Effects of Traffic Violation and Demographic Characteristics on Traffic Safety in Sulaymaniyah City

Burhan Muhamad Shareef[1]
Hardy Kamal Karim[2]
Hemn Unis Ahmed[2]
[1]University of Sulaimani - College of Engineering - Irrigation Department
[2]University of Sulaimani - College of Engineering - Department of Civil Engineering

Article Inform

About the Authors:
Corresponding author:
Hardy Kamal Karim
E-mail: hardy.karim@univsul.edu.iq
**Researcher Involved:**
Burhan Muhamad
Hemn Unis Ahmed

Abstract

In order to increase traffic safety on our roads, certain forms of behavior and personality traits of passenger car drivers were studied. As an attempt to understand the potential contribution of drivers' impulsiveness and aggressiveness in traffic accidents in Sulaimaniyah City, this study was conducted. The correlation between drivers' impulsiveness and aggressiveness were also explored. Participants, who filled Barratt Impulsiveness Scale (BIS-11) and Aggressive Driving Behavior Questionnaire (ADBQ), were 244 drivers. The male drivers who answered the questionnaires were 143, while female drivers were 101. The results of the statistical analyses showed that male drivers are driving more aggressively than female drivers; as a result, male drivers faced higher numbers of traffic accidents than female drivers. There were no significant differences between male and female drivers regarding drivers' impulsivity. Speeding as a measuring scale of the aggressive driving is significantly correlated with second-order impulsiveness subscales. The attentional and motor impulsiveness subscales are more correlated with the total score of the driving aggressiveness than non-planning subscale. There was moderate correlation between the impulsiveness total score and the overall aggressiveness score. The impulsiveness of the drivers was negatively correlated with the drivers' ages and positively correlated with number of crashes; while the driving aggressiveness was significantly correlated with number of crashes and negatively with gender and age of the drivers. The traffic police in Sulaimaniyah City can benefit from the results of this paper during permitting driving license and enforcement processes.

1. Introduction

Traffic violation laws cover any number of unlawful activities involving the moving vehicle or status of the vehicle. The most common law violations that deal with the moving vehicles are exceeding speed limits, drunk driving, tailgating, neglecting to yield emergency vehicles, swerving, not wearing a seat belt and not securing young passengers in a child safety seat and failing to stop at a red light. Expired registration is an example of the traffic violation laws that is related to the status of a vehicle; whereas driving with a suspended driving license is related to the driver
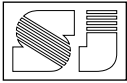
violations [1]. Because some of the drivers' inattention or distraction are not fully aware from drivers during driving performance; therefore, the majority of traffic violations are unintentional [2]. For example, right of way violations may be resulted by errors in judging turning headway, failure to obey traffic signals or signs may be resulted by driver inattention [3]. Cooper (1997) identified that a clear distinction between the conviction types of "exceeding the speed limits" and "excessive speed" in terms of accident-violation relationships [4]. It is believed that several factors contribute to conscious decisions to drive aggressively, such as disregard for the law and for other drivers, traffic delays, running late, anonymity, and habitual or clinical behavior[3].

Vehicle moving violation is one of the major causes of traffic accidents and road fatalities. Some researchers used self-reporting methods, which is based on Driver Behavior Questionnaire (DBQ) approach to investigate the effects of certain types of vehicle moving violations on traffic accidents such as speeding, alcohol usage, set belt, and red-light violations.

2. Literature Review

Many studies have been done about the drivers' behavior related to traffic violations. Moyano-Diaz (1997), measured attitudes toward 12 violation behaviors and compared casual attributions of accidents. A survey contained 41 items assessing a judgment of seriousness for a group of violation behaviors and asking about causes of accidents. Women obtained a higher level of response to the seriousness index than men. Also, pedestrians had a higher levels of seriousness index than drivers. Based on pedestrians' considerations, driving under the effects of alcohol and excessive speed were the most important causes of traffic accidents; while the experts' considerations were opposite [5]. Studies performed by Baker et al. (1992)[6] and Dissanayake and Lu. (2002)[7] obtained that fastening the seat belts, and using alcohol affects the severity of accidents greatly.

Mohammadi (2011) investigated the prevalence of mobile phone and seat belt usage during driving in college students aged between 18- and 24. The researcher realized that more than 50% of college students driving without using seatbelts. The study also obtained that females were less involved in injury traffic accidents. Moreover, it was indicated that the highest percentages of trauma and injury appeared on the college students aged between 18 and 24 years [8]. Zhang. et al. (2013) investigated the risk factors associated with traffic violations and accident severity in China, the researcher realized that one of the major risks that threating road safety is traffic violations [9]. Wahlberg et al. (2015) re-analyzed studies on prediction of accident involvement from DBQ factors, including lapses, and many unpublished effects [10]; Winter et al. (2015) explored the use of relatively approach for human factors survey research called Crowd Flower. Statistical results showed that the correlation between DBQ violations and self-reported accidents was $\rho = 0.28$. Self-reported accidents at the national level correlated strongly with accident statistics published by the World Health Organization [11].

Some other researchers used traffic violation and accident recorded approach to investigate the effects of certain types of vehicle moving violations on traffic accidents. Gebers and Peck (2002) assessed the accuracy of predicting future accidents risk by analyzing various combinations of prior driving records variables and demographic variables such as age, gender, and driving records. It was realized that the total historical accidents and violation records can be used as a measure to predict high-risk drivers and a probability of subsequent accidents involvement [12]. Alver et al. (2014) identified the relationship between socio-demographic characteristics, traffic rule violations, and traffic accidents among young drivers having 18-19 years old. The results showed that 23.9% of the drivers involved in at least one traffic accident in the last three years. This accident rate increased to 38.3% for the drivers who received at least one
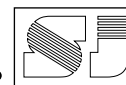
traffic citation/violation in last three years and peaked to 47.4% for the drivers who fined were for seat belt violations in last three years [13]. Shawky et al. (2017) explored the relationship between the at-fault drivers involved in traffic accidents and their history of traffic violation records as a function of drivers' behavior. Two main parameters, which addressed were accident rate per drivers and ratio of drivers with accident. Each parameter was investigated in terms of different variables; total number of violations, number of hazard violations, number of violations with penalty points and a cumulative number of traffic penalty points. There were strong relationships between the two parameters and the exploratory variables [14].

3. Methodology

The effects of traffic violations and demographic characteristics of the drivers on traffic safety were assessed by using ten questions selected from aggressive driving behavior questionnaire (ADBQ) approach, which consisted of twenty items that were filled by drivers. Six questions were directly related to traffic violation that included driving faster than speed limit, red light running, ignoring traffic signs and markings, bothering other drivers by cutting off, driving behind other vehicles very closely (tailgating), and drunk driving. Among the driver demographic characteristics that have impacts on the manifestation of traffic violations, gender and age as demographic indicators, the distances travelled by the drivers as a driving experience; as well as participation in traffic accidents were selected. Each of the drivers' violation type related questions was scored at six-point Likert scale (1 = never, 2 = hardly at all, 3 = occasionally, 4 = often, 5 = quite frequently, 6 = nearly all the time). Table 1 shows a sample of ADBQ form that was used to collect the driving violation behavior. Among the ADBQ form, questions number 2, 6, 7, 11, 16, and 18 were used as indicators for the driving violations that mentioned before.

Among 400 questionnaire forms were spread to passenger car drivers, 244 forms were appropriately responded by the drivers in which 143 drivers were male, and 101 of them were female. To know the effects of the traffic violation and demographic characteristics on traffic safety, the statistical software Minitab 16 was used to analyze descriptive and inferential statistical analyses. The average values of the scores that obtained from drivers' respond related to the violations questions and demographic characteristics were taken and compared using z-test statistical methods. The correlations among the violations and demographic characteristics of the drivers were obtained, too.

4. Presentation of the Data and Discussion of the Results

Table (2) shows the types of moving vehicle violations, as well as the average overall values of the violations for the sampled male and female drivers in Sulaymaniyah City. The table also included the p-values that obtained from comparing the male and female violation types using z-test statistical method. Regarding the drivers who drive above the speed limits, it was obtained that there is a significant difference between male and female drivers' behavior because the p-value calculated was less than 0.05. The male drivers score for the speed limits was 31.1, which is higher than the female drivers score 24.3. There were no significant differences between male and female drivers for the running through the red-light and drunk driving violations because the p-values are 0.665 and 0.054, respectively. Regarding the ignoring traffic signs and markings and swerving violation types, the male drivers drive more violent than female drivers. Also, the male drivers drive too closely behind other vehicles more than female drivers. Considering overall average values of the violations, the male drivers violation score was 21.2 which is greater than the violation's score of the female drivers 12.7; therefore, it can be
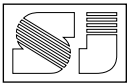
concluded that male drivers are driving in more violate manner than female drivers.

Table 3 shows the average values of the accidents per person, hourly driving per week, and average ages of male and female drivers. The results show that there is a significant different between male and female accidents per person; male drivers had higher numbers of accidents 1.86 traffic accidents per person than female drivers 0.88. This result supports that the male drivers are driving more violate than the female drivers. The traveling hours for the male drivers are greater significantly than female drivers; this is because in Mediterranean cultures males are more allowable than female to drive far away from their homes. The average age for the female drivers that sampled in this study is lower than the male drivers however the samples were taken arbitrarily; therefore, it can be said that the male drivers continue to drive when they get old more than female drivers. The driver's ages were separated into five group ranges from 18 to 65 years old.

Table 4 shows the types of moving vehicle violations and the average value of the overall violation based on the drivers age ranges. The numbers of the samples for each of the ranges are shown in the table, too. For almost all of the scores of the violation types and overall violations, as the ages of the drivers become greater, the smaller score of the violation types and overall violation obtained. The scores decrease gradually when the drivers age become older; however, the differences are bigger when the drivers age reaches 46. For example, when the drunk driving score for the age of 26-35 is 9.74, for the age range of 36-45 is 8.77; while the score decreases rapidly to 5.77. This result indicated that as when the drivers are getting old, they respect traffic laws more than before.

Table 5 shows the average values of the scores for the types of moving vehicle violations and the overall violation based on the hours that the drivers travel per week. The results show that the longer distance the drivers travel, the more violations occurs; for example, when the drivers drive from 0 to 10 hours a week, the speeding violation score is 24.78, while the speeding violation score becomes twice 45.8 when the drivers drive from 40 to 50 hours per week. These results support that when the drivers drive too long, they become tired and do more traffic violations during driving. When there is long drive, the drunk driving violation score increases rapidly; for example, the score become seven times more when the drivers drive from 0-10 to 40-50 hours per week. The only exceptional case is that ignoring traffic signs and marking violation in which the drivers score is becoming less when the hours of driving per week is becoming greater; this is because the drivers accustomed to follow the markings and signs when they drive more.

The values of Spearman's rank correlation coefficient (rs) among the demographic characteristics of the drivers and the types of violations measurements and overall violation score are shown in Table 6. The age of the drivers is negatively correlated with violation scores; for example, it correlates with cutting off, overall violation, and speeding with values of rs = 0.296, 0.247, and 0.215 respectively. The age of the drivers is less correlated with other types of violation scores. The number of accidents is correlated with overall violation, tailgating, red light running, and ignoring traffic signs and markings with the values of rs = 0.265, 0.25, 0.223, and 0.201, respectively. The results of correlation coefficient showed that there are small correlations between the drivers' demographic characteristics and the types of violations measurements and overall violation scores; however, all of the other types of the violation measurements are highly correlated with overall average value of the violation score. The highest value of the correlation is between tailgating violation type and the overall violation score is the highest correlation value 0.847. Red light running and speeding with the overall violation score approximately have the same correlation value, which is 0.66.
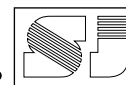
The overall average value of the male and female drivers, which is the average value of the all of the six types of violation scores, is 18.1. However, the value of the overall value of the violation score is not great; it should be taking into account the role of traffic police to reduce number of traffic accidents and improving efficiency of the traffic flows in Sulaymaniyah street networks.

5. Conclusion and Discussion

This paper concentrated on the effects of moving vehicle violations and demographic parameters on traffic accidents in Sulaymaniyah City. The results can be used in order to overcome the violations that the drivers were questioned. The conclusion of the results can be summarized as follows:
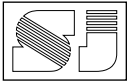
- All of the scores of moving vehicle violation types including speeding, ignoring traffic signs and marking, swerving, tailgating, and drunk driving for the male drivers are greater than female drivers.

- The overall average score of the violations of the male drivers was 21.2 which is greater than the overall average violation's score of the female drivers, which was 12.7; therefore, it can be said that the male drivers drive their vehicles in more violatively manner than female drivers.

- As a result of the moving vehicle violations that male drivers do more than female drivers, female driver have faced less traffic accidents (0.88 accident/person) than male drivers (1.86 accident/person).

- The male drivers travel more than female drivers per week; as well as the average age of the male drivers are greater than the female drivers age.

- As the ages of the drivers become older, the scores of the moving vehicle violation types and the overall violations become smaller.

- As the drivers drive more distances, they become tired and the scores of the types of violations of speeding, red light running, swerving, tailgating, drunk driving, and overall violation become greater; on the other hand, the score of the violation of the ignoring traffic signs and marking become smaller because the driver accustomed more when they drive more.

- The age of the drivers is negatively correlated with violation scores of cutting off ($rs = 0.296$), overall violation ($rs = 0.247$), and speeding ($rs = 0.215$); while it is less correlated with other types of violation scores.

- The number of traffic accidents is correlated with overall violation ($rs = 0.265$), tailgating ($rs = 0.25$), red light running ($rs = 0.223$), and ignoring traffic signs and markings ($rs = 0.201$).

- All of the types of the violation measurements are highly correlated with the overall average value of the violation score.

- However, the overall value of the violation score including male and female drivers is not great (18.1 out of 100), it should be taking into account from traffic police to reduce number of traffic accidents and improving efficiency of the traffic flows in Sulaymaniyah street networks.

- Traffic police in Sulaimaniyah City can benefit from the results of the study, especially by focusing young and male drivers during permitting driving license. Also, it is preferred to traffic police observe the drivers' violation on the streets during driving instead of stopping on intersections.

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آثار المخالفات المرورية والخصائص الديموغرافية على السلامة المرورية في مدينة السليمانية

بورهان محمد شريف[1]
د . هه ردى كمال كريم[2]
هيمن يونس احمد[2]

[1] جامعة السليمانية، كلية الهندسة، قسم هندسة الموارد المائية
[2] جامعة السليمانية، كلية الهندسة، قسم الهندسة المدنية

المستخلص

احدى الأسباب الرئيسية لزيادة حوادث السير هي المخالفات المرورية للسواق التي تحدث على شبكات الطرق. تهدف هذه الدراسة إلى تقييم آثار المخالفات المرورية والخصائص الديموغرافية للسواق على السلامة المرورية في شبكات الشوارع الحضرية في مدينة السليمانية. تم استخدام نهج استبيان لجمع البيانات من 244 سائق (143 سائق و 10 سائقة). تحتوي نموذج الاستبيان على عشرة أسئلة ؛ ستة منها تتعلق بأنواع المخالفات المرورية، وأربعة منها تتعلق بالمعايير الديموغرافية للسواق. سجل كل من السائقين إجابة على المقياس ليكرت من ستة نقاط (1 = أبدا ، إلى 6 = دائما تقريا)

تم استخدام البرنامج الإحصائي (مينتاب– 16 Minitab) لمقارنة درجات المقايس باستخدام الاختبار (z) والحصول على الإحصائيات الوصفية. كانت هناك فروق ذات دلالة إحصائية بين درجات الانتهاكات والمخالفات من السواق الذكور والإناث. وقد ظهر أن الذكور يقودون سياراتهم بطريقة أكثر انتهاكًا من الاناث، لأن الذكور حصلوا على درجات أعلى في جميع أنواع انتهاكات المركبات المتحركة والانتهاكات الإجمالية مقارنة بالإناث. كان لدى السائقات عدد أقل من الحوادث، والعمر، ومسافة السفر من السواق الذكور. السواق القدامى والمعمرون يقومون بانتهاكات أقل من السواق الشبان. السواق الذكور الذين لديهم مسافة سفر طويلة في الأسبوع يقومون بالانتهاكات والمخالفات أكثر من السواق الذكور الذين لديهم مسافة قيادة أقل في الأسبوع. درجة الانتهاكات الاجمالية لها ترابط مع عمر السواق (rs = 0.247) وعدد الحوادث (rs = 0.265). جميع أنواع المقايس للمخالفات له ارتباط وثيق مع متوسط القيمة الإجمالية للمخالفات. ومع ذلك كانت القيمة الإجمالية لدرجة المخالفات لجميع السواق 18.1 من أصل 100 . شرطة المرور ينبغي أن تبذل جهودًا لتقليل عدد حوادث المرور وتحسين كفاءة تدفقات حركات المرور في شبكات شوارع السليمانية.

الكلمات المفتاحية : العدوانية ، الاندفاع ، تصنيف السواق ، سلامة المرور ، سلوك السائق.
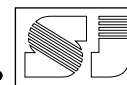
Table 1: Aggressive driving behavior questionnaire [15]

Age:	Male/Female:	Hours driving/week	No. of accidents

1. You become agitated or enraged when other drivers impede you, aren't paying attention, or drive poorly around you on

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

2. You travel above the speed limit, even if you have more than enough time to reach your destination.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

3. When other drivers do get on your nerves, how often do you think negatively of them without reacting verbally?

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

4. You think that other drivers just aren't thinking or paying enough attention when they anger you with their driving.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

5. When other drivers annoy or anger you, you try to think positively or just accept there are frustrating situations while

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

6. In cases where you know you can get away with it, you have no problem breaking minor laws or rules.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

7. When another driver angers you while on the road, you follow very close (tailgate) or otherwise try to scare them.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

8. You give the finger to drivers who annoy or anger you.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

9. When another driver angers you while on the road, you shout verbal insults towards then, even if they cannot hear you.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

10. You stick your tongue out or make faces at drivers that annoy you or make you mad.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

11. You drive intoxicated even when you realize that you may be over the legal limit.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

12. When another driver angers you at night, you shine your bright in their rearview mirror.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

13. You find being stuck in traffic or behind a slow driver especially annoying.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

14. When another driver angers you while on the road, you attempt to get revenge on them.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

15. You find drivers that are impatient (ex. Weave in and out of traffic, disregard stop signs, etc.) especially annoying.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

16. While driving, you fail to notice signs or other cars, misjudge other's speed, etc.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

17. You "wake up" to realize that you have no clear recollection of the road along which you have just traveled.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

18. You take chances and run through red lights.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

19. If another driver is following too closely, you slow down or hit your breaks to get them to back off.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time

20. You shake your head at a driver who annoys you.

1 = never   2 = hardly at all   3 = occasionally   4 = often   5 = quite frequently   6 = nearly all the time
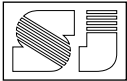
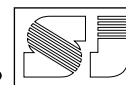**Table 2: Average values of traffic violations based on gender**

Type of moving vehicle violations	Male		Female		p-Value
	Average	S.D	Average	S.D	
Driving more than permitted speed limit (speeding)	31.1	28.2	24.3	23.8	0.041
Red light running	11.4	21.5	10.1	21.6	0.665
Ignoring traffic signs and markings	19.1	25.7	13.4	18.6	0.046
Bothering other drivers by cutting off (swerving)	30.2	30.5	22.8	24.5	0.035
Driving too closely behind other vehicles (tailgating)	17.7	28.0	5.9	15.5	0.0001
Drunk Driving	11.0	27.0	5.7	15.8	0.0540
Average value of violation score	21.2	18.8	13.7	12.7	0.0001

Table 3: Average values of drivers' traffic accidents, traveling, and age based on gender

Type of violation	Male		Female		p-Value
	Average	S.D	Average	S.D	
Average No. of accidents/person	1.86	1.920	0.88	1.02	0.0001
Hours driving / week	13.81	9.93	9.14	6.70	0.0001
Average Age	38.10	12.90	34.85	9.67	0.0270

Table 4: Average values of traffic violation based on drivers' age

Type of violation	Age range (year)				
	18-25	26-35	36-45	46-55	56-65
Number	50	77	57	39	21
Driving more than speed limit	41	27.92	25.44	19.23	23.81
Red light running	12	12.99	11.84	8.33	2.38
Ignoring traffic signs and markings	17.5	19.81	17.54	14.1	5.95
Bothering other drivers by cutting	42.5	30.84	18.42	17.31	19.05
Tailgating	16	15.26	11.4	8.97	7.14
Drunk Driving	11	9.74	8.77	5.77	5.95
Average value of violation score	24.17	20.35	16.01	12.82	10.91

Table 5: Average value of traffic violation based on hours driving per week

Type of violation	Hours per week range				
	0-10	10-20	20-30	30-40	40-50
Number	114	88	23	13	6
Driving more than speed limit	24.78	28.69	33.7	38.5	45.8
Red light running	9.43	11.08	15.22	9.62	20.8
Ignoring traffic signs and markings	17.98	18.18	10.87	9.62	8.33
Bothering other drivers by cutting off	28.07	24.15	25	38.46	37.5
Tailgating	10.09	13.64	17.39	21.15	16.67
Drunk driving	7.46	6.53	10.87	19.23	37.5
Average value of violation score	16.74	18.23	19.93	23.08	24.31

Table 6: Correlations among types of violation, overall violation scores and demographical traits of the drivers.

No.	Title	1	2	3	4	5	6	7	8	9	10	11
1.	Sex											
2.	Age	-0.131										
3.	Hours/driving	-0.26	0.073*									
4.	No. of accidents	-0.293	0.169	0.128								
5.	Speeding	-0.127	-0.215	0.168	0.144							
6.	Red light running	-0.028*	-0.106*	0.078*	0.223	0.256						
7.	Ignoring traffic signs and markings	-0.121*	-0.14	-0.11*	0.201	0.145	0.280					
8.	Cutting off	-0.13	-0.296	0.047	0.053*	0.327	0.290	0.168				
9.	Tailgating	-0.238	-0.112*	0.136	0.250	0.46	0.417	0.318	0.318			
10.	Drunk driving	-0.114*	-0.049*	0.171	0.139	0.316	0.515	0.301	0.273	0.564		
11.	Overall Average value of violation score	-0.217	-0.247	0.114*	0.265	0.66	0.662	0.523	0.616	0.847	0.606	

Note:

1- Negative values mean that the variables are correlated aversely.

*2- * means that the p-value is less than 0.05.*