The 12th International Conference on Ambient Systems, Networks and Technologies (ANT)
March 23-26, 2021, Warsaw, Poland

Does Pedestrian Penalty Affect Pedestrian Behavior? A Case of State of Qatar

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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 a pedestrian. 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.

Keywords: Pedestrian law amendment; Pedestrian fines; penalties; awareness; effectiveness; State of Qatar

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1. Introduction

Pedestrian safety has become a cause of concern for transport planners and traffic engineers due to the higher number of pedestrian casualties worldwide, which could be minimized [1]. Pedestrian casualties account for more than 23% of total casualties due to traffic crashes around the world [2]. The main concern for pedestrians' movement is that they normally don't follow traffic rules like crossing at designated locations and using sidewalks for crossing and many of them end up risking their lives. Jaywalking is a cause of concern for authorities in developed as well as developing countries. To improve the safety situation, many authorities started imposing fines on pedestrians. Recently, in 2019, more than 180 pedestrians were fined in Sydney in a two-day operation for being non-compliant [3]. In 2017, UAE issued a fine of 400 DHS (equivalent to USD 109) to more than 50,000 pedestrians for jaywalking [4]. In the same year, Morocco started penalizing jaywalkers with a fine of 25 MAD (equivalent to USD 3) [5]. Further, Singapore has increased the fines imposed on pedestrians for jaywalking on streets from S$20 to S$50 (equivalent to USD 15 to USD 37.5) and for expressway related offenses from S$30 to S$75 (equivalent to USD 22.5 to USD 56) from early 2019 [6].

On similar lines, the State of Qatar has employed the fines/penalties for pedestrians and has also started implementing them since 1st August 2019 [7]. The new law amendment penalizes pedestrians for violations while walking or crossing a road. The penalty is divided into three classes; (i) a fine of QR 100 (equivalent to USD 27.5) when pedestrians walk in the middle of the carriageway or not using the sidewalk or far edge of the roadway; (ii) a fine of QR 200 (equivalent to USD 55) when pedestrians don't use designated crossing areas; and (iii) a fine of QR 500 (equivalent to USD 137) when pedestrians don't follow signals at intersections and vehicles move or when military parades or processions are broken [8].

In the past, new fines were implemented but the impact of these increased fines on pedestrians' intentions to improve crossing behavior was not investigated in detail. The main aim of this paper is to examine the impact of the new law amendment on the pedestrians' adaptive intentions to improve their road behavior in the State of Qatar.

2. Previous studies

Various measures are required to discourage pedestrians from undertaking unsafe behaviors on road. This section reviews the previous studies undertaken in this context. A summary of roadway-related measures used to improve pedestrian safety around the world was presented by Maed et al. (2014) [9]. It was found that along with engineering measures, education, and enforcement, it is also essential to observe behavioral changes in the pedestrians. The effectiveness of interventions on driver yielding to pedestrians was assessed in Miami using two weeks of intensive enforcement program [10]. The program used decoy pedestrians, flyers with feedback, verbal and written warnings along with saturation enforcement. A multiple baselines across settings design was implemented to measure daily yielding behavior and pedestrian-driver conflicts at four different marked crosswalks. The results suggested that the proportion of drivers yielding to pedestrians increased with the introduction of an enforcement program in each corridor. Further, this improvement was maintained for over a year with marginal additional reinforcement. This showed the effectiveness of enforcement programs.

Two enforcement programs were tested to reduce the frequency of illegal crossings at signalized intersections and jaywalking outside designed crosswalks in Michigan, USA [11]. A five-step procedure was followed to implement the enforcement which included data collection before enforcement, awareness campaign, warning period, citation period, and data collection after enforcement implementation. A four-week campaign in the University campus resulted in 27% violations at signalized crosswalks. Further, the city-level program showed that the targeted interventions helped to reduce the jaywalking violations up to 17 % and the reduction was sustainable by about 8 % several weeks after enforcement ended. They also mentioned that the results of the enforcement program are case-specific and any deficiencies in the infrastructure contribute to the increase in violations.

Further, the residents' opinions, behavior, and knowledge about automated cameras at crosswalks and pedestrian safety were examined in D.C., USA [12]. A sample of 801 residents was collected from telephone surveys. The residents acknowledged that red lights running, over speeding, not stopping at stop signs, and not yielding for pedestrians are safety issues. Around 76 % and 87 % of the respondents supported the use of speed cameras and red

light cameras which were more familiar to them. Further, only 47% supported crosswalk cameras which were not very familiar enforcement measures to them.

In 2011, Oregon assigned the right of way to pedestrians at intersections regardless of markings present. The efficacy of changes in pedestrian law in improving pedestrian safety was assessed using historic data [13]. The detailed crash data for 3559 pedestrian crashes, occurred at intersections from 2007 to 2014 in Oregon State in the USA were used for analysis. An unbalanced fixed effects panel logit model was used effectively instead of Box-Tiao intervention model to evaluate the long term implications of policy changes. However, the results were inconclusive in evaluating the effect of the specific law on pedestrian safety.

It can be seen that only some studies were assessing the efficacy of enforcement programs. However, only one study was found on the evaluation of the effectiveness of law improvement. This emphasizes the need and the important significance of this study.

3. Data collection

3.1. Questionnaire design

A questionnaire survey was designed to collect information on residents' adaptive intentions due to the introduction of penalties for pedestrians. The questionnaire survey was designed using Surveymonkey.com tool. The questions were prepared in English first and then translated to Arabic, and Hindi to reach wider sections of the population considering the diverse population of the State of Qatar. Pilot surveys were conducted to check the readability/wording of the questions and responses. Further, the responses collected from pilot surveys were checked to determine if the responses can provide a clear idea about respondents' understanding of the law and subsequent behavioral changes. The questionnaire was comprised of questions on respondents' awareness and perception of the law amendment, enforcement of the law, perception about safety, involvement in crashes, and demographics. Mostly multiple-choice questions were asked to perform quantitative analysis of the responses. A rating scale of one to five was used for perception related questions. The survey can be accessed at https://www.surveymonkey.com/r/PedFinesAwareness. The details of the questions are as below:

- Law amendment awareness (Yes, No), if yes-source of information
- Law perception (Rating scale of 5, 1 being strongly disagree and 5 being strongly agree) – Threat to safety (one statement), the likelihood of crash (one statement), efficacy (three statements), the credibility of law amendment (three statements), adaptive intentions (three statements), spread awareness (one statement).
- Frequency of jaywalking (Rating scale of 5, 1 being Rarely and 5 being Almost always)
- Road safety perception (Rating scale of 5, 1 being Highly unsafe and 5 being Highly safe)
- Crash involvement as a pedestrian (Yes, No), if yes-frequency of major and minor crashes
- Law enforcement (Personal experience and known peoples experience)
- Measures to improve safety
- Demographics (gender, age group, nationality, level of education, employment status, driver's license, household income)

3.2. Responses collection

After receiving ethical clearance from Qatar University Institutional Review Board (QU-IRB) committee, the questionnaire was distributed online. Two channels were used mainly for survey distribution; first through Qatar University (QU) announcements for all students, employees, and staff, and second through the official Twitter account of the General Directorate of Traffic at the Ministry of Interior (MOI), State of Qatar. The questionnaire was posted only once and no reminder or follow-up email/tweet was scheduled as enough responses were received in the first round itself. The questionnaire was administered during the 4th week of September 2020. Finally, 321 and 1391 responses were collected from QU email and MOI Twitter account respectively. Only complete responses were retrieved for analysis purposes, this action fetched 66 and 458 responses for further use. The completion rate for the

QU community was around 20 % and 32 % for the general public. It should be noted that the responses from both the channels were merged for analysis purposes.

4. Results

4.1. Overview of the data

A total of 521 complete responses were obtained after cleaning the data obtained from both the sources with 89 % Arabic responses and the remaining 11 % English responses. It should be noted that no responses were obtained in Hindi language. The distribution of respondents' demographic characteristics, as displayed in Table 1, shows a good distribution of the sample especially considering gender and age group distribution with that of the distribution of the country. In 2019, the State of Qatar had 73.75 % male out of 2,799,202 populations. Further, there were 12.0 %, 48.5 %, 20.4 %, and 4.9 % people in the age group of 15-24 years, 25-39 years, 40-55 years, and >55 years respectively [14]. The population distribution for gender and age group for respondents matches with that of the Qatari population. This shows the sample is representative for gender and age group. The distribution of nationality showed that the highest proportion of respondents were Qatari nationals and Arabs. Furthermore, the proportion of Asians was lesser. This indicates a need to collect more data from Asian nationals to get more insights into the effectiveness of the amendment in the pedestrian law. The distribution of education level of respondents showed that most of the respondents completed high school education and while more than one third of respondents had a university degree.

Table 1. Overview of respondents' characteristics.

Characteristic	Frequency	Proportion
Gender		
Male	408	78.3
Female	113	21.7
Age group		
18-25 years	144	27.6
26-40 years	263	50.5
41-55 years	96	18.4
Above 55 years	18	3.5
Nationality		
Qatari	322	61.8
GCC national	19	3.6
Arab	116	22.3
Asian	39	7.5
European/American	8	1.5
Other	17	3.3
Level of education		
Below high school	23	4.4
High school	224	42.9
Bachelor degree	191	36.6
Higher degree	82	15.7

This section presents the preliminary findings from this study in this paper. The responses to the law amendment question showed that only 32 % of respondents were aware of the amendment before undertaking the survey. Figure 1 shows the distribution of the source of information for the new pedestrian law amendment. It can be seen that social media was the most popular source (35 %) followed by the MOI website (18 %), and television ads/news (13 %). It

should be noted that the respondents were made familiar with the law amendment before they answered further questions irrespective of their previous knowledge response. The means and standard deviations of the various parameters affecting pedestrians' intentions are presented in Table 2 and the frequency distribution of these parameters is shown in Table 3. It should be noted that all the parameters had a mean score of more than four, which is more than the neutral value of 3. This indicates that the respondents were aware of the severity of the safety situation and believed that the implementation of the amendment to the law will help to improve the pedestrians' crossing behavior and subsequently the pedestrian safety. Further, the higher score for adaptive intentions and spreading awareness implied that the amendment will have a positive effect on their crossing behavior and they will inform others about it.

All the parameters were significantly different against the neutral score of three at a significance level of < 0.001 as tested using t-test. A detailed analysis showing the effects of gender on various variables will be conducted in the future.
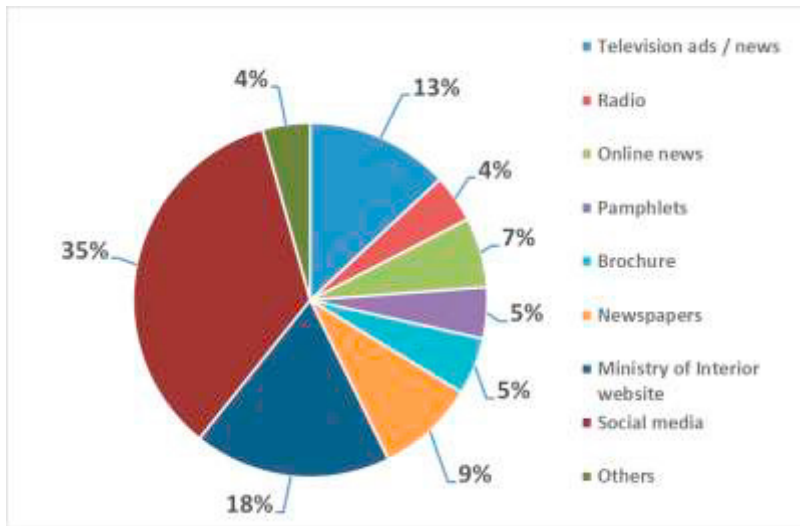

Fig. 1 Distribution of source of law amendment information

Table 2. Overview of respondents' perceptions about the pedestrian law amendment.

Parameter	Statements	Mean	S.D.
Threat to safety	(S1) Introduction of law amendment indicates that illegal crossing is a serious threat in the State of Qatar	4.51	0.85
Likelihood of crash	(S2) There are chances of being hit if I cross illegally.	4.39	1.06
Efficacy	(S3) The law amendment clearly emphasizes the importance of crossing roads safely.	4.28	1.12
	(S4) The law amendment clearly emphasizes the importance of crossing at suitable locations.	4.30	1.12
	(S5) The law amendment clearly emphasizes the importance of obeying pedestrian signals at traffic lights.	4.28	1.14
Credibility of new law	(S6) It is clear that the law amendment is to benefit pedestrians and promote safe walking.	4.31	1.13
	(S7) Introduction of the law shows ways to better utilize crossing facilities.	4.28	1.11
	(S8) Introduction of the law amendment will help to reduce pedestrian crashes and improve pedestrian safety.	4.27	1.17
Adaptive intentions	(S9) Law amendment increases my chances to cross at designated/specified locations.	4.20	1.13
	(S10) Law amendment increases my chances to obey pedestrian signals.	4.24	1.09
	(S11) Law amendment increases my chances to refrain from illegal crossing.	4.17	1.14
Spread awareness	(S12) I will spread awareness about the law amendment with my known people.	4.14	1.15

Table 3. Frequency distribution of respondents' perceptions

Statement Number	Variable ranking (%)				
	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
S1	2.1	1.7	5.6	25.1	65.5
S2	5.7	1.3	4.8	23.9	64. 2
S3	6.9	1.7	4.8	28.7	57.9
S4	6.5	2.5	4.4	27.6	59.0
S5	6.7	2.9	4.6	27.0	58.8
S6	7.1	1.3	5.9	24.1	61.5
S7	5.9	2.9	6.5	26.1	58.6
S8	7.1	2.9	6.7	22.4	60.9
S9	5.9	3.3	9.4	27.6	53.8
S10	5.7	2.3	7.7	29.9	54.4
S11	6.5	2.7	10.7	27.8	52.3
S12	6.9	2.5	10. 2	29.9	50.6

Note: Please refer to Table for description of statement numbers S1 to S12.

4.2. Effect of gender

To investigate the differences in the responses to law amendment perception Mann-Whitney test was performed for respondent gender. Mann-Whitney test is a non-parametric test used to check the difference between two categorical variables when the response variable is ordinal. It doesn't assume homogeneity of variance. The results are shown in Table 4. It can be seen that there was no significant difference in threat to safety perception (S1) between both groups, indicating the threat was perceived equally. Also, there was no difference in perception of the credibility of law (S6) which implies that all respondents felt that the law amendment is to benefit pedestrians. For all other statements, the difference between law amendment' perception and adaptive intentions were significantly different for male and female respondents. Male respondents showed a higher score for adaptive intentions which is expected to reflect in their behavior and subsequent improvement in safety is expected. Moreover, the findings indicate that the awareness campaigns should be targeted towards female pedestrians.

Table 4. Frequency distribution of respondents' perceptions

	Mean rank		MW Test values	
Statement No	Male	Female	Z	p
S1	260.29	263.55	-0.243	0.808
S2	269.18	231.46	-2.778	**0.005**
S3	269.42	230.61	-2.744	**0.006**
S4	268.65	233.39	-2.506	**0.012**
S5	267.84	236.31	-2.237	**0.025**
S6	266.56	240.92	-1.848	0.065
S7	272.00	221.30	-3.589	**<0.001**
S8	268.22	234.92	-2.386	**0.017**
S9	267.57	237.26	-2.091	**0.037**
S10	268.40	234.28	-2.368	**0.018**
S11	268.75	233.03	-2.445	**0.014**
S12	269.06	231.92	-2.527	**0.011**

Note: Significance assessed at 5% , Please refer to Table for description of statement numbers S1 to S12.

4.3. Relation between perception and adaptive intentions and awareness

To check the impact of the various parameters/perceptions on the adaptive intentions and spreading awareness, non-parametric correlations were computed, the results are shown in Table 5. All the correlation coefficients were positively correlated with adaptive intentions and awareness spreading at 0.001 significance level. This indicates that more respondents believed in the importance of the law and were more likely to adopt safer crossing practices road behavior in the future. As the survey results indicate behavioral improvements, the law is expected to reduce undesired crossings. These behavioral changes need to be monitored by conducting a before and after study.

Table 5. Correlations of pedestrian law amendment and adaptive intentions.

Perception characteristic	Cross at designated locations	Obey pedestrian signals	Refrain from crossing illegally	Spread awareness
Illegal crossing is serious threat	0.446	0.440	0.442	0.359
Chances of being hit if I cross illegally.	0.541	0.570	0.560	0.517
Crossing roads safely is important.	0.646	0.644	0.658	0.582
Crossing at suitable locations is important.	0.644	0.650	0.634	0.550
Obeying pedestrian signals at traffic lights is important.	0.647	0.665	0.645	0.537
Law amendment is to benefit to pedestrians and promotes safe walking.	0.692	0.707	0.660	0.593
Law amendment shows better ways to utilize crossing facilities.	0.707	0.703	0.636	0.613
Law amendment helps to reduce pedestrian crashes and improve pedestrian safety.	0.796	0.758	0.710	0.633

Note: all correlations are significant at the **0.001** level (2-tailed)

5. Conclusions

This paper presents findings from a questionnaire survey designed to investigate the perception and adaptive intentions of the amendment in pedestrian law recently introduced in the State of Qatar. The amendment introduced three types of penalties for pedestrians for jaywalking. A dataset of 521 complete responses collected using an online survey was used for analysis. The results indicated that two-thirds of respondents were not aware of the penalties introduced. Further, the majority of the respondents, who were aware of the law, got information from social media and MOI website. This emphasizes the need for MOI to educate residents using various means to improve awareness about the law amendment. The scores about the responses related to the perception of law amendment indicated that the respondents were familiar with the safety situation and believed that the implementation will lead to improved pedestrian safety. Further, the correlation between perception of law with adaptive intentions and spreading awareness showed that the respondents were likely to adapt safer crossing practices while on the road as well as inform others about the law. Moreover, to confirm the actual behavior changes MOI can deploy some patrols to check on pedestrians crossing behavior at popular locations. Finally, the perception about law and adaptive intentions were statistically different for male and female respondents, however, their threat to safety and belief that the amendment is to benefit pedestrians was statistically similar for both groups.

There are mainly two limitations to this study; firstly, as the responses were collected online, it only recorded responses of the population having access to the internet and is active on social media (Twitter). Therefore, the less educated population who forms a major proportion of pedestrians are not represented correctly in the study. Further, the distribution for nationalities showed fewer responses from Asian nationals (7.5 %). However, in practice, the proportion of Asians in the Qatari population is around 60% [15]. To overcome this shortcoming, the team has planned to collect more data for this subgroup by conducting personal interviews. Additionally, a future before and after study is planned to check the actual violations at signalized intersections and mid-block segments. Finally, the pedestrian

crash data before and after implementation of the law amendment will be analyzed to assess the impacts on pedestrian safety.

Acknowledgments

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