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Traffic Accidents in Jordan and Jordanian Youth's Perceptions of Their Consequences, Causes, and Reduction Methods

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Abstract

The aim of this study is to develop a deeper understanding of the causes and consequences of traffic accidents in Jordan, as well as to understand their spatial distribution and identifying the locations of the most dangerous accidents. The study primarily relied on surveying the opinions of youth under the age of 25 regarding the causes and consequences of traffic accidents in Jordan from their perspective. The study utilized data from the Jordan Traffic Institute for the past years. This study was based on a random representative sample of 4,919 male and female students from the University of Jordan who voluntarily completed an online questionnaire. Results showed that there is a similarity between the patterns and spatial distribution of traffic accidents and the population's spatial distribution in Jordan. Results also revealed that locations such as traffic lights, roundabouts, and road intersections are considered the most dangerous places, as they witnessed a higher number of accidents compared to other places. The study also demonstrated the prevalence and severity of traffic accidents in Jordan, causing a significant number of fatalities and injuries and imposing a substantial economic cost, ranging from 2% to 3% of the annual gross domestic product. The findings highlighted a high level of personal concern and awareness among the study sample regarding the seriousness and danger of traffic accidents in Jordan. Additionally, the findings showed that human factors play a larger role in rising numbers of traffic accidents in Jordan, compared to other factors related to the road environment and conditions. The variables associated with gender and family income in this study revealed significant differences among participants across all dependent variables.The study concluded with a set of recommendations to the relevant stakeholders and traffic authorities which should be taken into consideration when developing future traffic plans to reduce the number of traffic accidents and their consequences on society and on the economy. The study also recommended that relevant authorities should carry out awareness campaigns directed at the general public, but with focus on the youth, to emphasize the risks and consequences of traffic accidents.

Keywords: *Traffic accidents; Youth; Awareness; Accident causation; Jordan.*

JEL Classifications

1. Introduction and Literature Review

Traffic accidents worldwide are acknowledged as a significant cause of mortality, constituting

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a major health problem (Wangdi et al., 2018; Khasawneh et al., 2022; Mohammed et al., 2023; Azhar et al., 2023; Infante et al., 2023), and incurring large social and economic losses to countries, families and individuals (Ghadi et al., 2018). Every year around the world, 1.3 million people lose their lives in traffic accidents, while 20 to 50 million have non-fatal injuries, a high percentage of which leading to permanent disability. Road traffic injuries are the primary cause of death for youth and children worldwide. In addition to death and injury, these accidents can cause significant financial losses of up to 3% of a country's gross national product (GDP) for the victims, their families, and the nation as a whole (Peden et al., 2004; Toroyan & Peden, 2007; World Health Organization, 2021). The problem is that the age group primarily involved in road traffic accidents is the most productive, 15-40 years (Al-Khaldi, 2006). Thus, it is a great concern for all countries to reduce accidents and their consequences.

Road traffic accidents are caused by a collection of elements pertaining to the system's constituent parts, such as the road environment, cars, and other road users, as well as how they interact (Canonica et al., 2023; Infante et al., 2023; Hazaymeh et. al., 2022; Hammad et al., 2019; Sharma, 2016). Shantajit et al. (2018) summarized the road environment factors as featuring constrained routes, erroneous intersection layouts, inadequate lighting, unfamiliarity, subpar building, and poor design. Ditches and pot holes also contribute to road traffic accidents. Human factors that contribute to these accidents mainly involve speeding, drunken driving, failure to follow traffic rules, and reckless driving. Certain human factors can lead to accidents, such as improper use of safety belts and helmets, medical conditions (myocardial infarction, sudden illness, impaired vision), psychological factors (risk-taking, impulsiveness), poor judgment, delayed decisions, aggression, poor perceptions, family dysfunction, and distracted driving (using mobile phones) (Infante et al., 2023; Bucsuházy et al., 2020; Zhang et al., 2019; Touahmia, 2018; Plankermann, 2014; Petridou & Moustaki, 2000). Finally, vehicles themselves and their condition contribute significantly to accidents, such as unkempt cars, a high volume of vehicles, careless driving, and crowded buses (Canonica et al., 2023; Infante et al., 2023; Shantajit et al., 2018; Gopalakrishnan, 2012).

In the context of Jordan, traffic accidents are a serious problem, with some two persons dying every day as a result (Jordan Traffic Institute, 2020; Hazaymeh et. al., 2022; Edries & Alomari, 2022), and the country losing approximately 2-3% of its GDP (Ghadi et al., 2018). The total cost of accidents in Jordan was 326 million Jordanian Dinars (JOD) in 2019, although the number decreased to 296 million in 2020 due to the Covid-19 pandemic and its related quarantine period of 12 weeks (Jordan Traffic Institute, 2019; Jordan Traffic Institute, 2020). The Jordanian government has carried out a traffic safety strategy since 2008, which comprises the implementation of new traffic law, increasing the quality of the traffic police service, increasing coordination with other traffic-related agencies, and raising the level of awareness of traffic accidents through media and educational institutions (Mohammed et al., 2019; Al-Weshahn& Al-Zubi, 2012).

Several studies have focused on the problem of traffic accidents in Jordan, in terms of its trends and characteristics (Alzyoud, 2023; Al-Omari et al., 2019; AlKofahi & Khedaywi, 2019; Khasawneh et al., 2018; Bashar et al., 2013; Jadaan et al., 2013; Al-Masaeid, 2009), its causes (Khawaldah & Alzboun, 2022; Mahadin et al., 2021; Al-Masaeid et al., 2020; Al-Abdallat et al., 2016; Al-Khateeb, 2010; Edries & Alomari, 2022), and its economic costs (Ghadi et al., 2018; Al-Masaeid et al., 1999).

Generally speaking, solving this problem can only be achieved by raising the level of traffic awareness among citizens, directing their behavior to reduce the causes of accidents. Despite the great efforts made by various authorities and institutions in Jordan, they are still insufficient to reduce traffic accidents and mitigate their dangerous effects on the lives of individuals and

their property. There is no doubt that raising awareness of traffic safety standards among citizens is the direct way to reduce these accidents and mitigate the negative consequences. This awareness depends largely on the nature of society's perceptions toward the level of danger of the problem. Evaluation of individuals' perceptions toward traffic accidents in terms of their danger, causes, and effects is the first step in spreading and strengthening traffic awareness. This study therefore attempts to answer the following main question: what is the level of awareness of the traffic accidents problem among Jordanian youth (students of the University of Jordan)?

There are studies measuring the degree of citizens' awareness of the traffic accidents problem and its increase worldwide in general, and in Jordan in particular (Alzyoud, 2023). The reality of the problem in Jordan and its expected increase in light of population growth, increasing numbers of vehicles, and the decline in the road infrastructure together contribute to the significance of such studies. The large size of the Jordanian population and immigrants, as well as the increasing rate of private vehicle ownership, also add to the problem (Bashar et al., 2013). The increase in traffic accidents and their negative consequences has attracted the attention of many official and non-official institutions to call for conferences and conduct studies to discuss the dimensions of this problem and to find appropriate solutions. The current study addresses this problem and suggests appropriate ways to reduce it.

Traffic culture is an effective tool that contributes to the development of traffic awareness among individuals. Traffic culture and education enable the formation of desirable behaviors to deal with cars and traffic wisely and rationally. Therefore, traffic issues and awareness can be considered among the responsibilities of educational institutions in any country, including Jordan; because the human and physical losses that result from traffic accidents are borne by the state and its citizens, traffic awareness is important for the whole of society, but especially students and young people in general. Al-Masaeid (2009) concluded that young drivers, aged under 25, are over-represented in road traffic accidents. This may be because young people have problems in dealing with road conflicts and conditions (Hayakawa et al., 2000) and poor driving skills, along with the over-confidence (Glendon et al., 1996). The target group in this study is, therefore, University of Jordan students aged 18-24 years, who represent the new generation of drivers or will be license holders in the near future. There is no doubt that the level of awareness of accidents and their damage among youth will affect their future behavior, in order to create a national awareness about the problem of traffic accidents and its damages. Thus, the study aims to:

- Examine the facts about road accidents in Jordan and the effects they have.
- Analyze the spatial distribution and dangerous sites of traffic accidents in Jordan.
- Determine the perceptions of youth toward traffic accidents and their consequences in Jordan.
- Determine their individual attention toward traffic accidents in Jordan.
- Identify the main causes of traffic accidents in Jordan from young people's perspective and their suggestions for reducing them.

2. Data and Methods

2.1. Data Sources

Two primary sources provide the data needed for this investigation. First, the reality of traffic accidents in Jordan in terms of statistics, main causes, and consequences are based on the annual reports and statistics provided by the Jordan Traffic Institute (JTI). The JTI was established in 1996, as a separate division inside the Jordanian Security Directorate, to research

traffic and certify staff members in the field of traffic. Second, the data on youth awareness are collected from an online questionnaire, as detailed in the following sections.

2.2. Participants

A representative sample of students was chosen at random to participate in a cross-sectional study. Participants were undergraduates at the University of Jordan (UJ, located in Amman, Jordan) who voluntarily completed the online questionnaire designed for this study. The link to the questionnaire was uploaded on the eLearning website at UJ, where students can participate freely. The total number of responses reached 4,919 (representing about 10% of UJ students) during the period February-May 2023. Answering all the questions in the questionnaire was obligatory, to ensure no missing data; participants could withdraw from the study at any time. All study participants gave their informed consent, and the Institutional Review Board and Research Ethics Committee at UJ accepted the study's techniques and goals. The Institutional Review Board/the Research Ethics Committee at UJ has waived the need for the consent since all participants agreed on participating on the optional questionnaire, and they all are 18-year-old or above.

2.3. Study Instrument

An online questionnaire was distributed to a representative random sample of UJ students. All respondents agreed on participating in the study after reading and agreed on the consent form. The questionnaire was divided into six sections. The first deals with socio-demographic and economic characteristics of respondents: gender, age, marital status, major, family income, and place of residence. The second part represents the respondents' history of driving and traffic accidents, through Yes/No questions about car ownership, driving license, and traffic accident history. Questions include: Do you have a driving license? Do you own a car? Have you ever had a car accident? Have any of your family members had a car accident? and have you ever lost a close person (relative or friend) in a car accident? A 5-Point-Likert scale was used in sections 3-6, to allow respondents to express how much they agree or disagree with each statement (5 = Strongly Agree to 1 = Strongly Disagree). The third part is a five-item scale that represents the perception of the respondent toward the traffic accidents problem in Jordan. The fourth section is a 7-item scale that measures respondents' personal attention toward traffic accidents in Jordan. The fifth section covers the causes of traffic accidents in Jordan from the respondents' perspective. The final section asks for suggestions to reduce the level of traffic accidents in Jordan. The Cronbach's alpha coefficient for all domains of the questionnaire (sections 3-6) was .948, suggesting good reliability of the study instrument.

2.4. Statistical Analysis

The driving and traffic accident histories, as well as the categorical sociodemographic and economic variables, were analyzed using frequencies and percentages, whilst the continuous variables were analyzed using mean and standard deviation. One-way analysis of variance (ANOVA) was utilized to assess multi-value variables, and a two-sample t-test was employed to determine the significance for the binary variables. When a p-value was ≤ 0.05, it was deemed statistically significant. Version 23 of the SPSS program was used for all statistical analyses.

3. Results and Discussion

3.1. Analysis of Traffic Accidents in Jordan

2.1.1 Development of Traffic Accidents and their Consequences

Jordan's population and car count are steadily rising, much like those of other nations. The population was 11.310 million in 2022, and there were 1,855,901 registered cars. 169,409 road incidents were reported in the same year; 11,510 of them resulted in 562 deaths, 17,096 injuries, and a 322 million Jordanian dinar financial loss (see Table 1). However, the Covid-19 pandemic and its related quarantine were responsible for a relative decrease in traffic in 2020 compared to the previous four years (Table 1). In this regard, according to Qureshi et al. (2020), mandatory lockout rules reduced the number of non-serious or no-injury traffic accidents, but not those that resulted in major or fatal injuries. These shocking statistics confirm why this issue should be taken seriously by both the government and society.

Table 1: Summary of traffic accidents in Jordan and their consequences for the period 2015-2022.

Year/ Items	2000	2010	2015	2016	2017	2018	2019	2020	2021	2022
Populations (,000)1	5039	6113	9531	9798	10053	10309	10554	10806	11057	11310
Registered cars2	473339	1075453	1412817	1502420	1583458	1637981	1677061	1729343	1795215	1855901
Traffic accidents2	52796	140014	111057	144521	150226	150398	161511	122970	160600	169409
Human injuries accidents2	-	-	9712	10835	10446	10431	10857	8451	11241	11510
Deaths2	686	670	604	750	685	571	643	461	589	562
Injured people2	18842	17403	16139	17435	16246	16203	17013	12690	17485	17096
Financial costs (Millions) 2	-	311	275	323	308	313	324	296	320	322

Sources: 1 Department of Statistics, (Several Years). Annual Reports. Amman, Jordan.

2 Jordan Traffic Institute, (Several years). Annual reports. Amman, Jordan.

2.1.2 Spatial Analysis of Traffic Accidents and their Consequences:

Table 2 presents the spatial analysis of traffic accidents in Jordan for 2022. The governorate of Amman has the highest number of human injuries, accounting for 42% of the total, followed by Irbid (16.7%) and Zarqa (11.4%) governorates respectively. These percentages correspond to the population percentages in these governorates. However, although the percentages of deaths in Amman, Irbid, and Zarqa governorates decreased compared to the percentage of accidents in these governorates, the percentages of deaths in the remote governorates (i.e. Mafraq, Karak, and Ma'an) are relatively high compared to the percentages of accidents resulting in human injuries in these governorates. This may be because of the wide area covered by roads in these governorates, and fewer police.

The number of dangerous sites is presented in the last column of the table based, on data from the JTI (2016-2018). In this study, a dangerous site or blackspot is described as a place that has a record of traffic accidents or a high probability of accidents, human injury or death. Dangerous sites include road intersections, specific spots on the road, or whole sections of road. The dangerous sites in the study were determined after collecting the required data about

traffic accidents in terms of their numbers, locations, deaths, and injuries. The weighted injury accidents equation was used to define the sites, as follows (Jordan Traffic Institute, 2019b):

Dangerous sites = W + I + A = ≥10

Where: W = number of accidents with deaths multiplied by 3; I = number of accidents with injuries multiplied by 1; and A = number of accidents with physical damage multiplied by 1/3.

That is, dangerous sites are only defined as those with 10 or more scores based on the equation. These dangerous sites and their spatial distribution are presented in the last column of Table 2. Amman governorate has the most dangerous sites (114), accounting for 46.7% of the total number for Jordan. Zarqa governorate has 38 dangerous sites (15.6%), followed by Balqa and Irbid governorates with 30 sites for each of them. These results are similar to results revealed by the study of (Hazaymeh et. al., 2022).

Table 2: Spatial Analysis of Traffic Accidents (2022) and Dangerous Sites in Jordan for 2019.

Governorate	Population (2022)1	Human injuries accidents2	Deaths2	Severe injuries2	Moderate injuries2	Mild injuries2	N. of dangerous sites3
Amman	4,744,700	4,809	215	280	2,318	4,031	114
Zarqa	1,616,00	1,310	53	90	1076	710	38
Balqa	582,100	736	35	46	480	625	30
Madaba	224,000	284	12	31	259	194	6
Irbid	2,059,700	1,917	58	91	855	2,020	30
Jerash	280,700	370	18	40	173	407	6
Ajloun	208,500	241	7	7	138	258	1
Mafraq	651,100	641	59	93	627	400	4
Karak	374,800	453	36	51	296	393	4
Tafila	114,000	146	20	14	108	94	2
Ma'an	187,600	242	26	41	206	113	2
Aqaba	222,800	361	23	21	203	307	7
Total	11,302,000	11,510	562	805	6,739	9,552	244

Sources

1Department of Statistics, (2023). Estimated number of population in 2022. Amman, Jordan.
2 Jordan Traffic Institute, (2022). Annual report. Amman, Jordan.
3 Jordan Traffic Institute, (2019). Dangerous sites in the Hashemite Kingdom of Jordan (2016-2018). Amman, Jordan.

2.1.3 Dangerous Sites of Traffic Accidents

The authors reviewed the description of the 244 dangerous sites in Jordan according to the JTI study (Jordan Traffic Institute, 2019b), and categorized them in four groups: road intersections, traffic lights, and roundabouts together accounting for about 62%, and other. See Table 3.

Table 3: Dangerous Sites of Traffic Accidents in Jordan.

Dangerous sites	Frequencies	%
Traffic lights	51	20.9
Roundabouts	48	19.7
Intersections	52	21.3

Other Sites	93	38.1
Total	244	100

3.2. Youth's Perceptions toward Traffic Accidents in Jordan

3.2.1. Socio-Economic and Socio-Demographic Profile of Participants

According to the survey results, 31.3% of participants were male (1,542), and 68.7% were females (3,377), a male to female ratio of 1:2.19. Their ages ranged between 18 and 25, with an average mean age of 19.95, and the standard deviation was 2.23. The majority (97%) were single. More than half of the respondents (51.5%) were studying humanities-related majors, and the rest (48.5%) scientific majors and medicine. The income status of the respondents' families fall into six categories: less than 400 Jordanian Dinars (JOD) for 27% of the respondents; 400-799 JOD (35.4%); 800-1299 JOD (19.5%); 1200-1599 JOD (7.5%); 1600-1999 JOD (3.1%); and 2000 JOD and above (7.5%). Most of the respondents (75.3%) live in the capital, Amman, and the others in the governorates detailed in Table 4column 1

Table 4: Socio-Demographic and Economic Profile of Study Participants and Their Corresponding PTAP, PATA, and CTA Scores (N=4,919).

Variable	Mean ± SD or N (N%)	PTAP Score Mean ± SD or (p-value)	PATA Score Mean ± SD or (p-value)	CTA Score Mean ± SD or (p-value)
Age	19.95 ± 2.233	(.013b*)	(.722b)	(.000b*)
Gender		(.000a*)	(.000a*)	(.000a*)
Male	1542 (31.3)	4.381 ± .537	3.577 ± .787	4.110 ± .537
Female	3377 (68.7)	4.544 ± .462	3.692 ± .780	4.247 ± .496
Marital Status		(.143b)	(.722b)	(.436b)
Single	4773 (97)	4.491 ± .493	3.655 ± .785	4.206 ± .512
Married	133 (2.7)	4.567 ± .417	3.702 ± .785	4.148 ± .493
Others	13 (0.3)	4.369 ± .652	3.615 ± .743	4.239 ± .862
Major		(.093a)	(.000a*)	(.051a)
Humanities	2532 (51.5)	4.504 ± .487	3.718 ± .783	4.218 ± .510
Scientific or Medical	2387 (48.5)	4.481 ± .501	3.590 ± .781	4.189 ± .516
Family income (monthly JOD)		(.015b*)	(.000b*)	(.002b*)
Less than 400	1327 (27)	4.518 ± .502	3.767 ± .777	4.238 ± .523
400 – 799	1743 (35.4)	4.483 ± .474	3.672 ± .766	4.197 ± .499
800 – 1199	957 (19.5)	4.517 ± .477	3.594 ± .797	4.208 ± .515
1200 – 1599	367 (7.5)	4.454 ± .524	3.585 ± .780	4.164 ± .514
1600 – 1999	154 (3.1)	4.468 ± .525	3.495 ± .753	4.072 ± .536
2000 and above	371 (7.5)	4.436 ± .532	3.476 ± .820	4.198 ± .513
Place of Residence (Governorate)		(.402b)	(.009b*)	(.356b)
Amman	3702 (75.3)	4.489 ± .491	3.635 ± .793	4.199 ± .514
Zarqa	426 (8.7)	4.514 ± .531	3.684 ± .774	4.240 ± .503
Balqa	344 (7)	4.478 ± .517	3.687 ± .738	4.202 ± .537
Madaba	160 (3.3)	4.504 ± .433	3.809 ± .773	4.185 ± .485
Irbid	38 (0.8)	4.489 ± .443	3.793 ± .765	4.286 ± .457
Jerash	119 (2.4)	4.477 ± .456	3.808 ± .797	4.174 ± .501
Ajloun	34 (0.7)	4.512 ± .452	3.546 ± .738	4.252 ± .573
Mafraq	22 (0.4)	4.573 ± .340	3.695 ± .553	4.269 ± .468

Tafila	22 (0.4)	4.764 ± .374	4.007 ± .544	4.418 ± .367
Karak	7 (0.1)	4.686 ± .344	3.755 ± .357	4.453 ± .326
Ma'an	31 (0.6)	4.561 ± .512	3.853 ± .661	4.191 ± .570
Aqaba	14 (0.3)	4.357 ± .648	3.337 ± .721	4.014 ± .510

SD, Standard Deviation.

Numerical variables were summarized as mean and standard deviation, while the categorical variables were summarized using percentages.

PTAP, Perception toward Traffic Accidents Problem.

PATA, Personal Attention to Traffic Accidents.

CTA, Causes of Traffic Accidents.

ap-value is obtained using t-test; bp-value is obtained using one-way-ANOVA.

*Statistically significant p-value (≤ 0.05).

The scores of participants regarding Perception toward Traffic Accidents Problem (PTAP), Personal Attention to Traffic Accidents (PATA), and Causes of Traffic Accidents (CTA), are presented in the last three columns of Table 4. Using pair-wise t-test/ANOVA statistics, only three variables were significantly associated with PTAP level; age (ANOVA p-value: 0.013), gender (t-test p-value: 0.000), and family income (ANOVA p-value: 0.015). The results showed significant differences in PTAP between participants according to their age group, in favor of the younger participants, gender group in favor of females, and family income group in favor of the low-income groups: less than 400 JOD followed by 800-1199 JOD and 400-799 JOD respectively. Other variables, like marital status, major, and place of residence, showed no significant differences in PTAP level between study participants (t-test or ANOVA, p-value ≤0.05). Regarding PATA levels, the results showed significant differences among participants by gender, in favor of females; major in favor of humanities-related subjects; family income in favor of participants from low income groups, less than 400 JOD and 400-799 JOD respectively; and place of residence, in favor of participants living in Tafila and Ma'an governorates. Finally, the results showed significant differences among participants in regard to their CTA scores in three variables: age, in favor of younger participants; gender, in favor of females; and family income, in favor of the low-income groups, less than 400 JOD followed by 800-1199 JOD and 400-799 JOD respectively.

The results presented in Table 4 indicate that younger and female participants with low income are more concerned about PTAP, PATP, and CTA. Regarding age, the researchers believe that previous government campaigns delivered through schools and media may contribute to raising the level of awareness among Jordanian youth. Women, living in a paternalist Eastern community, always try to prove that they are better drivers than men, driving carefully and wisely. Low income participants take extra care to avoid accidents, which are expensive.

3.2.2. Driving and Traffic Accidents History

Based on the results shown in Table 5, only 36.5% of respondents (1,794) held a driving license at the time of the data collection. Only 14.6% (720) answered that they have their own cars. 28.5% of respondents (1,404) reported that they had been involved in a car accident and 65.5% (3,223) that at least one family member had had an accident. Finally,

22.5% of the respondents (1,108) reported the death of at least one of their family members or friends in a car accident.

Table 5: Respondents' Driving and Traffic Accidents History (N=4,919).

Variable	N (N%)	PTAP Score Mean ± SD or (p-value)	PATA Score Mean ± SD or (p-value)	CTA Score Mean ± SD or (p-value)
Do you own a driving license?		(.000a*)	(.284a)	(.005a*)
Yes	1794 (36.5)	4.454 ± .501	3.640 ± .780	4.177 ± .521
No	3125 (63.5)	4.515 ± .486	3.665 ± .787	4.220 ± .508
Do you own a car?		(.295a)	(.245a)	(.506a)
Yes	720 (14.6)	4.474 ± .514	3.687 ± .785	4.192 ± .521
No	4199 (85.4)	4.496 ± .489	3.650 ± .784	4.206 ± .511
Did you have a car accident before?		(.033a*)	(.209a)	(.645a)
Yes	1404 (28.5)	4.469 ± .509	3.634 ± .783	4.199 ± .512
No	3515 (71.5)	4.503 ± .485	3.665 ± .785	4.206 ± .513
Did any of your family have a car accident before?		(.908a)	(.014a*)	(.339a)
Yes	3223 (65.5)	4.492 ± .489	3.636 ± .786	4.209 ± .495
No	1696 (34.5)	4.494 ± .499	3.694 ± .779	4.194 ± .545
Have you lost any person (relative or friend) in a car accident?		(.809a)	(.000a*)	(.640a)
Yes	1108 (22.5)	4.496 ± .494	3.755 ± .740	4.210 ± .506
No	3811 (77.5)	4.492 ± .492	3.627 ± .795	4.202 ± .515

SD, Standard Deviation.

Numerical variables were summarized as mean and standard deviation, while the categorical variables were summarized using percentages.

PTAP, Perception toward Traffic Accidents Problem; PATA, Personal Attention to Traffic Accidents; and CTA, Causes of Traffic Accidents.

ap-value is obtained using t-test; bp-value is obtained using one-way-ANOVA.

*Statistically significant p-value (≤ 0.05).

The scores of participants regarding PTAP, PATA, and CTA, are presented in the last three columns of Table 5. Based on the t-test statistics, only two variables were significantly associated with PATP level (t-test, p-value ≤ 0.05). The results unexpectedly showed significant differences between participants according to their ownership of a driving license in favor of non-licensed students, and having had an accident in favor of those who had not experienced a car accident before. In addition, there were significant differences in the PATA levels between participants according to their families' experience of having a car accident in favor of those

who had not experienced one; and based on the history of car accidents that resulted in the death of a family member or friend in favor of those who had lost a close person. Regarding the CTA from the participants' perspective, there were significant differences according to ownership of a driving license in favor of the non-licensed

Perceptions of Respondents toward the Traffic Accidents Problem

Table 6 shows the conviction level of respondents toward the seriousness of the traffic accidents problem in Jordan, and its effects. It is clear that the majority declared that traffic accidents are a serious problem, with several negative effects; the average of their answers on the items of the scale was 89.8%. According to respondents' answers, traffic accidents are a real problem in Jordan, with an average of 93.3% recognizing serious damage to the life and safety of individuals (96%). In addition, respondents believe that traffic accidents incur economic loss, paid by the country and individuals (89.4%); that the problem and its effects in Jordan are increasing (87.2); and that this will negatively affect the economic development of the country (83.6%).

Table 6: Perceptions of Respondents Toward the Traffic Accidents Problem and Its Effects in Jordan.

Items	Mean	S.D	%
Respondents are convinced of the seriousness of traffic accidents problem and its effects in Jordan (alpha = .764)	4.49	.493	89.8
The problem of traffic accidents in Jordan is a real problem, not an illusion.	4.66	.580	93.2
Traffic accidents have serious damage to the life and safety of individuals.	4.80	.484	96
Traffic accidents have economic damage borne by the state and individuals.	4.47	.704	89.4
The problem of traffic accidents is exacerbating and its negative effects are increasing in Jordan.	4.36	.742	87.2
Traffic accidents negatively affect the economic development in Jordan.	4.18	.860	83.6

3.2.3. Respondents' Personal Attention to Traffic Accidents

According to the results shown in Table 7, respondents pay a high level of personal attention toward the traffic accidents problem in Jordan, averaging 73.2% based on the scale of seven items. They declared that they take care and avoid dangerous sites that have a history of traffic accidents (83.2%). More than 80% are interested in learning how to prevent traffic accidents. In addition, the majority (76.8%) are interested in knowing the causes of accidents in their surrounding areas and the resulting damage. A large percent of the sample (72.8%) follow the policies taken by authorities to reduce traffic accidents, and normally read the news about accidents (65.8%), although they are less interested in attending events about traffic accidents and raising the general awareness in this regard (56%).

Table 7: Respondents' Personal Attention to the Traffic Accidents Problem in Jordan.

Items	Mean	S.D	%
Personal attention to traffic accidents problem in Jordan (alpha = .873)	3.66	.748	73.2
I am interested in constantly reading the news of traffic accidents.	3.29	1.043	65.8
Make sure to know the causes of traffic accidents that happen in my surroundings.	3.84	1.005	76.8
I am interested in knowing the damages caused by traffic accidents.	3.84	1.000	76.8

I regularly attend events related to traffic accidents and raise awareness of them.	2.80	1.206	56
I am interested in knowing the ways to prevent traffic accidents.	4.01	0.961	80.2
Take care of dangerous sites with frequent accidents.	4.16	0.955	83.2
I follow with interest the measures taken by the various authorities to reduce traffic accidents.	3.64	1.093	72.8

3.2.4. Causes of Traffic Accidents According to Respondents

From the results in Table 8, the respondents believe that human factors are more responsible for traffic accidents than road environment conditions in Jordan. They agreed on the human-related reasons given as the main causes of traffic accidents in Jordan, with an average of 87.6%. Of themse, speeding and recklessness or carelessness while driving were the main causes of traffic accidents in Jordan with an average of 93.2% each, followed by using a mobile phone while driving (90%). These findings corroborated a prior study that found the main factors causing traffic accidents in Jordan are reckless driving and aggressive driving (Al-Masaeid, 2009). Touahmia (2018) also found that breaking traffic laws and traveling at excessive speeds are the primary reasons for accidents in Saudi Arabia. The average agreement on the road-related factors among respondents was 83.2%. These included cracks in some roads and poor asphalt pavement, the presence of large slopes in some streets especially at the main intersections, and poor planning and geometry of cornering areas.

Table 8: Causes of Traffic Accidents in Jordan from the Respondents' Perspective.

Items	Mean	S.D	%
Human-related reasons (alpha = .884)	4.38	0.536	87.6
Speeding	4.66	0.604	93.2
Recklessness or carelessness while driving	4.66	0.656	93.2
Sudden stop	4.10	0.820	82
Using a mobile phone while driving	4.50	0.738	90
Driving a vehicle while under the influence of drugs or alcohol	4.44	0.936	88.8
Stopping the vehicle in a double or random way on the road	4.02	0.903	80.4
Failure to comply with traffic priorities	4.44	0.750	88.8
Driving too close to other cars	4.21	0.813	84.2
False overtaking and non-compliance with the designated lane	4.50	0.721	90
Driving in the opposite direction of the road	4.37	0.963	87.4
Failure to comply with traffic lights	4.42	0.857	88.4
Loading and unloading people or stuff on the street	4.27	0.867	85.4
Weak traffic awareness and culture among citizens	4.29	0.842	85.8
Large trucks using roads during undesignated times and on undesignated streets	4.22	0.906	84.4
The lack of safety and security conditions in some vehicles and the lack of periodic vehicle maintenance	4.19	0.859	83.8
Pedestrians crossing from places not designated for crossing the street	4.30	0.848	86
Road environment-related reasons (alpha = .920)	4.16	0.614	83.2
Poor planning and geometry of cornering areas	4.32	0.830	86.4
The presence of large slopes in some streets, especially at the main intersections.	4.33	0.802	86.6
Existence of detours on the main streets without suitable alternatives	4.24	0.869	84.8
Traffic intensity on the street	4.28	0.848	85.6
Occupying part of the street by buildings or commercial stores	4.14	0.927	82.8
Existence of ongoing maintenance work for some roads	4.16	0.909	83.2
No barriers between the two sides of the street	4.04	0.922	80.8
Street retailers on the sides of some roads	3.80	1.081	76
The presence of bumps in a random and unorganized way	4.26	0.880	85.2
Cracks in some roads and poor asphalt pavement	4.35	0.839	87
There is not enough lighting on some roads	4.22	0.889	84.4

Lack of traffic signs or indicative land signs on some roads	4.05	0.975	81
Lack of road shoulders (side distance for parking and service)	4.16	0.892	83.2
Lack of pedestrian lanes on some roads	4.27	0.860	85.4
Animals crossing some roads suddenly	3.70	1.143	74
There are no speed cameras on some roads	3.80	1.054	76
Weak security control in some areas	3.85	1.016	77
Total	4.20	0.513	84

3.2.5. Suggestions to Reduce Traffic Accidents

Finally, respondents were asked to rank some suggested ways to reduce traffic accidents in Jordan (see Table 9). In general, respondents agreed on the suggestions offered with 90.8% on average. Among the suggestions, the most important ones according to respondents were to maintain roads and the asphalt surface on an ongoing basis (94.2%), to identify and rehabilitate dangerous sites with a history of frequent accidents (93.6%), to allocate pedestrian crossing places in residential areas (92.8%), to light the streets appropriately (92.6%), and to apply the laws intended to deter traffic violations (91.6%). Previous studies also confirmed that the enforcement of traffic laws would have a positive influence on traffic safety (Detho et al., 2019; Castillo-Manzano et al., 2019; Timmermans et al., 2019; Uzumcuoglu et al., 2018; Jadaan et al., 2018).

Table 9: Respondents' Suggestions to Alleviate or Reduce Traffic Accidents in Jordan

Items	Mean	S.D	%
Ways to reduce traffic accidents (alpha = .908)	4.54	0.474	90.8
Enforcing deterrent laws and traffic violations	4.58	0.700	91.6
Maintaining roads and the asphalt surface on an ongoing basis	4.71	0.556	94.2
Activating the role of schools and universities in raising awareness of the dangers and damage of traffic accidents	4.49	0.691	89.8
Activating the role of mosques and churches in raising awareness of the dangers and damage of traffic accidents	4.38	0.784	87.6
Activating the role of the media by all means to raise awareness of the dangers and damage of traffic accidents	4.53	0.672	90.6
Establishing an adequate public transportation system to reduce the use of private vehicles	4.49	0.789	89.8
Identifying and redesigning dangerous sites with a history of frequent accidents	4.68	0.596	93.6
Providing streets with traffic signs and land signs	4.59	0.649	91.8
Increasing the number of speed control cameras on the roads	4.30	0.922	86
Lighting streets appropriately	4.63	0.630	92.6
Allocating pedestrian crossing places in residential areas	4.64	0.622	92.8
Placing concrete walls or iron railings between the two sides of the roads	4.45	0.744	89
Increasing security and police presence on streets with frequent accidents	4.49	0.740	89.8
Verifying the eligibility of applicants to obtain a driving license.	4.62	0.667	92.4

4. Conclusion

Jordan faces a significant issue with traffic accidents, as the country loses 2-3 percent of its

GDP and two people die in traffic-related incidents every day. In addition to examining the causes of traffic accidents, the study looks into the geographic distribution of high-risk locations for collisions. The study also highlighted the perceptions of Jordanian youth toward traffic accidents in terms of causes and consequences. The results showed that the issue is a real and serious problem in the country and one of the leading causes of death among young people. The number of accidents has gradually increased over the last 20 years in line with the increase in population and the number of registered cars, although there was some decrease in 2020 due to the Covid-19 pandemic and its related quarantine. The results show a stable number of deaths and injuries because of traffic accidents for the period 2000-2022, but with high financial costs. The spatial distribution of traffic accidents in terms of numbers appeared to be consistent with the spatial distribution of population in Jordan, where Amman, Irbid, and Zarqa are the leading governorates in this regard. The descriptive analysis showed that traffic lights, roundabouts, and road intersections are the main dangerous sites with a high number of accidents.

Young people's perception of traffic accidents was also investigated in this study, where 4,919 students at the UJ voluntarily participated in an online questionnaire designed to answer the study questions. The study found a high level of awareness toward traffic accidents among the study sample, with about 90% of participants convinced of the seriousness of traffic accidents and their consequences. In addition, the majority of participants (73.2%) showed personal attention toward the problem. Based on the results, participants believe that human-related factors are more responsible for traffic accidents in Jordan than road environment-related factors (87.6% and 83.2% respectively). Speeding, recklessness or carelessness, and using a mobile phone while driving were the main human-related causes of accidents in Jordan with an average of more than 93%. Additionally, cracks in some roads and poor asphalt pavement, the presence of large slopes in some streets, and poor planning and geometry of cornering areas are the main road environment-related factors. The study suggests the traffic-related official authorities in Jordan take these causes into consideration when planning to reduce the problem and its consequences. In addition, these authorities should lead traffic awareness campaigns for citizens, especially youth. Based on the results, only two variables have significant differences on all dependent variables (PTAP, PATA, and CTA): gender and family income in favor for females and participants from low income families respectively. The researchers' interpretation is that females in general drive for short distances in Jordan, and that they aim to convince the Jordanian community that women are able to drive a car carefully and wisely and without accidents because they live in a male-oriented community. Low income participants also drive with care to avoid costly accidents.

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