Analysis of Fatal Traffic Accidents in Amman City, Jordan

Mohammad N. Al-Marafi, Adli H. Balbissi

Abstract — Highway related accidents are considered one of the most serious problems in the modern world. According to the World Health Organization (WHO), more than 1.2 million people die each year in motor vehicle accidents. Jordan, as one of the developing countries, has high level of traffic accidents. In Jordan, traffic accidents have caused more than 4500 fatalities between the years 2007-2012. The main objective of this study is: to analyze fatal traffic accidents in the capital of Jordan, Amman in order to propose effective countermeasures to reduce the frequency and severity of traffic accidents in Jordan. Fatal accidents data for six years period (2007-2012) was collected from the Central Traffic Department in Amman and from the Jordan Traffic Institute for selected areas inside the capital Amman. The data was analyzed based on accident type, accident time (hour, day and month), victim characteristics (age, gender, location), weather conditions, road surface conditions, light conditions, vehicle type, speed limit, driver fault, road type, road geometric characteristics, education level of driver, and vehicle license type. Geographic Information System (GIS) has been used for the analysis and recording of fatal traffic accidents. Using GIS, the locations of fatal traffic accidents were drawn as points on the Amman City map. After locating the accidents in their proper locations, each year had a separate layer (theme) over the base layer (the map). After that, all other characteristics of the accidents were added. The results of analysis presented the major contributing factors of each of the above analysis elements.

Index Term — Accidents, Fatal Traffic Accidents, Geographic Information System, Countermeasures.

I. INTRODUCTION

The problem of fatalities as a result of road accidents is now acknowledged to be a global phenomenon with authorities in virtually all countries of the world concerned about the growth in the number of people killed on their roads.

According to the World Health Organization (WHO) [1] more than 1.2 million people are killed on the worlds' roads each year, and more than 80% of road deaths occur in low and middle income countries. Jordan is one of the countries that suffer such conditions. Statistics reported by the Jordan Traffic Institute (2012) [2] indicated that 112817 traffic accidents occurred during the year 2012, which has resulted in a total of 818 fatalities at a rate of 2.24 deaths per day and 6.70 fatalities per 10,000 vehicles and 12.80 fatalities per 100,000 population with an estimate of JD 267 million of estimated financial costs.

The capital city of Jordan, Amman, suffers the highest number and majority of traffic accidents fatalities among the other cities of Jordan. For the year 2012, Amman received about 29.4 percent of the total number of accidents fatalities. This reflects the seriousness of the accidents in Amman city compared to other cities in Jordan.

This research is conducted to analyze the fatal traffic accidents for the six years period (2007-2012) based on accident type, accident time (hour, day and month), victim characteristics (age, gender, action), weather conditions, road surface conditions, light conditions, vehicle type, speed limit, driver faults, road type, road geometric characteristics, education level of driver, and vehicle license type. This data was obtained from the Central Traffic Department in Amman. Geographic Information System (GIS) has been used to determine the location of each fatal accident.

In Jordan, road accidents are a serious problem in scale and nature through the extensive human and economic losses. some research papers have investigated the reasons of traffic accidents in addition to the effect of pavement conditions, geometric designs, weather conditions, lighting conditions, speeding , victim gender, age, and the use of geographical information system (GIS) in analyzing Fatal Traffic Accidents.

Al-Balbissi studied the influence of driver gender on road accidents. Accident records for 3 years and for three different income regions were analyzed. Annual distance traveled, social and economic participation, and effect of public vehicle accidents were considered. Effects of environmental factors and driver age were also included. Driver faults analysis identified possible reasons for accident differences. Analysis of accident severity was used to assess degree of harm. Statistical analysis at the 5% significance level was used to evaluate all differences. He found that male accident rates are significantly higher. This trend is consistent through all the analyses. Accident differences are significant only in normal
driving conditions. Drivers over age 50 had the lowest accident rates. Accident rate differences were caused by lack of attention and impatience among male drivers [3].

Al-Masaeid investigated the effect of pavement condition, road geometry, and roadside conditions on rural road accidents and found that the pavement condition had significant effect on single- and multiple vehicle accident rates, but no statistical influence on the total accident rate. Further, the number of sharp horizontal curves and the roadside condition were found to have a significant effect on single-vehicle accident rates. The number of vertical curves and the number of intersections were found to have a significant influence on multiple-vehicle accidents [4].

Edwards (1999) investigated the relationship between weather and road accidents in England and Wales. The weather information recorded on Police Accident Report Forms was taken as the prevailing weather at the time of the accident. At the local authority level, accident severity for the various adverse weather categories of rain, fog, and high winds is compared with the non-hazardous condition of fine weather. Severity ratios are then calculated. The author found that accident severity decreases significantly in rain compared with fine weather, while severity in fog shows geographical variation. Evidence for accident severity in high winds remains inconclusive [5].

Obaidat investigated the potential of utilizing Geographic Information Systems (GISs) in identifying hazardous pedestrian-accident-prone locations. The study was performed for roads in Irbid city-Jordan for the years 2002 and 2003. Pedestrian accident data were analyzed by pedestrian characteristics, driver characteristics, accident time and location, environmental conditions, vehicle speed and characteristics, and accident severity. Pedestrian accidents were correlated to operational factors, including traffic volume, vehicle speed, pedestrian volume, street length, and access points. Hazardous locations of vehicle-pedestrian accidents as were identified using a GIS query builder. Results showed that there was a high potential for GISs in studying pedestrian accidents [6].

Yannis et al. investigated the effect of lighting conditions on the frequency and severity of road accidents at both urban and rural roads in Greece. A total of 358485 police-recorded accidents were analyzed and the proposed models were developed with the use of log-normal regression. The application of these models allowed the investigation of the influence of road lighting and other parameters such as weather conditions, accident type and vehicle type on the number of casualties and injuries. It appears that road lighting contributes to the reduction of the number of accidents and their severity and that this influence increases with the increase of the severity of the accidents. The absence of street lighting during nighttime has the highest impact on the number of fatalities and serious injuries. They found that nighttime lighting has great potential in improving traffic safety and reducing the accident severity, especially for fatal and serious injuries accidents [7].

II. SIGNIFICANCE AND OBJECTIVES OF THE RESEARCH

The problem of traffic accidents is a major problem in the Hashemite Kingdom of Jordan and represents a serious safety and economic challenge for the state. Traffic accidents are considered the second leading cause of death. The Fatality Rate (FR) in Jordan equal 6.00 fatalities per 10,000 vehicles in year 2011. This value is high when compared with several other selected countries covering a wide range of traffic conditions and variety of traffic fatalities at the same year. These countries included the United States of America (2.60), Sweden (0.70), Romania (4.70), Egypt (1.10), and Qatar (2.50). In addition, the costs of traffic accidents in Jordan were estimated to be about JD 267 million (US$ 376) in the year 2012. This was equivalent to about 1.23 percent of the National Domestic Product of Jordan (JD 21751.8 million).

Figure 1 shows the percent of fatalities in the Kingdom and Amman City during the study period (2007-2012) for each month. It can be clearly seen that September is the most hazardous month and Amman Governorate, is the one with highest fatalities (9.9 %) of the total number of fatalities in the Kingdom.

The financial, economic, cultural and sociological losses associated with traffic accident increase the engineering responsibility to conduct studies that will enable better understanding of the causes that will lead to finding solutions. This research is an effort on this track which will help in understanding the problem of fatal traffic accidents in Amman city and recommend suitable measures for reducing such type of accidents. The main objectives of this study are:

1. To analyze the fatal traffic accidents in the study area of Amman which will include; Al Naser, Al Abdali, Tlaa El Ali, and Sweileh districts. This study area covers about one third of the city and includes most of government agencies and private sector companies in Amman. The data were analyzed based on accident type, accident time (hour, day and month), victim characteristics (age, gender, action), weather conditions, road surface conditions, light conditions, vehicle type, speed limit, driver faults, road type, road geometric characteristics, education level of driver, and vehicle license type.

2. To identify the fatal traffic accidents prone locations (which have the highest number of fatal traffic accidents) in the study area.

3. To find the best countermeasures and solutions and apply these solutions in order to reduce the number of fatal traffic accidents.
III. METHODOLOGY

The capital Amman (largest city in Jordan) was selected as a study area. To accomplish the objectives of this study, data on fatal traffic accidents were obtained from traffic directorate from the Central Traffic Department in Amman and Jordan Traffic Institute for the years 2007 - 2012. Data were organized in statistical tables and prepared in order to represent data in an easy and illustrative manner.

Geographic Information System (GIS) has been used for the analysis and recording of fatal traffic accidents. Using GIS, the locations of traffic accidents were drawn as points on Amman city map. After locating the accidents at the proper locations, each year had a separate layer (theme) over the base layer (the map). After that, all other characteristics of the accidents were added.

IV. STUDY AREA AND DATA COLLECTION

The study area is the part of Amman City which consists of Al Naser, Al Abdali, Tlaa El Ali, and Sweileh. This study area covers about one third of the city and it represents the variety in traffic volume and population activity in the city as shown in Figure 2. The number of fatal traffic accidents occurred in the study area during the study period from 2007 to 2012 was 136 fatal traffic accidents; this data collected from Central Traffic Department in Amman which is responsible for recording all traffic accidents in the city and then download the locations of the fatal accidents at the GIS software using the Google Earth program and Jordan Map to identify the location of each fatal accident in the study area. Figure 3 shows all fatal accidents locations from the year 2007 to the year 2012 in the study area.

V. ANALYSIS AND RESULTS

A total of 145 traffic accident fatalities have occurred in the study area during the six years (2007-2012). These fatalities were analyzed in the following sections based on accident type, time of the day, day of the week, month of the year, weather condition, vehicle category, speed limit, driver faults, victim age, victim gender, light conditions, road surface conditions, weather conditions, victim action, road type, number of lanes per direction, road geometric characteristics, and driver education level.

A. Distribution of fatalities by time of day

It was found that traffic accidents fatalities are more frequent during the period (15:00 – 15:59) with 9.0 % of the total number of accidents fatalities occurring in this period, followed by (18:00 – 18:59) with 8.3 %, as shown in Table I. These time intervals represent the peak traffic and pedestrian activities in the study area because it is the end of the working hours for both government agencies and private sector companies in Jordan.

<table>
<thead>
<tr>
<th>Time of Accident</th>
<th>Number of Fatalities</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>00:00 – 00:59</td>
<td>9</td>
<td>6.2</td>
</tr>
<tr>
<td>01:00 – 01:59</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>02:00 – 02:59</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>03:00 – 03:59</td>
<td>5</td>
<td>3.4</td>
</tr>
<tr>
<td>04:00 – 04:59</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>05:00 – 05:59</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>06:00 – 06:59</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>07:00 – 07:59</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>08:00 – 08:59</td>
<td>6</td>
<td>4.1</td>
</tr>
<tr>
<td>09:00 – 09:59</td>
<td>7</td>
<td>4.8</td>
</tr>
<tr>
<td>10:00 – 10:59</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>11:00 – 11:59</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>12:00 – 12:59</td>
<td>6</td>
<td>4.1</td>
</tr>
<tr>
<td>13:00 – 13:59</td>
<td>9</td>
<td>6.2</td>
</tr>
<tr>
<td>14:00 – 14:59</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>15:00 – 15:59</td>
<td>13</td>
<td>9.0</td>
</tr>
<tr>
<td>16:00 – 16:59</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>17:00 – 17:59</td>
<td>10</td>
<td>6.9</td>
</tr>
<tr>
<td>18:00 – 18:59</td>
<td>12</td>
<td>8.3</td>
</tr>
<tr>
<td>19:00 – 19:59</td>
<td>4</td>
<td>2.8</td>
</tr>
<tr>
<td>20:00 – 20:59</td>
<td>5</td>
<td>3.4</td>
</tr>
<tr>
<td>21:00 – 21:59</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>22:00 – 22:59</td>
<td>2</td>
<td>1.4</td>
</tr>
<tr>
<td>23:00 – 23:59</td>
<td>6</td>
<td>4.1</td>
</tr>
</tbody>
</table>

B. Distribution of fatalities by day of the week

Table 2 shows the number of traffic accidents fatalities during the day of the week. It was noticed that Thursday and Sunday in the week had the maximum number of fatal traffic accidents. 19.3 percent and 16.6 percent of the total number of traffic accidents fatalities occurred on Thursdays and Sundays, respectively. In Jordan, Sunday is the first working day of the week and Thursday is the last working day of the week.
Therefore, it might be that people on the first business day of the week are normally more nervous and tense than on other days, and on the last business day of the week they rush to go home to do activities and enjoy. In addition, these two days are characterized by more traffic and pedestrians activities.

Fig. 2. Map Image for Study Area (Al Naser, Al Abdali, Tlaa El Ali, and Sweileh)

Fig. 3. The Locations for all Fatal Traffic Accidents in study area from 2007 to 2012
C. Distribution of fatalities by month of the year

Monthly distribution of traffic accidents fatalities indicated that July has the highest numbers of fatalities with 11.7 percent. This summer month has long, warm, and active days, and with school holiday, in addition to the presence of large number of visitors (e.g. Jordanian expatriates). Months of November and September follow with 11.0 and 10.3 percent respectively as shown in Table III.

D. Distribution of fatalities by weather conditions

To investigate the effect of weather conditions on traffic accidents, the number of traffic accidents fatalities per weather condition was recorded for all possible weather conditions in study area including: Clear, Rain, Snow, and Fog. The maximum percentage of the accidents fatalities happened when the weather condition was clear with 92.4 % and only 0.7 % of fatalities have occurred during Snow and Fog conditions as shown in Table 4. This result referred to that in winter season during the time of snow or fog drivers tend to travel at speeds low enough to reduce fatalities when crashes occur.

E. Distribution of fatal traffic accidents by vehicle category

In all years investigated, the highest percent of fatal traffic accidents 74.7 % are caused by small passenger cars, followed by Trucks 9.8 % and then dual purpose vehicle 9.2 % as shown in Table 5. This was expected because small passenger cars form the largest component of the traffic fleet in Jordan especially in urban area.

F. Distribution of fatalities by speed limit

It can be observed from Table 6 that the highest number of traffic accidents fatalities in study area occurred at speed limit of 60 km/hr with 40.7 %, followed by 50 km/hr. and 40 km/hr. with 22.8 % and 21.4 % respectively. Posted speed limits in study area ranged between 40 and 60 km/hr. the result showed that even such moderate levels of urban speed limits fatalities where greater at higher speeds.

G. Distribution of fatalities by driver faults

The major identified driver fault was sudden deviation with 30.6 percent followed by exceeding speed limit with 10.6 percent, and then not giving priority to pedestrians with 10.0 percent as shown in Table 7. On the other hand, driving under the influence of alcohol, incorrect bending and turning, and loss of control while driving had the lowest percentages; 0.6, 1.9 and 1.9 percent of the total number of fatalities respectively during the study period from 2007 to 2012.
H. Distribution of fatalities by victim age

The age groups of victims were also addressed in this study. The maximum percentage of accidents fatalities was for the age groups (16-20), (21-25), (26-30), and (36-40) as shown in Table 8. These outcomes are rational because of most population of Jordan are young and 62.7% (about two thirds) of registered drivers in Jordan are indeed young drivers in the age group of 18-40 years adding that some young drivers are commonly reckless and inattentive during driving.

I. Distribution of Fatalities by Victim Gender

It was found that about 82.1 percent of the total number of fatalities was males and only about 17.9 percent was females as shown in Table 9. This was expected since males get involved in more outdoor activities as compared to females. In addition, females constitute a small proportion of Jordanian drivers and are more abiding to traffic regulations including the use of safety belts, thereby reducing both their accident probability and the chance of getting harmed by the accident. Furthermore, many females do not report (under-reporting) their accidents.

J. Distribution of Fatalities by Accident Type

It can be observed that collision with pedestrian has the maximum percentage of fatalities with 64.1 percent of the total number of traffic accidents fatalities followed by car collision with 24.1 percent as shown in Table 10. On the other hand, only 6.2 and 5.5 percent were the contribution of the turnover accidents and collision with fixed object, respectively.

K. Distribution of Fatalities by Light Conditions

The numbers of traffic accidents for three light conditions were recorded. The light conditions included: day light, night with sufficient (street) light, and night with insufficient (street) light. It was found that about 63.4 percent of the traffic accidents fatalities occurred under the day light condition,
about 30.3 percent have occurred during night with sufficient light, and only 6.2 percent have occurred during night with insufficient light condition as shown in Table 11. These results are expected because this study was conducted for the urban area of the city where most of pedestrian trips end before sunset.

**TABLE XI**

DISTRIBUTION OF FATALITIES BY LIGHT CONDITION

<table>
<thead>
<tr>
<th>Light Condition</th>
<th>Number of Fatalities</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day light</td>
<td>92</td>
<td>63.4</td>
</tr>
<tr>
<td>Night With Sufficient Light</td>
<td>44</td>
<td>30.3</td>
</tr>
<tr>
<td>Night with Insufficient Light</td>
<td>9</td>
<td>6.2</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**L. Distribution of Fatalities by Surface Conditions**

It is commonly known that the road pavement surface condition influences the occurrence of fatal traffic accidents. Subsequently, different pavement surface conditions were considered in this study to investigate the effect of the surface condition on fatal traffic accidents. They included: Dry, Wet, and Snowy. The number of accidents fatalities per each pavement surface condition was recorded. The highest percentage (90.3%) of fatalities occurred when the pavement surface condition was Dry as shown in Table 12.

**M. Distribution of Fatalities by Victim location**

The maximum percentage 51.7% of the accidents fatalities happened while the victims were crossing the road as shown in Table XIII. Without clear and marked crosswalks, which is the case at most Amman streets, pedestrians cross the streets randomly resulting in more accidents fatalities.

**TABLE XII**

DISTRIBUTION OF FATALITIES BY SURFACE CONDITION

<table>
<thead>
<tr>
<th>Road Surface Condition</th>
<th>Number of Fatalities</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry</td>
<td>131</td>
<td>90.3</td>
</tr>
<tr>
<td>Wet</td>
<td>13</td>
<td>9.0</td>
</tr>
<tr>
<td>Snowy</td>
<td>1</td>
<td>0.7</td>
</tr>
<tr>
<td>Total</td>
<td>145</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**N. Distribution of Fatalities by Road Type and Number of Lanes**

Table 14 shows the number of traffic accidents fatalities by road type (divided, undivided) and number of lanes per direction. The maximum percent of fatalities have occurred at two-lane divided roads with a percent of 44.8%, followed by 26.9% have occurred at three-lane divided roads, and 11.0% have occurred one-lane undivided roads.

**O. Distribution of Fatalities by Road Geometric Characteristics**

It is commonly known that the road geometric characteristics influence the occurrence of fatal traffic accidents. Subsequently, different pavement surface conditions were considered in this study to investigate the effect of the surface condition on fatal traffic accidents. They included: straight and flat, straight and downgrade, straight and upgrade, curve and flat, curve and downgrade, and curve and upgrade. The number of accidents fatalities per each road geometric characteristics was recorded. The highest percentage 86.9% of fatalities occurred when the road geometric characteristic was straight and flat as shown in Table XV.

**P. Distribution of Fatal Accidents by Driver Education Level**

Table 16 shows the number of fatal traffic accidents by driver education level (educated, uneducated). The maximum percentage of fatal accidents has occurred when the drivers are educated with a percent of 73.9%, whilst 26.1% have
occurred for uneducated drivers.

The higher percentage of fatalities among educated people is a reflection of the high percentage of educated people in Jordan which amounts to about 90%. However, this result may indicate that education level does not have major influence on reducing fatal traffic accidents.

**Q. Distribution of Fatal Traffic Accidents by Vehicle License Type**

The numbers of different vehicle license types involved in fatal traffic accidents in the study area from 2007 to 2012 are shown in Table 17. In all years investigated, the highest percent of fatal traffic accidents 81.0 % are caused by Private vehicles, followed by public vehicles 12.6 %. This was expected because Private vehicles form the largest component of the traffic fleet in Jordan.

**R. Distribution of Fatal Accidents on Major Streets in Study Area**

Table 18 shows the number of fatal traffic accidents that occurred on the major street inside the study area during the study period. The maximum percentage of the fatal accidents happened on Queen Rania Al Abdallah Street with 22.4 %. This result is expected because this street goes through most of Private and government institutions including Jordan University, Al Essra Hospital, Alrai Newspaper, and Jordan university Hospital.

**VI. SUMMARY**

Amman city was taken as an example to investigate the characteristics of fatal traffic accidents for sex years period (2007-2012). Data were obtained from the Central Traffic Department in Amman. Each Fatal accident was located on Amman streets map using geographic information system (GIS) software with assistance of Google Earth program.

Analysis was made to the extracted data from the original police reports with focus on the fatal traffic accidents occurred in study area during that period

**VII. GENERAL RECOMMENDATIONS**

Although it is not possible to eliminate completely fatal traffic accidents on the streets and highways, it is surely possible to reduce the current number of fatal traffic accidents if correct and appropriate measures are taken. To help achieving this goal, the following recommendations are made.

- Warn the public of local hazardous road locations that have been identified and mapped out using the Geographic Information system (GIS).
- Enforce traffic laws in congested areas, downtowns, and business district areas not only for wrong and double parking but also for speeding, zigzagging, and other hazardous traffic movements.
- Provide good lighting systems on streets especially in congested areas.
- Sidewalks and street curbs should be always monitored to ensure their availability for pedestrians only and not for retailing and other activities.
- Drivers who tend to make high number of traffic violations of certain types within a given period of time must have their driving licenses suspended for a certain period of time as a punishment rule.
- Using intelligent transportation systems (ITS) to improve traffic. For example, drivers could be encouraged to use alternative routes rather busy roads during peak hours, which in turn would reduce potential accidents.
## TABLE XIX
### MAJOR CONTRIBUTORS TO FATAL ACCIDENTS

<table>
<thead>
<tr>
<th>Comparison theme</th>
<th>Major contributor</th>
<th>% of total accidents</th>
<th>Suggested solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Time of day</td>
<td>15:00 – 15:59</td>
<td>9.0</td>
<td>Introduce variation in end of working hours</td>
</tr>
<tr>
<td>2- Day of the week</td>
<td>Thursday</td>
<td>19.3</td>
<td>Impose more police control on Thursday</td>
</tr>
<tr>
<td>3- Month of the year</td>
<td>July</td>
<td>11.7</td>
<td>Impose more police control in this month</td>
</tr>
<tr>
<td>4- Weather conditions</td>
<td>Clear</td>
<td>92.4</td>
<td>Traffic laws should be enforced on this weather</td>
</tr>
<tr>
<td>5- Vehicle category</td>
<td>Small Passenger Car</td>
<td>74.7</td>
<td>More law enforcement on this type of vehicles on the road</td>
</tr>
<tr>
<td>6- Speed limit</td>
<td>60 km/hr</td>
<td>40.7</td>
<td>Investigate the advantage of imposing speed range</td>
</tr>
<tr>
<td>7- Driver faults</td>
<td>sudden deviation</td>
<td>30.6</td>
<td>Apply law enforcement on drivers who commits these violations even without accident occurrence</td>
</tr>
<tr>
<td>8- Victim age</td>
<td>(16-20) years</td>
<td>12.4</td>
<td>Enforce the use of safety belts on drivers and provide protected pedestrian facilities</td>
</tr>
<tr>
<td>9- Victim Gender</td>
<td>Male</td>
<td>82.1</td>
<td>Improve driver awareness</td>
</tr>
<tr>
<td>10- Accident Type</td>
<td>Collision with Pedestrian</td>
<td>64.1</td>
<td>Protected pedestrian facilities should be provided</td>
</tr>
<tr>
<td>11- Light Conditions</td>
<td>Day light</td>
<td>63.4</td>
<td>Impose more police control in this condition</td>
</tr>
<tr>
<td>12- Surface Conditions</td>
<td>Dry</td>
<td>90.3</td>
<td>Impose more police control in this condition</td>
</tr>
<tr>
<td>13- Victim location</td>
<td>Walking on road</td>
<td>51.7</td>
<td>Protected pedestrian facilities should be provided and safety measures should be implemented on locations where walking on road is dangerous</td>
</tr>
<tr>
<td>14- Road Type and Number of Lanes</td>
<td>two- lane divided roads</td>
<td>44.8</td>
<td>Impose more police control</td>
</tr>
<tr>
<td>15- Road Geometric Characteristics</td>
<td>Straight and Flat</td>
<td>86.9</td>
<td>Implement traffic calming measures</td>
</tr>
<tr>
<td>16- Driver Education Level</td>
<td>Educated</td>
<td>73.9</td>
<td>Improve driver awareness</td>
</tr>
<tr>
<td>17- Vehicle License Type</td>
<td>Private</td>
<td>81.0</td>
<td>Improve driver awareness</td>
</tr>
<tr>
<td>18- Major Street in Study Area</td>
<td>Queen Rania Al Abdallah</td>
<td>22.4</td>
<td>Implement traffic calming measures</td>
</tr>
</tbody>
</table>

### REFERENCES