Studying and Analysis of crash severity for different Expressways on Al-Rusafa side for Baghdad city using Binary Logistic Regression Model

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Abstract: Nowadays, in Iraq, especially Baghdad, many accidents are recorded daily, and the occurrence is different in terms of severity (fatal, injury, property damage only) with different seasons, days and even times, as a result of the anxiety and great concern that these accidents pose on the part of drivers of these highways. Therefore, this study has become necessary to find out the causes which have direct interference with the accident impact on these roads. On the other hand, many researchers in the field of traffic engineering in Iraq didn't address the severity of accidents on highways. In addition, this study is the first to find out the main causes of accidents for the most important main and vital highways that are used on a daily basis by drivers on the Al-Rusafa side in Baghdad (Mohamed Al-Qasim Expressway, Army Canal expressway). Furthermore, the data utilized in this research consists of a sample size of (236) forms and it was collected from traffic officers for period 2006 to 2019. After analysis by using Logistic Regression Model, there are three variables closely linked to the severity of accidents on Mohamed Al-Qasim Expressway (cause of an accident like (wrong turn, loss of control, closing (safety distance), vehicle body type, speed). Also, and four variables on Army Canal Expressway (road condition, day, vehicle body type, speed) resulting from the Binary Logistic Regression model.

Keywords: Accident severity; Binary Logistic Regression Model; Mohamed Al-Qasim expressway; Army Canal expressway; Highway’s accident.

1. Introduction

The crash normally known as a traffic accident or crash occurring where a car crash with another vehicle crashes, including pedestrians, animals, barriers to roads or other fixed objects such as a wall or utility post. Traffic crashes can lead to injuries, death, vehicle damage and property damage. Furthermore, driving experience, driving skills, vehicle design, road design and road conditions lead to collisions[1]. Iraqi society's lives have been affected by extremely serious road accidents in Iraq that are similar to the existing terrorist activity, which has become one of the major problems reducing our human resources and causing socioeconomic problems and human resources losses. Hence, traffic incidents were known for several years
as either an element to consider the differences within traffic accidents and specific transport networks. Furthermore, there are insufficient road safety specialists, and actual experiences are limited to few Iraqi experts, the division of these experts as well as the lack of management personnel for road safety are also lacking[2]. Accidents in road traffic affect road productivity and contribute to congestion. The pause depending on the type/duration of a collision, the number of roads involved in the crash, the reflexes to the crash and the time needed to restore the road services[3]. In Iraq (one of the Middle East's advanced countries), Traffic accidents in several other countries were one of the major deaths occur. The increase in vehicle coach's prevalence seems to be the greatest difficulty without fixing the transportation infrastructure (e.g. construction of new roads or using new traffic system)[4]. Furthermore, the severity of road accidents and thus the enhancement of safe driving, due to loss of human lives and economic and social costs, is an essential issue to communities[5]. Hence, the severity of accidents should be determined on the basis of the accident scene's current circumstances. The sole derogation from this provision is especially regarding fatal accidents. If any injury causes a fatality, the injury's special status should be changed to a fatal injury, within a certain minimum amount of time after a road car crashing. The definition of a fatality in road travel varies between countries. In the United States, the definition used in the Fatality Analysis Reporting System (FARS) [6], which is using by the National Highway Traffic Safety Administration (NHTSA) [7], that The fatality of road traffic is an individual person who actually dies within 30 days of a public road fatal collision involving a car with an engine (NHTSA, Fatality Analysis Reporting System, 2010). A 12-month law to count accidental deaths used further below World Health Organization processes and procedures for the investigative reporting of fundamentally important United States statistics [8]. Greece, Portugal and Spain in the European Union hunt 24 hours, France employ 6 days; Italy indent 7 days to count numbers of casualties on roads [9].

2. literature review

The study is divided into two parts and focuses on several studies on road incidents at regional and international levels.

2.1 Previous local studies

Some of past studies in Iraq are briefly reviewed here. Studies of accidents in the traffic are rarely carried out in the city of Baghdad, especially on highways.[10], found a cross-sectional hospital analysis in the city of Hillah focused on the data gathered for 5 months from the city's Central Hospital (May- November 2013). The research aimed to examine some of Road Traffic Accidents victims' sociodemographic attributes, the authors conclude that about half of the drivers had no driving licenses and 59% had an experience of prior exposures to RTAs, 83% were male and 76% were urban and 69% were exposed to RTAs during the day. [11], found The expert system for RTAs has been developed which offers expert advice for the area of road safety in Iraq. There are two stages in the system. The first one is a diagnostic phase and the second one is a remedial phase. This expert method aimed at reducing the number of RTAs. [12], A study of traffic accidents in Iraq for the period from 2005 to 2017 showed the classification of traffic injuries according to the number of deaths and injuries during the accident. The highest rates of traffic accidents were recorded in the period from 2014 to 2017. This increase was a result of not taking security precautions in addition to safety precautions, as the results of that study from 2014 to 2017 for these years where the number of injuries increases by 12% over previous years and the number of deaths due to accidents increased in 2017 by 21% of previous years.

2.2 Previous International Studies

Researchers have employed many statistical techniques to analyze driver injury severity. Among these techniques were multinomial logit, nested logit, and ordered logit and probit models. [13], Estimated logit model nested to predict severity of accident. In three collision
cases, three different versions are calibrated: single-vehicle, dual or multi-vehicle collisions. Crash dynamic concept, seating posture, belt usage, car condition, vehicle mass, driver's behavior and driver action are all factors that influence the amount of injury suffered by people involved in traffic accidents. In the simulations the conditions of the road surface is negligible. Bad weather can lead to drivers slowing and maintaining a reasonable distance from other cars. [14], The logistic regression model has analyzed risk factors in road crashes. The main risk factors for injuries caused by road crashes, travel causes, the intake of drugs, Mexico-Cuernavaca highway, on weekdays, during daylight hours and under adverse weather, have been identified in this study. [15].Using Ordered Probit Model to Analysis Accident Severity this research aims to classify the contributing factors influencing crash gravity by using an ordered probit model with a wide range of driving properties, road attributes, vehicle form, peat characteristics and crash characteristics. In order to demonstrate the parameter estimation process, the recorded crash in Singapore from 1992 to 2001 was used. Several aspects such as car type and road type were found to be associated with seriousness, including the type of crash, place type, age of pedestrian and time of accident. In the three forms of injuries analyzed, it was also observed that seriousness of damage reduces over time. [16].A binary model of logistic regression has been designed to classify crash-related variables in built-up areas along Nevada Rural highways, The vector was a biological variable in this article (injury or no injury). Descriptive data shows that more collisions have occurred with variables like favorable weather, driver, route, etc. For the binary logistic regression model, the total effects of the forecast variables were estimated. Factors such as 4-hour categories of time, weekday; month; car primary type, and vehicle factor had a significant impact on injury injuries, as seen in the results.

3. Data source and Area of study
The field data are collected for the identified (Mohamed Al-Qasim Expressway, Army Canal Expressway) were Figure 1 shows the satellite image show the location of these Expressways. in this research, the required data collection period for specific years. In Iraq, traffic accidents are analyzed and studied based on data, and these data are of two types. Either by preparing a questionnaire and distributed it to a certain number of people who are often participants in a specific traffic accident and ask them several questions and then collect that data and analyze, or depend on government sources, which are more comprehensive as it was collected from hospital records, police stations, or traffic sectors. Furthermore, accidents data available at Central Statistical Organization Iraq (CSO) are in traditional view (not in specific information) and cannot be examined in detail, particularly when the intensity of accidents is evaluated. Hence, the Iraqi ministry is concerned with recording and classifying accidents, which is the Ministry of the Interior - the General Directorate of Criminal Statistics, the only source of data for crashes is in Iraq forms filled out through traffic police officers. The main source of road accident data in Iraq (particularly Baghdad) is the traffic police sector. Therefore, in this study, the data gathered from traffic officers have been limited to crash accidents 236 forms, which contain information as shown in Table (1). Possible copies of accident reports have been collected manually from traffic officer's sectors in a random process during period of study from 2006 and 2019. The objective is to identify factors that could affect the severity of the incident (injury plus PDO accident or fatal accident); eight independent variables were summarized from collected collision accident forms. The Table (1) below shows the levels and the description for dependent variable and independent variables.

| Variable class | Variables | Percent of Accidents | Percent of Accidents |
|---------------|-----------|----------------------|----------------------|
|               | (Mohamed Al-Qasim Expressway) |                     | (Army Canal Expressway) |
### Dependent variable

| Accident severity | Injury + PDO | 88.7%  | Fatal | 11.3%  |
|-------------------|-------------|--------|-------|--------|

### Independent variable

#### Contributing Factors

| Factor                      | Percentage |
|-----------------------------|------------|
| Driver                      | 83.4%      |
| Vehicle                     | 4.6%       |
| Vehicle and Driver          | 3.3%       |
| Unspecified *               | 8.6%       |

#### Road Condition

| Condition  | Percentage |
|------------|------------|
| Dry        | 92.7%      |
| Wet *      | 7.3%       |

#### Weather

| Condition  | Percentage |
|------------|------------|
| Sunny      | 91.4%      |
| Rainy      | 7.3%       |
| Fog        | 0.7%       |
| Cloudy *   | 0.7%       |

#### Seat belt

| Condition | Percentage |
|-----------|------------|
| Yes       | 4.6%       |
| No *      | 95.4%      |

#### Speed (estimate) during the accident (km/hr)

| Speed | Percentage |
|-------|------------|
| 90    | 12.9%      |
| 100   | 8.2%       |
| 110   | 1.2%       |
| 120   | 16.5%      |
| 130   | 18.8%      |
| 140   | 17.6%      |
| 150   | 4.7%       |
| 160   | 11.8%      |
| 170   | 0%         |
| 180   | 5.9%       |
| 190   | 1.2%       |
| 200   | 1.2%       |

#### Day

| Day          | Percentage |
|--------------|------------|
| Weekday      | 70.2%      |
| Weekend *    | 29.8%      |

#### Causes

| Cause                               | Percentage |
|-------------------------------------|------------|
| Unspecified                         | 9.3%       |
| Parking on highway                  | 0.7%       |
| Wrong turn                          | 7.9%       |
| Loss of control                     | 22.5%      |
| Alcohol                             | 0.7%       |
| Lack of attention                   | 21.2%      |
| Closing (safety distance)           | 13.9%      |
| Sudden stopping and lack of attention | 5.3%      |
| Wrong overtaking                    | 6.6%       |
| Lane changing (path of driving)     | 2.0%       |

* Percentage may not sum to 100 due to rounding.
|                  | 2.0% | 0    |
|------------------|------|------|
| Tire condition (tire explosion) |      |      |
| Tire condition (tire explosion) and Loss of Control |      |      |
| Brake            | 2.0% | 4.7% |
| Moving against traffic (wrong side) | 0.7% | 0    |
| Vehicle defect * | 2.0% | 1.2% |
| Vehicle Body type |      |      |
| Truck involved   | 20.5%| 44.7%|
| Non-truck involved * | 79.5%| 55.3%|

**Description of data**

- a: refers to the reference category.
- Fatal: one Person or more is killed in the motor vehicle crash suddenly or within 30 days.
- Injury: one person or more was injured when the accident occurred.
- Seat belt: Safety belt wear by drivers, while collecting accident data from highways in Baghdad, interviews conducted with traffic officers, the statistics they had about wearing seat belts by the driver and passengers were the highest recorded rate of (5%), referring to the WHO report on the enforcement of the seat belt law in Iraq, where a scale was used to determine the degree of enforcement based on the opinion of the respondents, the scale ranges from 0 to 10 where 0 is ineffective and 10 is very effective, in Iraq the enforcement was 8 [17].
- Speed during the accident: An official letter issued by the General Traffic Directorate in 2008, in which the speed limit was determined on all roads in Iraq, the speeds were for both Expressways Mohamed Al-Qasim Expressway and Army Canal Expressway 100 km/h, according to World Health Organization Report speed limit for urban road in Iraq is 100 km/h [17].

**Figure (1):** Shows the satellite image represents Location of (Mohamed Al-Qasim Expressway) and (Army Canal Expressway) (source: Google Maps [18] [19]).

**4. Data Analysis by Binary Logistic Regression Model**

Logistic regression provides a method for modeling a binary response variable, which takes values 1 and 0, data are analyzed by binary logistic regression to find out (describe) the relationship between the dependent variable and the independent variables, this results in a change in the odds ratio of the occurrence of significance detected by each variable, through evaluating the relationship of all variables together, the advantage of logistic regression is to eliminate confusing results, the objective of this analysis to establish the relationship between the response variables and independent variables in binary logistic regression and to classify
the relative value of independent variables. The logit model in the sample is a logarithm of odds. Hence, a discrete dichotomous variable comes in two types which is the dependent variable 0 for injury plus PDO and 1 for fatal, therefore, one of the dependent variable types (severity) has to be omitted from the model and used as a reference case for the estimate of the BLR model. In this research, non-fatal injuries (injury, property damage only) were used as a basic group. Table (1) summarizes the factors examined in BLR model.

Researchers have employed many statistical techniques to analyze driver injury severity, among these techniques were multinomial logit, nested logit, ordered logit, probit models and binary logistic regression \[13,16,20,21,22,23,24]\). The BLR can be mathematically expressed as in the following equation:

$$\text{Logit} (P) = \ln \left( \frac{p}{1-p} \right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i$$

(1)

Where,

- P is the Probability of fatal accident,
- \( \alpha \) is the model coefficient,
- \( \beta_i \) is the regression coefficient
- and \( X_i \) is the independent variable.

In the Binary Logistic Regression Model, the approximate change in log odds is the fatal accident of each coefficient in a unit increase. Wherever, other explaining factors being consistent in the respective factor. For a factor, the coefficient of odds ratio (OR) is an exponential of the coefficient. Therefore, the (OR) applies to how many severe collisions are preferred to one-factor value (for example, on the weekday) as opposed to the reference case value (for instance, weekend). Hence, if (OR) is greater than 1, the inspecting factor is more likely to be in a fatal collision than the reference variable value. Only certain variables for coefficient values of 0.05 alpha were found effective predictors for this model, the independent parameters (factors) of the BLR model only are deemed confident when they are important in their significance at a level of 0.05 alpha. Some tests conducted for data, especially for independent variables, when analyzing by the method of BLR to find out the effectiveness and participation of the entered data in the general model census.

SPSS (version 25) software, Gretl software, and Microsoft Excel worksheet were used to analyze the collected data. During the analysis, this data must pass several tests to ensure that the data fit the model and its correct implementation like (Likelihood Ratio test, Goodness of fit test).

### 4.1 Likelihood ratio test

The effect of any independent variable on the outcome can be tested using the likelihood ratio (LR) test. If the independent variable contains M types, so each independent variable \( X_i \) will have an M − 1 non-redundant coefficient \( \beta_i \). \( (X_i) \) does not influence the dependent variable, the zero hypothesis. The LR test should be used to test the theory. First, the whole model that includes all independent variables with the LR statistics LRF resulting in the LR estimates. Secondly, the LR estimates a limited model built with the resulting LR statistical LRR excluding independent \( X_i \) variable. Finally, the LR calculates the variance of the chi-square LRF and LRR. The LR statistics are calculated in log-likelihood LL as follows equation:

$$LR = [-2 \text{LL (of full model)}] - [-2 \text{LL (of restricted model)}]$$

(2)

It can be concluded from the likelihood ratio test that the independent variables (expectation) are effective and participate in predicting the outputs, in the general model statistics, if the values of (P) are less than 0.05 at a confidence level of 95 percent. This means that all the independent variables in the model are not equal to zero and all of them are actually involved in modeling the crash severity for each highway as shown in Tables (2) and (3).
4.2 Goodness of fit statistics test

To determine the suitability of the model in the binary logistic regression, a test Goodness of fit must be performed and extracted by two tests: the general Hosmer-Lemeshow test and the classification table. As for the Hosmer-Lemeshow test, it is used to measure suitability in order to determine whether the expected events are identical with the observed events, as the value of this test in the binary regression model is the Pearson's chi-squared statistic in the table of frequencies for the observed and expected events.

In regards to the HL test, a further method to assess the Goodness of fit of the BLR model. Is the classification table in classification table the real (observed) variable values are categorized to find the right portion of the anticipated events, and the predicted values (at a user-assigned cut-off point, e.g. P = 0.5) are classified. If the expected P is less than or equivalent to 0.5, the statistical proportion assumes that the occurrence does not exist, but otherwise. The overall proportion reflects the total percentage of cases accurately determined by the full model.

Tables 2 and 3 showed the effects of both methods. As is evident, all the tests of the BLR model are successful as the value of (P) in the likelihood ratio test were it is less than (0.05), and its value in the goodness of fit is greater than (0.5). This indicates that the binary model works well with usable data sets.

**Table (2).** Results of Tests for Binary Logistic Regression Model for Mohamed Al-Qasim Expressway.

| The LR statistic Results | P-value |
|--------------------------|---------|
| LR statistic             | P-value |
| 66.493                   | 0.000   |

**The Generalized Hosmer-Lemeshow Results**

| Chi-Square value | P-value |
|------------------|---------|
| 3.894            | 0.867   |

**The classification Table Results**

| Overall % correct | 98.7% |

**Table (3).** Results of Tests for Binary Logistic Regression Model for Army Canal Expressway.

**The LR statistic Results**

| LR statistic | P-value |
|--------------|---------|
| 81.870       | 0.000   |

**The Generalized Hosmer-Lemeshow Results**

| Chi-Square value | P-value |
|------------------|---------|
| 5.387            | 0.715   |

**The classification Table Results**
4.3 Multicollinearity

Cross-tabulation analysis (chi-square test) is used to reveal multicollinearity relationship between all the independent variables. Binary Logistic Regression requires that the multicollinearity relationship is to be the minimum between the independent variables, therefore, this test performs a match of the independent variables between them (p-value less than 0.05), for example the multicollinearity between the road condition vertically and horizontally were the extracts values for phi and significant. If the result of this test indicates the existence of a specific correlation between the independent variables (categorical), other tests such as phi and Cramer's V are used to evaluate the strength of these correlations between the variables ranging from 0 to 1. Hence, purpose for use multicollinearity, the form used for collecting data: For instance, sampling of a small set of reactionary values in the population, another purpose, particularly in time-series data, for multicollinearity is that the regression in the model share a common pattern, that is, over time all of them increase or decrease [25].

Results of Chi-Square Test for Association (Phi & Gramer's V) values for both Highways in this study reported in Tables (4) and (5).

Table (4). Statistic Results of Chi-Square Test for Association (Phi & Gramer's V) for Mohamed Al-Qasim Expressway.
Table (5). Statistic Results of Chi-Square Test for Association (Phi & Gramer's V) for Army Canal Expressway.

| Independent variables | Contributing factors | Road condition | Weather | Seat belt | Speed during the Accident kph | Day | Causes | Vehicle body type |
|-----------------------|----------------------|----------------|---------|-----------|-----------------------------|-----|---------|------------------|
|                       | Phi                  | Sig.           | Phi     | Sig.      | Phi                         | Sig. | Phi     | Sig.             | Phi             | Sig. | Phi             | Sig. |
|                       | 0.47                 | 0.00           | 0.47    | 0.00      | 0.09                        | 0.85 | 0.59    | 0.48             | 0.26            | 0.12 | 0.90            | 0.00 |
| Contributing factors  | 0.47                 | 0.00           | 0.80    | 0.00      | 0.06                        | 0.54 | 0.26    | 0.80             | 0.01            | 0.92 | 0.50            | 0.01 |
| Road condition        | 0.47                 | 0.00           | 0.91    | 0.00      | 0.07                        | 0.54 | 0.27    | 0.80             | 0.01            | 0.92 | 0.50            | 0.01 |
| Weather               | 0.09                 | 0.85           | 0.06    | 0.54      | 0.07                        | 0.54 | 0.32    | 0.56             | 0.04            | 0.68 | 0.28            | 0.68 |
| Seat belt             | 0.59                 | 0.48           | 0.26    | 0.80      | 0.27                        | 0.80 | 0.32    | 0.56             | 0.36            | 0.35 | 0.82            | 0.00 |
| Speed during the Accident kph | 0.26 | 0.12 | 0.01 | 0.92 | 0.01 | 0.92 | 0.04 | 0.68 | 0.36 | 0.35 | 0.38 | 0.22 | 0.11 | 0.32 |
| Day                   | 0.78                 | 0.00           | 0.50    | 0.01      | 0.50                        | 0.01 | 0.28    | 0.68             | 0.82            | 0.00 | 0.38            | 0.22 |
| Causes                | 0.29                 | 0.06           | 0.15    | 0.16      | 0.15                        | 0.16 | 0.08    | 0.44             | 0.34            | 0.45 | 0.11            | 0.32 |
| Vehicle body type     |                      |                |         |           |                             |      |         |                  |                |      |                 |      |

5. Results and Discussions
Tables 6 and 7 shows the results of estimates for BLR model. It shows the factors that have a relative effect on participation in fatal accidents compared to collisions in which there are injuries. Whereas outcome of eight variables that were introduced in the model for both highways, it was found that three variables (cause of an accident like (wrong turn, loss of control, closing (safety distance), vehicle body type, speed) for (Mohamed Al-Qasim Expressway) and four variables (road condition, day, vehicle body type, speed) for (Army Canal Expressway) had a statistical function (p < 0.05).

Table (6). Parameter Estimates and Odds Ratios of Binary Logistic Regression Model for Mohamed Al-Qasim Expressway.

| Variable class | Variables | Fatal relative to base level |
|----------------|-----------|------------------------------|
|                |           | Coff. | Sig. | OR   |
| Constant       |           | -29.462 | 0.212 | 0.100 |
Causes

|                | Fatal relative to base level |
|----------------|-----------------------------|
| Constant       | -15.571                     |
| Wet            | 3.758                       |
| Reference      | -4.394                      |
| Category       | 5.672                       |
| Reference      | 0.249                       |

For the Highways taken in this study results shows a similarity for the variables that will be interpreted towards the following:

The results are interpreted according to the odds ratio, in Table (6) shows the value of the odds ratio for the cause factor ((wrong turn, loss of control, closing (safety distance)) is 14.556,25.490,3.817 respectively this ratio indicates that the probability of a (fatal) collision occurring when ((wrong turn, loss of control, closing (safety distance)) is 14.556,25.490,3.817 more than the probability of it occurring in the case of a vehicle defect.

The results are interpreted according to the odds ratio, in Table (7) the value of the odds ratio for the road conditions factor is 42.844 this ratio indicates that the probability of a (fatal) collision occurring when the road in the dry case is 42.844 more than the probability of it occurring in the case of the wet road.

Also, the results are interpreted according to the odds ratio, in Table (7) the value of the odds ratio for the Day factor is 12.012 this ratio indicates that the probability of a (fatal) collision occurring when the weekday case is 12.012 more than the probability of it occurring in the case of the weekend. And this agrees with the findings of previous study [26].

Heavy vehicles have a higher chance of fatal accidents on highways compared to other vehicle accidents such as (passenger cars, buses, etc.). Tables (6) and (7) shows the odds ratio for both Highways as the odds ratio for the vehicle body type was found 39.206 for Mohamed Al-Qasim Expressway and 29.064 for Army Canal Expressway, meaning the

Table (7). Parameter Estimates and Odds Ratios of Binary Logistic Regression Model for Army Canal Expressway.
probability of a fatal accident in the presence of a heavy vehicle is 39.206 and 29.064 more than the probability and does not happen if heavy vehicles do not participate in the accident. Hence, it obstructed the flow of traffic. This is consistent with the results of the previous study [27].

Also, in this study, most of the accidents were due to exceeding the speed limit, as most of the drivers of these roads do not adhere to the speed limits despite the monotony of the highway from being unqualified and suffering from a severe lack of maintenance and in different sections that do not have fences, as well as a lack of traffic guiding signs in the path of the road. This is consistent with the results of the previous study [27].

Also, in this study, most of the accidents were due to exceeding the speed limit, as most of the drivers of these roads do not adhere to the speed limits despite the monotony of the highway from being unqualified and suffering from a severe lack of maintenance and in different sections that do not have fences, as well as a lack of traffic guiding signs in the path of the road. This is consistent with the results of the previous study [27].

6. Conclusion

This study aimed to analyze the crash severity of accidents for different Expressways in Baghdad capital city. The main testing results seem to be:

1- Wrong turn, loss of control and closing (safety distance) is very dangerous, as it causes the driver of the (other) oncoming vehicle to surprise the presence of an obstacle in the front, which makes it difficult to control the vehicle, and a collision occurs.

2- The results showed that when the highway is in a dry case, its danger is more than it is wet. This result is acceptable and logical, given that most of the accident data obtained were in the condition of the road (dry), and the opposite is likely to be true if the largest possible number of data were collected.

3- The results showed that weekdays accidents are more dangerous than weekend, and this result is natural, given that on weekends, Highway users are less likely than other days.

In both highways, there are variables closely related to accident severity that they have participated in in terms of model outputs:

4- The severity of the collision depends on the type of vehicle involved in the accident. There is a greater chance of a fatal accident when the accident is related to heavy vehicles, since heavy vehicles are distinguished by their weight and size compared to other vehicles, both highways are considered vital roads in the capital Baghdad, since these highways connect cities and most goods are transported through them and transportation is done by heavy vehicles. Therefore, accidents increase on these highways.

5- Most of the accidents were due to exceeding the speed limit, as most of the drivers of these roads do not adhere to the speed limits despite the monotony of the highway from being unqualified and suffering from a severe lack of maintenance and in different sections that do not have fences, as well as a lack of traffic guiding signs in the path of the road.

6- The absence of a storage system for traffic accidents on the highways of Baghdad capital city, as the stored reports for the years specified in this study are very poor in
7- Traffic signs are almost non-existent on the highways of Baghdad capital city.

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