لقياس مستوى مفهوم الذات لدى المراهقين من ذوي الإعاقة البصرية؛ منها: مقياس مفهوم الذات للمراهقين من إعداد (Laea & Garaigordobil, 2008)، مقياس مفهوم الذات لولاية تينيسي، ومقياس مفهوم الذات من إعداد (سالم، 2020)، ولقد خلصت نتائج الدراسات السابقة والأدبيات إلى ارتفاع مستوى مفهوم الذات لدى المراهقين من ذوي الإعاقة البصرية، وكذلك ارتفاع مستوى مفهوم الذات لدى الإناث المراهقات من ذوي الإعاقة البصرية مقارنة بالذكور، وبناءً على ذلك تمت صياغة توصيات الدراسة.

الكلمات المفتاحية: مفهوم الذات، المراهقين، الإعاقة البصرية، الذات

Social Sciences and Humanities
(Graduate Students)

فاعلية وسائل التواصل الاجتماعي في تحقيق التواصل والتعاون
بين المدرسة وأولياء أمور ذوي الإعاقة

ميادة سعد النمروطي؛ هنادي منصور الخاطر؛ أسامة محمد بطاينة
جامعة قطر، قطر
ma1402206@qu.edu.qa

ملخص

هدفت هذه الدراسة إلى التعرف على مدى فاعلية وسائل التواصل الاجتماعي في تحقيق التواصل والتعاون بين المدرسة وأولياء أمور ذوي الإعاقة في قطر. وقد اتبعت الدراسة المنهج الكمي والكيفي للإجابة عن تساؤلاتها، واستخدم الباحثون مقياس الشراكة من إعداد خليفة (2018)، كما أجرى الباحثون مقابلة مقننة من إعداد خليفة (2018) مع اختصاصية في التربية الخاصة كأداة للدارسة؛ حيث تكونت عينة الدراسة من (23) من الآباء والأمهات ممن لديهم طفل من ذوي الإعاقة. وقد أسفرت النتائج عن أن هناك اختلافًا في نتائج كل من الاستبانة والمقابلة مع الاختصاصية حول مدى الاستفادة من استخدام وسائل التواصل الاجتماعي في عملية التواصل والتعاون بين المدرسة وأولياء أمور ذوي الإعاقة؛ حيث حصل التواصل الاجتماعي في تحليل الاستبانة على الترتيب السادس بنسبة بلغت 66.08%، الأمر الذي لم يتفق مع استجابات الاختصاصية التي أكدت على أهمية التواصل الاجتماعي في عملية التواصل؛ فقد وصلت نسبة الاستفادة من وسائل التواصل الاجتماعي لدى الاختصاصية 100%. وفي المقابل أوضحت النتائج أن مبدأ التواصل فعال بين المدرسة وأولياء أمور ذوي الإعاقة؛ حيث حصل على الترتيب الثاني بين مبادئ التعاون التسعة بنسبة بلغت 68.91%، وهي نتيجة معززة لأهداف الدراسة نسبيًا، وتأكدت تلك النتيجة من خلال استجابات الاختصاصية التي قدمت أساليب وطرقًا متنوعة للتواصل.

الكلمات المفتاحية: المدرسة، التواصل، وسائل، التعاون، الاجتماعي

Social Sciences and Humanities
(Graduate Students)

الشراكة والتعاون بين البيت والمدرسة في المجتمع القطري

ميسون إسماعيل أبوحمده
جامعة قطر، قطر
ma1513751@qu.edu.qa

ملخص

هدفت الدراسة إلى الكشف عن التعاون والشراكة بين البيت والمدرسة في المجتمع القطري لأسر الأطفال من ذوي الإعاقة، وفق المبادئ السبعة للتعاون ومعرفة مدى رضا أولياء الأمور نحو الخدمات المقدمة لأبنائهم من ذوي الإعاقة، ومدى التزام المدرسة في تجسير التعاون مع أولياء أمور ذوي الإعاقة لدى عينة بلغت (10) من آباء وأمهات أطفال من ذوي الإعاقة، بالإضافة إلى مقابلة مع اختصاصي الدعم. استخدمت الباحثة مقياس التعاون، ومقياس المقابلة المقنن. وقد استخدم في البحث المنهج الكمي والكيفي، وقد أظهرت نتائج الدراسة أن هناك توافقًا لدى الأهل واختصاصي الدعم في عدد من النقاط، منها: التواصل والاحترام والالتزام والثقة والمساواة والدفاع عن حقوق الطفل، والتزام تام في المبادئ السبعة للتعاون.

الكلمات المفتاحية: التعاون، التواصل، الكفاءة المهنية، الاحترام

Social Sciences and Humanities
(Graduate Students)

معوقات التواصل بين المعلمين وأولياء أمور الطلاب ذوي اضطراب طيف التوحد
من وجهة نظر أولياء الأمور في دولة قطر

فاطمة محمد النعيمي؛ ميسون إسماعيل أبو حمده
جامعة قطر، قطر
fa1514065@qu.edu.qa

ملخص

هدفت الدراسة إلى التعرف على أهم معوقات التواصل بين أولياء أمور طلاب من ذوي اضطراب طيف التوحد ومعلميهم في مدارس مختلفة في دولة قطر، وذلك من وجهة نظر أولياء الأمور. استخدمت الدراسة المنهج الكمي والوصفي المسحي والتحليلي، وتكونت عينة الدراسة من عشرة آباء وأمهات لطلاب ذوي اضطراب التوحد، وُزِّعت عليهم استبانة تستكشف وجهات نظر هم بشأن مستوى التعاون فيما بينهم وبين معلمي أطفالهم، إضافة إلى استقراء أهم المعوقات التي تحول دون تواصل فعال في مصلحة أطفالهم. أظهرت نتائج الدراسة، بعد تحليل إجابات أولياء الأمور باستخدام برنامج (Stata 15)، أن مستوى التواصل الذي عبّر عنه أولياء الأمور يقع في المستوى المرتفع، في حين ترتبت عوائق التواصل وفق المجالات التي صنفناها في المستوى المتوسط، وهي أولًا عدم مساواة الطلاب من ذوي اضطراب التوحد بغير هم من حيث الأنشطة المتنوعة التي تناسب التفاوتات فيما بينهم، وثانيًا احترام الطفل من حيث نقاط قوته، أو أسرته من حيث مشاركتها أو مراعاة ثقافتها، لننتقل إلى المعوق الثالث المتمثل في حقوق الأسرة، ولا سيما مشاركة أولياء الأمور في اجتماعات لمناقشة أوضاع أطفالهم أو تقييمهم لفعاليات تخصهم؛ ما انعكس على ضعف ثقة أولياء الأمور بقرارات المدرسة التي تخص أطفالهم، أو بالكفاءة المهنية لأخصائيي المدرسة ومعلميها والتزامهم. وأخيرًا أوصت الدراسة بضرورة إيجاد مجلس أولياء الأمور الخاص بأطفال ذوي اضطراب التوحد؛ لتحسين التعاون والتواصل فيما بينهم ومعلميهم لتحقيق أعلى فاعلية للتواصل.

الكلمات المفتاحية: اضطراب طيف التوحد، التواصل، معوقات التواصل، أولياء الأمور

Social Sciences and Humanities
(Graduate Students)

الخصائص النمائية لمرحلة البلوغ لدى متلازمة داون كما يدركها الوالدان

فاطمة محمد النعيمي؛ هنادي منصور الخاطر
جامعة قطر، قطر
fa1514065@qu.edu.qa

ملخص

تهدف الدراسة إلى التعرف على الخصائص النمائية لمرحلة البلوغ لدى متلازمة داون بمتطلبات مرحلة المراهقة والبلوغ لدى الأبناء من خلال مراجعة تحليلية للدراسات السابقة في الفترة من 2015-2021، للوقوف على هذه الخصائص، وكيفية إدراك الوالدين والتعامل معها. ومن خلال مراجعة وتحليل تلك الدراسات والأدبيات في هذا المجال، تنوعت عينات الدراسة بين الذكور والإناث من متلازمة داون، الذين تراوحت أعمارهم بين 10-21 سنة، كما طُبقت أدوات دراسة مختلفة؛ حيث تنوعت المقاييس المستخدمة (استبانة، مقياس للمهارات الحياتية من إعداد الباحث، برنامج تدريبي وقياس الفاعلية والفرق بين المجموعتين التجريبية والضابطة)؛ لقياس الخصائص النمائية في مرحلة البلوغ لدى متلازمة داون، كذلك تنوعت أدوات القياس لتحديد مدى إدراك الوالدين لهذه المرحلة. ولقد خلصت نتائج الدراسات والأدبيات إلى أن المراهقين من متلازمة داون بحاجة إلى تقديم التوعية والتوجيه والإرشاد المُسبق من قبل المرشدين المختصين والوالدين لمرحلة البلوغ لديهم، وما يمرون به من تغييرات تؤثر على الجانب النفسي لديهم وسلوكياتهم، واستجابتهم لمختلف المواقف التي يمرون بها، والتي يواجهون معها تحديات كبيرة في ظل تدني قدراتهم الذهنية بما يؤثر على مستوى فهمهم وتعاملهم معها؛ كما أن والديّ المراهق من متلازمة داون بحاجة إلى الإرشاد من قبل الأخصائي الاجتماعي والمختصين بمجال الإرشاد، وذلك للتمكن من فهم الخصائص النمائية التي يمر بها أبناؤهم في هذه المرحلة، وكيفية التعامل معها.

الكلمات المفتاحية: مرحلة البلوغ، متلازمة داون، الخصائص النمائية، الوالدان

Social Sciences and Humanities
(Graduate Students)

المشاركة التعاونية بين معلمي التربية الخاصة وأسر طلاب ذوي الإعاقة

فاطمة محمد البوعينين؛ عالية سالم المري
Qatar University, Qatar
albuenain.fatima@hotmail.com

ملخص

هدفت هذه الدراسة إلى التعرف على مدى تطبيق المشاركة التعاونية بين معلمي التربية الخاصة وأسر الأطفال من ذوي الإعاقة، من خلال معرفة ترتيب مبادئ التعاون لدى أسر ذوي الإعاقة ومعلمي التربية الخاصة ومن ثم مقارنتها، ومعرفة مدى رضا أسر ذوي الإعاقة للكفاءة المهنية والتواصل لمعلمي التربية الخاصة وانعكاسها في تعزيز المشاركة التعاونية، أما في الجانب التطبيقي؛ فقد سعت الدراسة إلى مقارنة النتائج بين درجات مقياس التعاون والكفاءة المهنية والتواصل، والربط بينها وأثرها على فاعلية التعاون في مدارس المجتمع القطري، ثم الاستفادة من هذه النتائج للوصول إلى المقترحات والتوصيات التي من الممكن أن تسهم في تعزيز المشاركة التعاونية بين معلمي التربية الخاصة والأطفال من ذوي الإعاقة. تكونت عينة الدراسة من أربع عشرة من أسر الأطفال ذوي الإعاقة المسجلين في مدرسة حكومية (مركز دمج) في دولة قطر. وطبقت الباحثتان مقياس الشراكة من إعداد خليفة (2018) المكون من (46) سؤالا، كما تم إجراء مقابلة مع معلمة التربية الخاصة. واستخدمت الباحثتان المنهج الكمي والكيفي. خلصت الدراسة إلى أن ترتيب مبادئ التعاون اختلفت لدى أسر ذوي الإعاقة، بينما كان ترتيبها متساويًا لدى معلمي التربية الخاصة، ولكن عند المقارنة بين نتائج الطرفين تبين أن الكفاءة المهنية والاتصال احتلتا المرتبة الأخير من مبادئ التعاون لدى أسر الأطفال ذوي الإعاقة مقارنة بترتيبها المتكافئ لدى معلمة التربية الخاصة؛ بما يشير إلى أن هناك تأثيرات على المشاركة التعاونية بين الطرفين مما يحول دون المشاركة التعاونية الفعالة؛ لذا من المهم بناء شراكة فعالة تساعد أسر الأطفال ذوي الإعاقة لمساعدتهم وتمكينهم من التعامل بشكل أفضل مع أطفالهم.

الكلمات المفتاحية: أسر ذوي الإعاقة، الإعاقة، المشاركة التعاونية، معلم التربية الخاصة

Social Sciences and Humanities
(Graduate Students)

**مدى تطبيق مبادئ التّعاون بين أسر ذوي الإعاقة واختصاصي التّربية الخاصة
في المدارس التخصصية في دولة قطر**

جواهر حسن الظاهري
جامعة قطر، قطر
199754172@student.qu.edu.qa

ملخص

هدفت هذه الدراسة إلى التّعرف على واقع التّعاون بين أسر ذوي الإعاقة واختصاصي التّربية الخاصة في المدارس التخصصية في قطر، وكيف يؤثر تطبيق مبادئ التعاون السبعة في دعم هذا التّعاون والمشاركة الوالدية في المدرسة ومؤسسات المجتمع الأخرى، بالإضافة إلى معرفة أبعاد هذه المشاركة ومدى فاعليتها على جودة برامج التربية الخاصة المقدمة لأبنائهم. وقد اتبعت الدراسة المنهج الكمي والكيفي للإجابة عن تساؤلاتها، كما استخدمت الباحثة مقياسي التعاون والقبول والرفض الوالدي لخليفة (2007)، ومقياس المقابلة المقتنة؛ حيث تم إجراء مقابلة مع الأخصائي النفسي في مجمع التربية السمعية للبنات، وتكونت عينة الدراسة من خمس عائلات من أُسر لديهم أطفال من ذوي الإعاقة، وقد اشتملت العينة على (5) آباء و(5) أمهات من أُسر مختلفة من المجتمع القطري. أظهرت نتائج تحليل استبيان المشاركة الوالدية أن مبدأ التّواصل يأتي في المقدمة؛ حيث حصل على المرتبة الأولى بنسبة 94.8%. وجاء التّواصل الاجتماعي في المرتبة الثانية حيث بلغ 94.5%، أما بالنسبة إلى مبدأ حقوق الأسرة فقد حصل على المرتبة الثالثة بنسبة بلغت 91%، ثم جاء مبدأ الكفاءة المهنية في المرتبة الرابعة بنسبة بلغت 90.5%، بينما يحتل مبدأ الاحترام المرتبة الخامسة بنسبة 90%، في حين حصل مبدأ الدفاع عن حقوق الطفل على المرتبة السادسة بنسبة 90%، ويأتي مبدأ المساواة في المرتبة السابعة بنسبة مقدارها 85%، ثم مبدأ الثقة في المرتبة الثامنة بنسبة بلغت 82%، في حين جاءت أقل النسب من نصيب مبدأ الالتزام حيث احتل المرتبة التاسعة بنسبة بلغت 81%.

الكلمات المفتاحية: التعاون، الشراكة، ذوي الإعاقة، اختصاصي التربية الخاصة، الأسرة

Social Sciences and Humanities
(Graduate Students)

أثر برنامج تدريبي قائم على الاستقصاء وحل المشكلات على الأداء التدريسي لمعلمي العلوم

فاطمة علي المالكي[1]؛ أريج عصام برهم[2]

[1]مركز التدريب والتطوير التربوي، وزارة التعليم والتعليم العالي، قطر
[2]كلية التربية، جامعة قطر، قطر
fat.almalki@edu.gov.qa

ملخص

هدفت الدراسة الحالية إلى الكشف عن أثر برنامج تدريبي قائم على الاستقصاء وحل المشكلات على الأداء التدريسي لمعلمي العلوم، وقد تناولت الدراسة الحالية عدة مجالات؛ شملت تخطيط وتنفيذ وتقويم الدروس بالإضافة إلى النمو المهني للمعلم وبيئة التعليم والتعلم. بلغ عدد المشاركين في الدراسة (8) معلمات علوم بالمرحلة الابتدائية في المدارس الحكومية في دولة قطر، بنسبة (50%) تقريبًا من أصل (17) معلمة ممن حضرن البرنامج التدريبي. استخدم الباحثون استمارة الملاحظة الصفية لقياس الأداء التدريسي لمعلمي العلوم قبل/وبعد تطبيق البرنامج التدريبي القائم على كيفية التخطيط والتطبيق لأنشطة التعلم القائم على الاستقصاء وحل المشكلات. كما استخدمت الأساليب الإحصائية الوصفية، المتمثلة في حساب المتوسطات الحسابية والانحرافات المعيارية لدرجات الأداء التدريسي للمعلمين في استمارة الملاحظة الصفية.

أظهرت نتائج الدراسة وجود أثر إيجابي دال إحصائيًا للبرنامج التدريبي القائم على الاستقصاء وحل المشكلات على الأداء التدريسي لمعلمي العلوم بشكل عام. وبشكل خاص، أظهرت نتائج الدراسة وجود فروق ذات دلالة إحصائية تعزى لأثر البرنامج التدريبي في مجال التقويم الصفي حيث جاء في المرتبة الأولى، تلاها في المرتبة الثانية مجال التخطيط للدروس، وجاء في المرتبة الثالثة مجال التنفيذ للدروس، كما احتل النمو المهني مجال المرتبة الرابعة، بينما لم تظهر الدراسة فروقًا ذات دلالة إحصائية في مجال بيئة التعليم والتعلم. وقد قدمت الدراسة الحالية عددًا من التوصيات في ضوء نتائجها؛ حيث أوصت بتنفيذ البرنامج التدريبي القائم على الاستقصاء وحل المشكلات لمعلمي العلوم في صفوف المرحلة الابتدائية، وكذلك تعزيز التعاون بين مركز التدريب والتطوير التربوي في وزارة التعليم والتعليم العالي، والمركز الوطني للتطوير التربوي في جامعة قطر.

الكلمات المفتاحية: معلمي العلوم، الاستقصاء، حل المشكلات، البرامج التدريبية

Social Sciences and Humanities
(Graduate Students)

Blue-collared Workers' Travel Behavior Modeling using "exPlainable" Machine Learning Model: The Case of Qatar

Aya Alkhereibi, Ali AbuZaid, Tadesse Wakjira
Qatar University, Qatar
aalkhereibi@qu.edu.qa

Abstract

This paper presents a novel study on the examination of explainable machine learning (ML) technique to predict the mode choice for communities with a majority of blue-collared workers. A total of 4875 trip records for 1050 blue-collared workers have been used to predict their travel mode choices based on 11 trips and socio-economic attributes. The data used in this paper are obtained from the Ministry of Transportation and Communication (MoTC), which targeted blue-collared workers as they represent 89% of the total population in the State of Qatar. A total of four ML models are evaluated to propose the best predictive model. The four models were examined using different performance metrics. The models' prediction results showed that the random forest (RF) model had the highest accuracy with a predictive accuracy of 0.97. Moreover, SHapley Additive exPlanation (SHAP) approach is used to investigate the significance of the input features and explain the output of the RF model. The results of SHAP analysis revealed that occupation level is the most significant feature that influences the mode choice followed by occupation section, arrival time, and arrival municipality.

Keywords: Mode choice; Machine learning; Transportation planning; Travel behavior, SHAP

Social Sciences and Humanities
(Graduate Students)

Smart City and Preservation of Identity in Doha

Huzeyfe Altiok
Qatar University, Qatar
ha1903669@qu.edu.qa

Abstract

The globalization and modernization process of the 20th-21st centuries decreased diversity and created similar cultures—the modern culture also created" modern" cities. Modern cities provided humanity the integration into production. Transportation, accommodation, and the other needs of people integrated into the output have been designed into those cities. However, later developments and research denote that the cities are not sustainable for the long term. Air pollution, water supply, food, and access to services are modern cities' main concerns. Therefore, a new development in the concept of cities was created, which is smart cities. The theory of smart cities provides the administrative power of a country with a well-established, sustainable, and smart development. The theory implemented in Doha is one example of the latest developed/developing cities. The limited population of Qatar and the significant wealth of natural gas provide them the means to establish a smart city. The main catch phrase for Qataris on that development project is "modernization with protecting the heritage." This study examines Qatar's attempts to create Doha as an example of a smart city while protecting tradition and culture. The focus of that study will be the economic, societal, and environmental developments to denote the harmony of modernity and tradition in Doha. The research indicates that the Qatari administration builds Doha on three pillars: smart society, smart environment, and smart development.

Keywords: Smart city; Smart environment; Smart society; Smart development; Identity

Social Sciences and Humanities
(Graduate Students)

The Development of Urban to Support Sport Tourism in Qatar, A Case Study: West Bay North Beach

Mohamed Ali, Georges Jabbour, Mahfoud Amara
Qatar University, Qatar
ma1307850@qu.edu.qa

Abstract

Sports the travel industry is recognized as movement that includes either watching or taking part in a game while staying outside of the sightseers' typical environmental factors. Major games, like the football, Olympic Games and rugby competitions, have developed into solid the travel industry attracts and of themselves, contributing altogether to the host objective's travel industry profile. Major Sports event and tourism are intertwined and mutually beneficial. Qatar has host many of mega sport event and next year will host FIFA World Cup 2022. Urban regeneration is one of the benefits of mega event in Qatar. The purpose of this study is to analyze West Bay North Beach Project development that has been launched in April 2021. A total of 15 Arabic and English press content were collected from different websites.

- 12 beaches operate by hotels in one area.
- Project contains three phases: First phase includes open beach number 7 to beach number 12, which are now open.
- Second phase contains beaches number 1 to 3 and beach number 6 and will be open in second quartiles of 2021.

Third phase includes beaches number 4 and 5, and it will be available in 2023.

- Length of two-kilometer cycle path.
- Walkway of 1.5 km length and 8 meters width.
- Access public transit across 36 stations, with buses running every 12 minutes from 6 a.m. to 9 p.m.

The North Beach Project in West Bay is planned to become a major new sport tourist attraction. An exceptional tourist attraction in Doha Downtown by building up a interconnected organization of the general population and business exercises, associating it to the encompassing regions through open transportation, person on foot ways, and cycling paths from the Corniche to Lusail. The limitation of the study is a few information has been published about the project.

Keywords: Sport tourism, West bay North, Qatar, Beach

Social Sciences and Humanities
(Graduate Students)

ترجمة القسم الأول من كتاب نظرية دراماتيكا السردية؛ عناصر البنية

لجين محمود عامر؛ دانة عمار زرزور؛ فاطمة عبد القادر اليوسف
جامعة قطر، قطر
amer.lujain98@gmail.com

ملخص

الكتابة حرفةٌ وصِنعة تتطلّبُ مهارةً وخِبرة. ويُمكن لمهارة الكتابة أن تتولَّد لدى المرء بفعل دراسةٍ أو ممارسة، أو كلا الاثنين معًا، فالكتابة كغيرها من المواهب، على صاحبها أن يُمارسها ويتعلّم قواعدها وأُسُسَها؛ ليتكمن من الوصول إلى ما بَعدَ الهِواية؛ الاحتراف. ولهذا السبب تولّدت النظريات السردية لدى نُقّاد الأدب على مرّ العصور، ولقد أُخرجت العديد من كتب النظريات السردية الناضجة في عالم الأدب والنقد حول العالم، وإحدى أهمّ هذه النظريات، وأكثرها تأثيرًا في عالمنا اليوم نظرية "دراماتيكا" السردية. وأهمية هذه النظرية نابعةٌ من تأثيرها في الدراما العالمية، واهتمامها اهتمامًا بالغًا بالمُتلقي، ومما تمتاز به من شموليةٍ وإحكام في نظرتها للقصة. فهذه النظرية تنظرُ إلى العمل السرديّ من جميع نواحيه، وبأدق تفاصيله، كما تملك القدرة على توجيه المؤلف للمسار الصحيح في الكتابة أيًّا كان توجُّهه الكتابيّ؛ منظّمًا أو حُرًّا، مُساعِدةً المؤلف بذلك على إنتاج عملٍ كاملِ الأركان. أما عن أهمية ترجمتنا لهذه النظرية السردية، فهي نابعةٌ من أهمية النظرية نفسها، التي نتجت عند المؤلفين لشعورهم بحاجة المؤلف الغربيّ لهذه النظرية في كتابة القصة، ونحن كذلك نشعُرُ بحاجة المؤلف العربيّ لهذه النظرية من أجلِ الوصول لإنتاج قصصيٍّ مُحترف. فهدفنا الأساسيّ من هذا البحث تقديمُ ترجمةٍ واضحة ووافية للجزء الأول من كتاب نظرية "دراماتيكا" للقصة. والابتعاد عمّا قد يُسبِّبُ لبسًا أو خلطًا لدى القارئ العربي.

ولقد قُسّم كتاب نظرية "دراماتيكا" في الأساس إلى قسمين: قسم عناصر البنية، وهو الجزء الذي يحتوي قواعد وأُسُس النظرية وعلى المفاهيم وشروح البُنية العميقة للقصة، وقسم فنّ السرد القصصي، وهو الجزء الذي يحتوي على التطبيق العملي للنظرية. ولقد تُرجم في هذا البحث القسم الأول فقط، والذي انقسم إلى أربعة محاور رئيسة هي: الشخصية، والموضوع، والحبكة، والنوع الأدبي، كما تُرجمت مُقدّمة الكتاب التي تتحدث عن "دراماتيكا والكاتب المُبدِع".

الكلمات المفتاحية: دراماتيكا، نظرية، قصة الكتابة، سيناريو/نص، الترجمة

Social Sciences and Humanities
(Underraduate Students)

Complexity and Use in Building Evaluation (CUBE2): The Modular Case of the BCR Corridors at Qatar University

Shaikha Saoud Al-Thani, Lolwa Al-Mohannadi, Meera Al-Khulifi, Doha Elsaman,
Dr. Mark David, Hebah Osama

Qatar University, Qatar
sa1601268@qu.edu.qa

Abstract

The BCR Corridors at QU are notorious for wayfinding difficulties of end-users in the building complex. These navigation problems appear to arise due to the repetitive similarity of individual parts in its modular design, highly localized impediments to readability and visibility such as shading device screens and temporary installations, and the relationship of those different parts composing the collective whole of the BCR Corridors to the immediate surrounding context of the QU campus (Figure 1). The purpose of the "Complexity and Use in Building Evaluation" research project (CUBE2: QUST-2-CENG-2019-12) is to build on the research success of the post-occupancy cluster in the first demonstration project (CUBE1: QUST-2-CENG-2018-9). It includes continuing to develop a detailed post-occupancy dataset of movement and space use in buildings at QU. The goal is to contribute positively to future design refinements, alterations, and design of new university buildings at QU. We want to help create a world-class center of education and research where space use, interaction, and innovation are tactically 'woven' into the design and planning of the campus at various scales of the built environment. In the CUBE1 study, Major et al. (2019) were able to graphically illustrate building program/use and movement/space use patterns. It included quantifying the relationship between movement and spatial layout, and the significance of other end-user activities such as sitting and interacting in the common areas of the QU Women's Engineering Building. It also included identifying adaptive re-use of classrooms and storage spaces for laboratory and office uses, leading to a shortage of storage spaces in the building. There was a consistent relationship (R^2=0.68, $p < 0.001$) between sitting and interacting unrelated to accessibility or metric area, i.e., the availability of seating was the dominant factor for casual encounter, mostly of students. Finally, there was a weak but consistent relationship (R^2=0.38, $p < 0.001$) between spatial layout and movement flows using space syntax modeling when allowing for the strongly programmatic differences (classrooms versus faculty offices) in different wings of the building (Major et al., 2019) (Figure 2). The post-occupancy evaluation findings in the CUBE1 project were largely consistent with previous results of space syntax research over the last 30 years for generative layouts such as office buildings, colleges, and research laboratories. Those results include the generative role of spatial layout for movement and casual encounter in buildings, the prescriptive effects of strong programmatic aspects (in this case, classroom location and course schedules) in causing some spaces to over-perform/underperform for some types of uses, most usually movement, and the singular importance for the provision of seating to facilitate consistent and robust use of spaces whether at the building or urban level (Hillier and Penn, 1991; Hillier, 1996; Hillier et al., 1996; Major et al., 2019; Sailer et al., 2016).

Keywords: Educational building; Innovation; Post-occupancy evaluation; Space syntax

Social Sciences and Humanities
(Underraduate Students)

Configuration and Use in Building Evaluation (CUBE3): Space Syntax Modeling of Layout in the Main Library at Qatar University

Raghad Alatoom, Aljazi Ali Al-Banai, Ghalya Nasser Al-Maadeed,
Hanae Abdelwahab Taha, Mark David Major
Qatar University, Qatar
lk1406289@qu.edu.qa

Abstract

The Research and its Purpose:

- To conducted a post-occupancy evaluation of the QU Main Library, drawing on fieldwork observations of entries, movement, and room/space use.
- This will positively contribute to future design refinements, alterations, and new university buildings in creating a world-class center of education and research.

How can we study its success?

- Collect information to determine the use of each space in the building.
- Direct observations of the use of the library and the space functions.

Keywords: Space use; Movement; Post-occupancy evaluation; Space syntax

Social Sciences and Humanities
(Underraduate Students)

فصل النظريات الإسلامية عن المقررات الدراسية وأثرها على الهوية القطرية:
دراسة حالة ـ تخصص سياسات وتخطيط وتنمية في جامعة قطر

مريم المري، فاطمة علي، مظهر الزعبي
جامعة قطر، قطر
ma1702197@qu.edu.qa

ملخص

استهدفت الدراسة الحالية التعرف على أثر إقصاء النظريات الإسلامية عن المقررات الدراسية لتخصص سياسات وتخطيط وتنمية على الهوية القطرية للطلبة القطريين، واستخدمت الدراسة المنهج الوصفي التحليلي ومقابلات تم تطبيقها على عينة (6) أساتذة من جامعة قطر وجامعة حمد بن خليفة، و(8) طالبات من قسم شؤون دولية بجامعة قطر وطالب واحد أيضًا من قسم شؤون دولية بجامعة قطر، وأظهرت النتائج أن إقصاء النظريات الإسلامية عن المقررات الدراسية لتخصص سياسات وتخطيط وتنمية يؤثر على الهوية القطرية للطلبة القطريين؛ مما يؤكد على ضرورة إدماج التعليم وإضفاء الصبغة الإسلامية.

الكلمات المفتاحية: الهوية القطرية، النظريات الإسلامية، جامعة قطر، المقررات الدراسية

Social Sciences and Humanities
(Underraduate Students)

Effect of Pedestrian Penalty on Pedestrian Behavior in Qatar

Omar Khaled Ghonim, Deepti Muley, Mohamed Kharbeche,
Yousef Mohamed, Ahmed Madkoor
Qatar University, Qatar
og1510462@qu.edu.qa

Abstract

Crashes involving pedestrians are a major concern for authorities in many developed and developing countries. To refrain pedestrians from illegal or unsafe road behavior, authorities introduced three pedestrian penalties in the State of Qatar from August 2019. This paper assesses the awareness, perception, and adaptive intentions of the new amendment to the pedestrians' law. A questionnaire survey, designed in three languages, was distributed online using Qatar University contacts and Twitter account of the General Directorate of Traffic at the Ministry of Interior, State of Qatar. A sample of 521 complete responses was obtained and used for statistical analysis. The results indicated that only 32 % of the respondents were aware of the law amendment before taking this survey. Further, the higher score for perception, adaptive intentions and awareness showed that the respondents were aware of the risks and the law amendment will have a positive effect on their behavior on road as pedestrians. The outcomes of the analysis show the efficacy of the law amendment. However, the actual behavior changes need to be studied by analyzing the pedestrian crash data and conducting a before and after study. Moreover, the study of the effects on pedestrians' behavior, through empirical observations, is proposed to get insight into actual behaviors after law amendment as a part of future work on the topic.

Keywords: Pedestrian law amendment; Pedestrian fine; Penalties; Awareness; Effectiveness