Statistical Analysis for Major Causes of Traffic Accidents

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Abstract

In the United Arab Emirates (UAE), with its rapid amplification of road construction and the rise in the number of vehicles, road traffic accidents are becoming risky. In this research, the major causes of road accidents were studied in UAE using data for all accidents that occurred in 2021 and 2022. The accidents are divided into collisions, run over, and rollover accidents. Accordingly, human errors, including eleven types, were described as the main factors of all types of accidents. Furthermore, to find the root causes of accidents, drivers were categorized according to their gender, male, and female, and to their age, below 18 years old and greater than 60 years old. The two most common errors of driving causing accidents were sudden deviation of the vehicle and neglect and lack of attention. The percentage of female drivers causing accidents was less than 20%. Male drivers caused more collisions, run over, and rollover accidents than female drivers. Young male drivers made more accidents than old male drivers, but young females caused fewer accidents than middle-aged females and old females who made more accidents compared to other age categories of females.

Keywords: Traffic accidents, Driver errors, Collision accidents, Run-over accidents, Rollover accident, Causes of accidents, United Arab Emirates.

It has been recognized that road traffic accidents constitute one of the significant issues of modem everyday life. Car accidents have turned out to be one of the significant issues in the United Arab Emirates (UAE) and other parts of the world. It is intense in creating social orders as in the industrialized ones.

Traffic accidents are of major consideration for all members of society and have developed into one of the most significant problems that lead to many social and psychological crises and material losses. According to the latest statistics, in the two years 2016 and 2017, there was a decrease in the number of traffic accidents that occurred at the United States level during the first ten months of the year 2017 to 29,815 traffic accidents, compared to 27,325 traffic accidents during the same period last year 2016. In the UAE, road fatalities specify the major health problems, which are head and back injuries and neck and chest injuries. Road traffic accidents have been a fundamental cause for morbidity and mortality in both advanced and developing countries, contrasted with many western countries in the world, developing countries have a big increase in mortality rates caused by car accidents. Therefore, car accidents are the preferable cause of death, injuries, and property damage. There are lots of factors leading to traffic collisions that are well known. They are the behavior of the driver, the road environment, the road layout, and the vehicle design. The important conditions for the driver are driver age, medical fitness of the driver, alcohol and fatigue, and the effect of drugs. The road environment aspects include road design, engineering, road

safety education, and weather. The vehicle layout has two main facets, which are, first, factors that support to avoid accidents, such as tire condition, lights, and brakes; second, and factors that protect the passenger; which are seat belts, headrests, and airbag. Over the past two years between 2021 and 2022, there are being massive road construction programs in the United Arab Emirates. For example, in Al-Ain city, there is an increase in economic growth that led to a significant increase in the population and so the number of vehicles. That resulted in a growth in road traffic accidents, where the resulting damage made it a public health problem in the country [1-10].

LITERATURE REVIEW

Many studies have been performed to assess the literature available in relation to road traffic accidents, using many strategies to evaluate the traffic accidents and the main causes of those accidents [1-10].

Road traffic fatalities are regional, affecting society in terms of human. Many of the people are injured or killed and properties are damaged yearly, and the financial effect is equally staggering for cost the entire world billions of dollars in human suffering. The World Health Organization (WHO) reported that worldwide, the total number of road traffic deaths is as high as 1.24 million per year worldwide, with extremely many people being injured from those accidents. According to World Health Organization studies, it has been predicted that the fifth main issue of death in 2021 and later, is road accidents. Countries want to take more work, and make roads safer for all users, and so reduce this problem. There are four key risk factors: driving at high speed, drinking while driving, and many people do not use seat belts and child restraints [11].

To achieve the main goal of road safety, five main factors have to be considered: education, engineering, enforcement, experience, and emergency. The road safety study recommends arranging and focus on those five factors to reach safe roads [12].

It has been found that there are many factors which affect and cause car accidents. Those factors can be summarized under three major categories: errors of humans, roads, infrastructure, and unsafe vehicles [13]. Each country must focus on decreasing the number of accidents and developing perfect data for the system. The reason for accidents must be established and analyzed for countermeasures [14-16].

A study of the causes of traffic accidents was conducted in India. It has been found that there is a continuous improvement in the mortality rates in advanced countries, but that is not the case in developing countries [17].

According to a study on road fatalities in Nigeria, many healthcare issues resulted from traffic accidents, like mortality and morbidity [18]. Unfortunately, it has been found that the deadest accidents result in killing young people, which is a great loss for their families and for their country.

According to a study about using seat belt in the United States, it was found that the advantages of the seat belt clearly save money and lives and other benefits to society. The seat belt is effective and minimizes traffic accidents and fatalities in developed countries. That study showed that seat belt wearers take less damage than non-seat belt wearers [19]. A study in the UAE discussed different awareness which supports the traffic safety in the country; infrastructure, driving behavior, training, and vehicles [20]. During the period 2007 and 2010, in Abu Dhabi, the greatest fatal traffic accidents were caused by males in the age 18-35 years. The other group, which is below 18 years old, was ranked second in causing accidents, but the smallest traffic injury rates were among old people. A study was conducted about the consequences of speeding over the speed limit in UAE, which showed that it has a damaging effect on road safety [21]. As the number of traffic accidents is increasing in UAE, a particular

software is needed to reduce those accidents by checking these kinds of accidents and to locate the speed of vehicles before accidents happen [21]. Other research studies [22, 23] have investigated the influence of speed humps in reducing car accidents and changing the behavior of drivers towards avoiding accidents.

A study of bends on the road found that the curvature of the road forces the driver to decrease the speed of the vehicle, and so the probability of having accidents eb reduced. So, making some bends in the road it might make it safer with less accidents. It is preferred to make those bands widened in industrial areas [24]. Furthermore, the traffic department can provide some roads' requirements to stop injuries and deaths resulting from road traffic accidents. For instance, they can provide and reduce speed limits at critical locations and calm the traffic of vehicles [25].

Many studies have been recently conducted to analyze the number of fatalities of road accidents in the UAE and to compare that with other developing and developed countries. Several evaluation methods were used, and statistical analysis was performed to determine the main causes of accidents [16-38].

RESEARCH METHODLOGY

The Ministry of Interior's annual statistical report was the main source of data used in this study. The data is assembled for all road traffic accidents that occurred in the UAE years 2018 and 2019. It includes many aspects. First the main factors for road traffic accidents. Second, types of accidents; physical and non-physical, by activity, by vehicle and construction accidents. Third, driver errors cause accidents. Fourth, the gender of the driver, there are differences in driving behavior between two genders male and female drivers. Fifth, the age of drivers is divided into five groups starting from 18 years old and ending with greater than 60 years old.

3.1 Main Factors for Road Traffic Accidents

In this research was based on the data that was taken from all accidents, fatalities, and dangerous accidents resulted from car accidents which were developed in Ras Al-Khaimah from 2018 till 2019. Automobile accidents four main factors in road accidents are recognized: driver error, road situation, vehicle defects, and pedestrian mistake. Most car accidents circle around driver errors, the driver oversees making errors, or oversight in driving, which also is classified as human error. The road environment is the main factor you cannot drive on it because there are lots of reasons which are slippery road, road layout, deposits on highway and fog, rain, and snowstorm. Vehicle mistakes are the most significant factors in car collisions. Accidents can establish when the section of a vehicle was insufficient and not worked. Parts can be dishonorable in accidents that can include car wheels, brakes, axles, and airbags. The last main cause is the pedestrian mistake that can be walking down the road, crossing the street incorrectly, human beings distracted, and not giving an important for the sign. Figure 1 illustrates the number of accidents that led to four main factors for highway traffic accidents, which are driver error, vehicle defects, pedestrian mistakes, and road situation. For the driver error had, numerous of accidents there are 628 accidents. For the second highest of accidents for road situation with 144 accidents. The pedestrian mistake had 20 accidents. Vehicle defects obtained the smallest number of accidents which are 6 vehicle accidents. Figure 2 represents the percentages of the four factors which occurred in 2018 and 2019. The driver's error took the highest percentage, which is 78.696%. The second highest factor got 18.045% which is a road situation. The pedestrian mistakes proceed to 2.50%. The lowest percentage of vehicle defects caused around 0.75%.

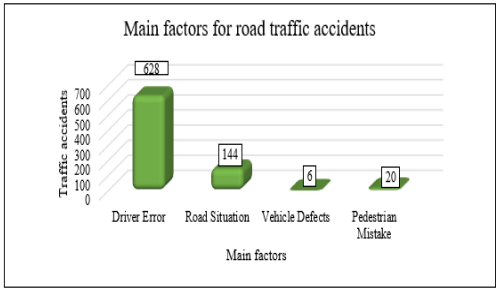

Figure 1: Main factors causing accidents

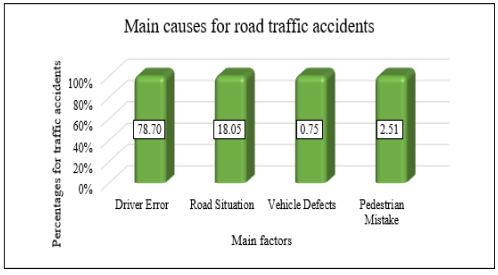

Figure 2: Main causes of accidents

3.2 Types of Accident

3.2.1 Factors Causing Car Collisions

Figure 3 shows information about the number of car collision accidents that occurred in the past two years 2016 and 2017. According to the chart, there was an increase in driver error factor that had 21,127 car collision accidents. For the second factor which is the second highest in the number of collisions, accidents are the pedestrian mistake and earn 106 car collision accidents. The road situation made the lowest number of accidents and 15 collision accidents. Vehicle defects now exist for collision and accidents. Overall, the collision accident has four major factors, the first factor is driver error, and the smallest is vehicle defect. If these factor trend continues, we can foresee that the driver error will increase continuously and for the vehicle, the defect will not be as high as the driver error.

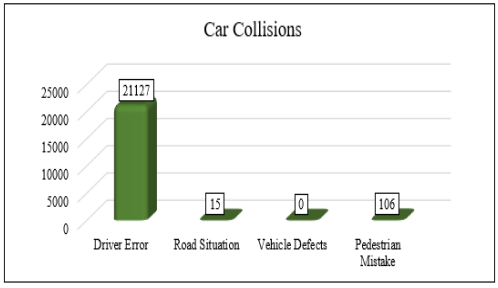

Figure 3: Causes of collision accidents

3.2.2 Main Causes of Turn Over Accidents

Figure 4 shows information about the number of car turnover accidents that occurred in the past two years 2016 and 2017. According to the chart, there was an increase in driver error factor that had 4,125 turns over accidents. The second factor, which is the second highest in the number of turnover accidents, is the pedestrian mistake and earns 235 turns over accidents. The road situation and vehicle defects, there is no turn accidents. Overall, turn over accident had four major factors the first factor is driver error, and the smallest is pedestrian mistake. If these factor trend continues, we can foresee that the driver error will increase continuously and for the vehicle, the defect will not be as high as the driver error.

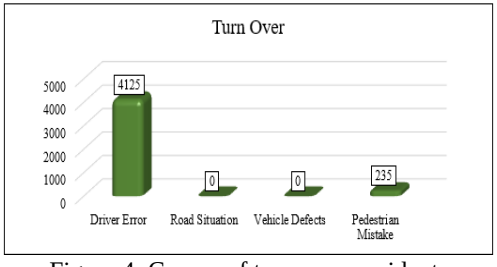

Figure 4: Causes of turn-over accidents

3.2.3 Main Causes of Rollover Accidents

Figure 5 shows information about the number of rollover accidents that occurred in the past two years 2016 and 2017. According to the chart, there was an increase in driver error factor that had 426 rollover accidents. The second

factor which is the highest number of rollover accidents is the road situation and earn 109 rollover accidents. The pedestrian mistake caused the lowest number of accidents, and 104 rollover accidents. Vehicle defects now exist for rollover accidents. In conclusion, the rollover accident had four major factors, the first factor is driver error, and the smallest is vehicle defect. If these factor trend continues, we can foresee that the driver error will increase continuously, and the vehicle defect will not be as high as the driver error.

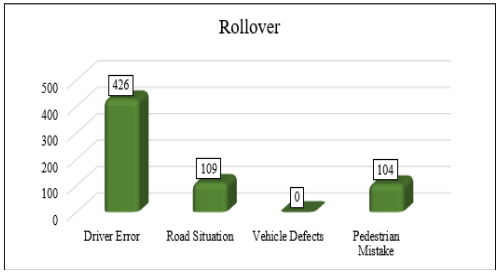

Figure 5: Causes of rollover accidents

3.3 Different Errors of Driver Causing Accidents

Table 1 shows the eleven types of driver errors distributed from E1 to E11. They create traffic accidents at three points, street, vehicle, and driver errors. Driver mistakes lead to the maximal percentages of accidents.

Figure 6 compares the eleven error types made by the driver and caused accidents. As we can see that E1, which is a sudden deviation of the vehicle, is causing more accidents among other errors. The lowest driver errors that cause accidents are E6, E8, and E10, they are the failure to comply with the road line under the influence of alcohol or anesthetic, and explosion wheels.

Table 1: Types of driver error

Error #	The main cause of the accident
E1	Sudden deviation of the vehicle
E2	Neglect and lack of attention
E3	Speed Limit Exceeding
E4	Entering the main road without making sure is it an empty road
E5	Override the red light
E6	Failure to comply with the road line
E7	Not leaving enough space
E8	Under the influence of alcohol or anesthetic
E9	Exceeding in a place where it is forbidden to overtake
E10	Explosion wheels
E11	Not appreciating the users of the road

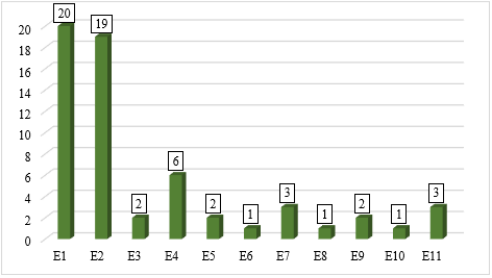

Figure 6: Proportion of accidents caused by different drivers' errors.

Figure 7 gives the data of collision accidents created by the eleven types of drivers' errors. E1 is the biggest common driver error to make collision accidents. E1 is a sudden deviation of the vehicle. E7, E8, E9, and E11 obtained the smallest amount of driver error causing collision accidents. They are E7 is doesn't leave enough space, E8 is under the influence of alcohol or anesthetic, E9 is exceeded in a place where it is forbidden to overtake, and E11 is not appreciating the users of the road.

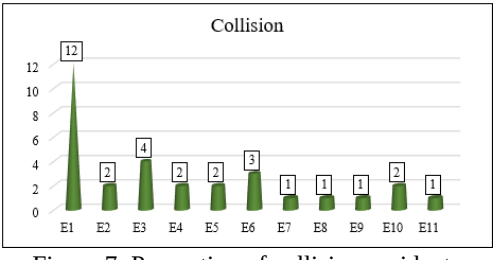

Figure 7: Proportion of collision accidents caused by different drivers' errors

Figure 8 represents the data of run-over accidents created by the eleven types of driver errors. E1 is the highest common driver error to make run-over accidents. E1 is a sudden deviation of the vehicle. E10 and E11, gained the lowest common driver errors that cause run-over accidents. E10 explosion wheels and E11 not appreciating the users of the road.

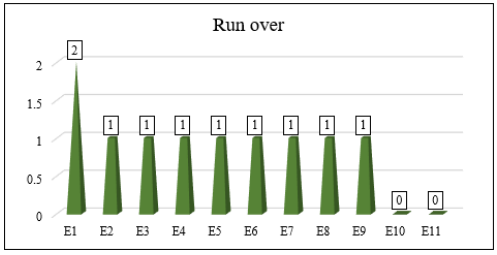

Figure 8: Proportion of run-over accidents caused by different drivers' errors

Figure 9 represents the data of rollover accidents created by the eleven types of driver errors. For E1 is the highest in causing rollover accidents. E1 is the sudden deviation of the vehicle. E2 is the lowest in causing rollover accidents. E2 is neglect and lack of attention.

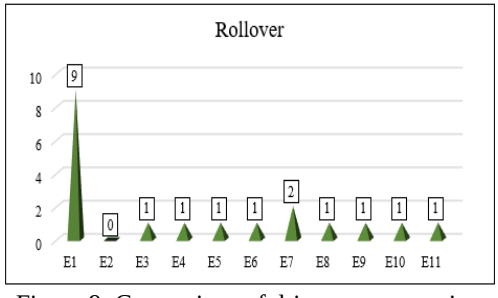

Figure 9: Comparison of driver errors causing rollover accidents

Figure 10 compares the eleven types of driver errors causing fatality. E2 is the highest driver error reason for fatality. E2 is neglect and lack of attention. E11 didn't cause any fatal accidents.

Figure 11 explains the driver errors that lead to severe and slight injuries and to fatalities. In the summation of the three possibilities, E4 has the highest rate, and E9 has the lowest rate of summation.

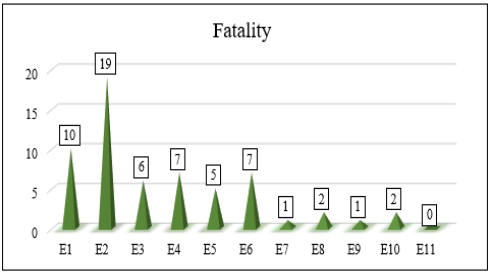

Figure 10: Comparison of driver errors causing the fatality

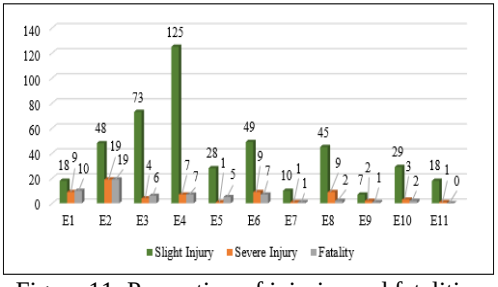

Figure 11: Proportion of injuries and fatalities caused by drivers' errors

3.4 The Gender of the Driver

The driver's gender is divided into male and female. The accidents caused by male drivers are counted disassembled from the accidents caused by female drivers. It connects the analysis data for males and females for the eleven types of driver errors and the age of the driver are separated into five age groups. Moreover, the summary of the data for male and female drivers is connected to three types of accidents, rollover, collisions, and run-over accidents.

3.4.1 Comparing Errors of Male Drivers with Errors of Female Drivers which Causes Collision Accidents

Figure 12 presents the collision accidents created by male drivers, which resulted from the eleven error types created by males. For every error type, the collisions are divided into 5 age classes. The primary age class once the male driver is a smaller amount than 18 years previous, the second age category once the male driver from 18 to 30 years old, the third category once the driver from 31 to 45 years old, the fourth category once the driver from 46 to 60 years old and therefore the fifth category once the driver is greater than 60 years old.

Figure 12 shows that most of the male driver collision accidents have been caused by E1, which is the sudden deviation of the vehicle. Male drivers less than 18 years old created the highest range of collision accidents caused by E6, that is, that the failure to comply with the road line. The best collision number created by drivers from 18 to 30 years old resulted from E1, which is a sudden deviation of the vehicle. Male driver, third age category, from 31 to 45 years old caused the very lowest number of E5 collisions, which overrides the red-light weight. The maximum collisions created by the fourth age category, from 46 to 60 years old, and therefore the category greater than 60 years old, because of E10 explosion wheels.

The five categories of age of males have been compared. For the initial category, less than 18 years old created 16 collision accidents during this year. The category of male drivers, from 18 to 30 years old, created 24 collision accidents. The third age category of male drivers, from 31 to 45 years old, created 21 collision accidents. The fourth age category of male drivers, from 46 to 60 years old, created 13 collisions, whereas males older than 60 years old created 11 collisions. Which means that the second age category gets large in the number of accidents.

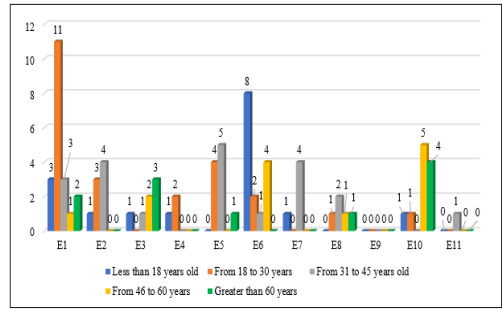

Figure 12: The 5-age category of male drivers causing collision accidents.

In Figure 13, most of the collision accidents caused by female drivers resulted from E1, which is the sudden deviation of the vehicle. Constant results are found within the male driver, which implies that does not matter of gender. Female drivers less than 18 years old created the highest range of collision accidents resulted from E3, that is, that the speed limit exceeding. The highest number of collision accidents created by the second age category, from 18 to 30 years old resulted from E1, that is, the sudden deviation of the vehicle. Female driver, third age category, from 31 to 45 years old created more collision accidents, which resulted from E4, that is, entering the main road without making sure is it an empty road. The highest range of collision accidents created by the fourth age category, from 46 to 60 years old resulted from E1, which is a sudden deviation of the vehicle. The fifth age category, larger than sixty years old, had most of their accidents coming from E7, which is not leaving enough space.

Comparing the five age categories of female drivers, for the first and second categories less than 18 years old and from 18 to 30 years old, both made 5 collision accidents in this year. For the third and fourth ages, the categories from 31 to 45 years old and from 46 to 60 years old of female drivers made four collision accidents, while the fifth age category greater than 60 years old caused six collision accidents. That means that the fifth age category gets large in the number of accidents.

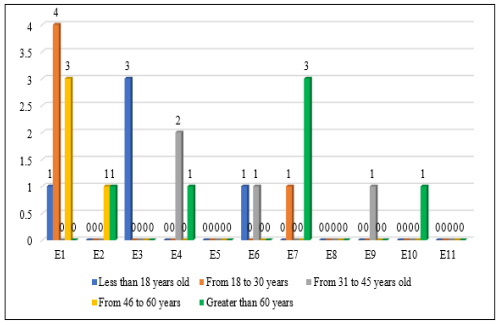

Figure 13: The 5-age female category caused collision accidents.

As shown in Figure 14. for the whole collision accidents, 85 collision accidents we caused by male drivers, with a percentage of 72, on the opposite hand, female drivers caused 24 collision accidents, with a percentage of 28%. In Figure 14, it can be easily found that for every type of error, male drivers created more collisions compared to females. The highest case is E6, that is, failure to comply with the road line, the male collision accidents were 15 (85%) and by female drivers were 2 (15%). An in-depth number of male and female drivers of collision accidents created is found for E4, entering the main road without making sure is it an empty road and E7, which is not leaving enough space.

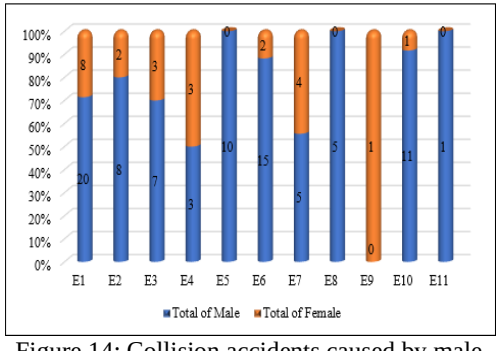

Figure 14: Collision accidents caused by male and female drivers

3.4.2 Male Driver Errors versus Female Driver Errors resulted in Run-Over Accidents

The accidents of run-over caused by males based on eleven types of errors as shown in Figure 15. For each type of error, the run-over accident was divided into five age categories. When the male driver is less than 18 years old is the first category, then when the male driver age is from 18 to 30 years old, it is the second age category, the third category when the driver is from 31 to 45 years old, the fourth category when the driver is from 46 to 60 years old and the fifth category when the driver is greater than 60 years old.

Figure 15 clearly shows that the most run-over accidents caused by male drivers have resulted from E4, entering the main road without making sure is it an empty road. Male drivers less than 18 years old made the highest number of run-over accidents resulting from E8, which is under the influence of alcohol or anesthetic. The highest number of run-over accidents made by the second age category 18 to 30 years old, resulted from E5, which overrides the red light. Male driver, third age category, from 31 to 45 years old who caused the highest number of run-over accidents resulted from E4, entering the main road without making sure is it an empty road. The highest number of run-over accidents made in the fourth age category, from 46 to 60 years old resulted from E5, which overrides the red light. The fifth age category, greater than 60 years old, because of E1 sudden deviation of the vehicle.

Comparing the five age categories of male drivers, for the first category, less than 18 years old made 32 runs over accidents in this year. The second age category of male drivers, from 18 to 30 years old, made 8 run-over accidents. The third age category of male drivers, from 31 to 45 years old, made 11 runs over accidents. The fourth age category of male drivers, from 46 to 60 years old, made 12 run accidents, while male drivers greater than 60 years old made 7 run-over accidents. That means that the first age category gets a massive range of the number of run-over accidents.

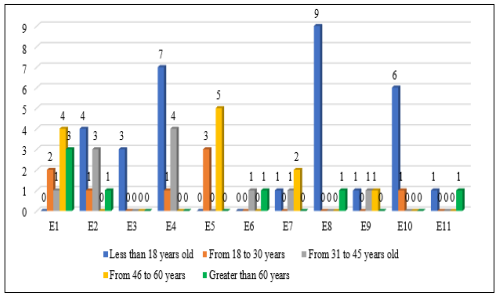

Figure 15: Males of 5-age category caused run-over accidents.

The female drivers of the five age categories causing run-over accidents are shown in Figure 16. The categories are less than 18 years old, from 18 to 30 years old, from 31 to 45 years old, from 46 to 60 years old, and the fifth category when the driver is greater than 60 years old. In Figure 16, you can find the most female driver run-over accidents resulting from E3, in which the speed limit is exceeding. Female drivers less than 18 years old caused more accidents of run-over type when they did E9, which is exceeding in a place where it is forbidden to overtake. For the ages from 18 to 30 years old resulting from E5, which overrides the red light, it has the maximum number of accidents of this type. Female driver, third age category, from 31 to 45 years old, made the highest number of run-over accidents resulted from E7, which doesn't leave enough space. For the ages from 46 to 60 years old, the highest rate of accidents of this type resulted from E3, in which the speed limit is exceeding. The fifth age category, greater than 60 years old, because of E8, is under the influence of alcohol or anesthetic.

Comparing the five age categories of female drivers, for the first and fourth categories less than 18 years old and from 46 to 60 years old, both made 8 runs over accidents in this year. For the second and third age categories, from 18 to 30 years old and from 31 to 45 years old of female drivers made 9 run accidents, while the fifth age category greater than 60 years old made 7 run-over accidents. That means that the second and third age categories get large in the number of accidents.

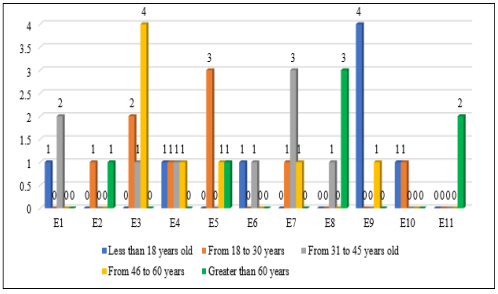

Figure 16: Run-over accidents caused by females of 5-age category.

Figure 17 shows the comparison between male and females drivers causing run-over accidents for each kind of driver error. For all run-over accidents, male drivers made 70 runs over accidents with a percentage of 59%, on the other hand, female drivers made 41 runs over accidents with a percentage of 41%. In Figure 17, for all types of error, male drivers made more run-over accidents than female drivers. The highest case is E4, entering the main road without making sure is it an empty road, the male run-over accidents were 12 (75%) and by female drivers were 4 (25%). A close number of male and female drivers of run-over accidents made is found for E5, which overrides the red light, and E7, which doesn't leave enough space.

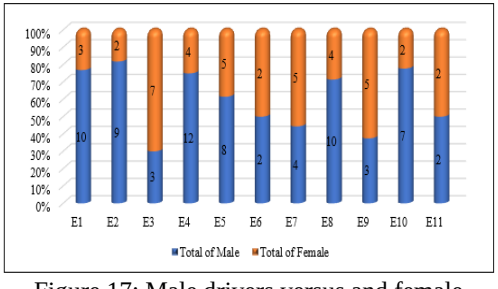

Figure 17: Male drivers versus and female drivers causing run-over accidents.

3.4.3 Rollover Accidents Caused by Errors of Male Driver Errors versus those of Female Drivers

As shown in Figure 18, most of the male driver rollover accidents have resulted from E7, which doesn't leave enough space. Male drivers less than 18 years old made the highest number of rollover accidents resulting from E5, which overrides the red light. The highest number of rollover accidents made by the second age category, from 18 to 30 years old resulted from E7, which doesn't leave enough space. Male driver, third age category, from 31 to 45 years old made the highest number of rollover accidents resulted from E4, entering the main road without making sure is it an empty road. The highest number of rollover accidents made by the fourth age category, from 46 to 60 years old resulted from E9, which exceeding in a place where it is forbidden to overtake. The fifth age category, greater than 60 years old, is a result of E2 neglect, and lack of attention.

Comparing the five age categories of male drivers, for the first category, less than 18 years old made 16 rollover accidents in this year. The second age category of male drivers, from 18 to 30 years old, made 13 rollover accidents. The third age category of male drivers, from 31 to 45 years old, caused rollover accidents. The fourth age category of male drivers, from 46 to 60 years old, they made eleven rollover accidents, while male drivers greater than 60 years old made four rollover accidents. That means that the first age category gets a massive number of rollover accidents.

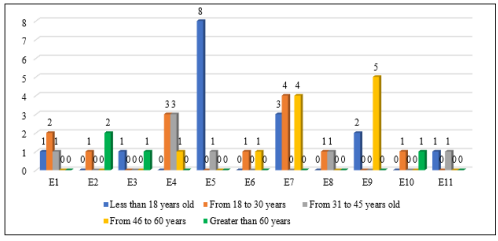

Figure 18: Males of 5-age category causing rollover accidents

Figure 19 shows the rollover accidents made by female drivers of the same five age categories. One can find that most female driver rollover accidents result from E2, which neglect and lack of attention. Female drivers less than 18 years old made the highest number of rollover accidents resulting from E2, which is neglect and lack of attention. The highest number of rollover accidents made by the second age category, from 18 to 30 years old resulted from E7, which does not leave enough space. Female driver, third age category, from 31 to 45 years old made the highest number of rollover accidents resulted from E1, sudden deviation of the vehicle. The highest number of rollover accidents made by the fourth age category, from 46 to 60 years old resulted from E5, which overrode the red light. The fifth age category, greater than 60 years old, is a result of E9, exceeding in a place where it is forbidden to overtake.

Comparing the five age categories of female drivers, for the first, second, and fourth categories, less than 18 years old, from 18 to 30 years, and from 46 to 60 years old, all of them made six rollover accidents in this year. For the third and fifth age, categories from 31 to 45 years old and greater than 60 years old of female drivers made four rollover accidents.

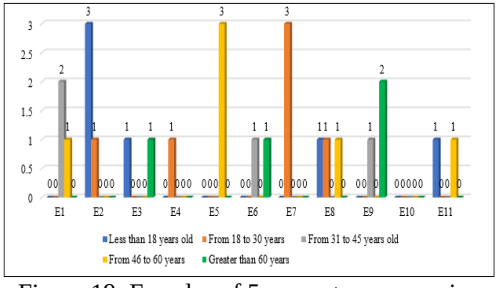

Figure 19: Females of 5-age category causing rollover accidents

The comparisons between male and female drivers who are causing rollover accidents for each type of driver error are shown in Figure 20. For all rollover accidents, male drivers caused 51 rollover accidents with a percentage of 50.98%.

On the other hand, female drivers caused 26 rollover accidents with a percentage of 49.02%. In Figure 20, for all types of error, male drivers made more rollover accidents than female drivers. The highest case is E7, which doesn't leave enough space, the male rollover accidents were 11 (75%) and by female drivers were 3 (25%). A close number of male and female drivers of rollover accidents made is found for E1, sudden deviation of the vehicle and E2, which is neglect and lack of attention.

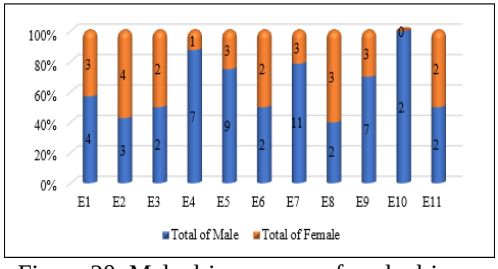

Figure 20: Male drivers versus female drivers causing rollover accidents.

3.4.4 Comparing the Errors of Male and Female Drivers of All Ages Causing all Vehicle Accidents

Figure 21 shows all accidents caused by male and female drivers of five age categories, it is evident from the chart that most of the male and female drivers accidents caused in the age group less than18 years old which got the highest number of accidents.

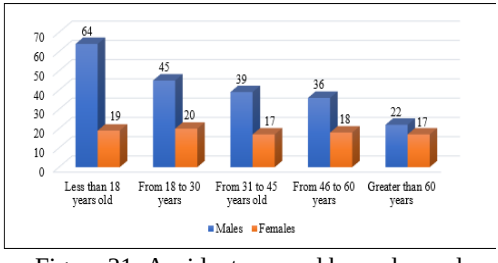

Figure 21: Accidents caused by males and females of 5-age category.

Figure 22 illustrates the number of car accidents caused by male and female drivers for a group age less than 18 years old. Overall, male caused the maximum number of vehicle accidents with 64 vehicle accidents. For the minimum number of vehicle accidents caused by females to number 19 vehicle accidents.

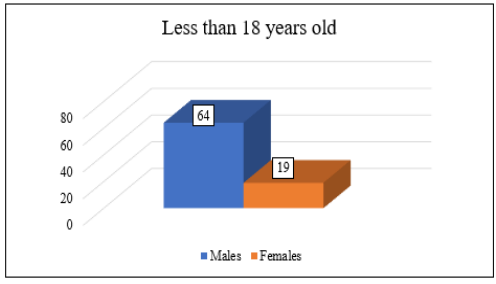

Figure 22: Accidents caused by male and female drivers aged less than 18 years old.

Figure 23 shows the number of vehicle accidents caused by male and female drivers for group age from 18 to 30 years old. Male driver causes the highest number of vehicle accidents. For the lowest number of vehicle accidents caused by female drivers.

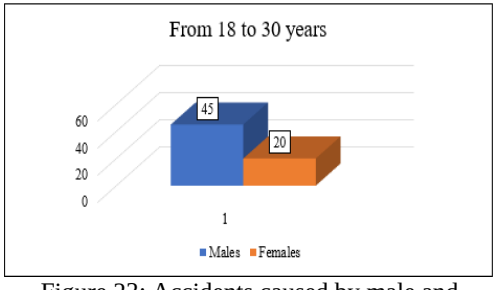

Figure 23: Accidents caused by male and female drivers age from 18 to 30 years old

Figure 24 shows the number of vehicle accidents caused by male and female drivers for the group age from 31 to 45 years old. As shown in the figure, the male driver causes the highest number of vehicle accidents. For the lowest

number of vehicle accidents caused by female drivers.

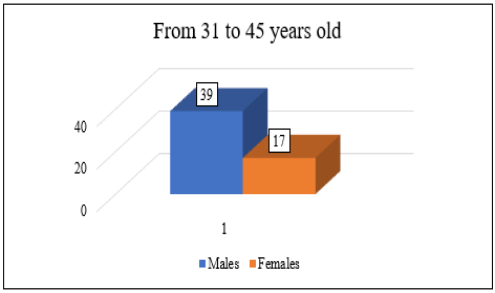

Figure 24: Accidents caused by male and female drivers age from 31 to 45 years old

Figure 25 shows the number of vehicle accidents caused by male and female drivers for group age from 46 to 60 years old. As shown in the figure, male causes the highest number of vehicle accidents. For the lowest number of vehicle accidents caused by females.

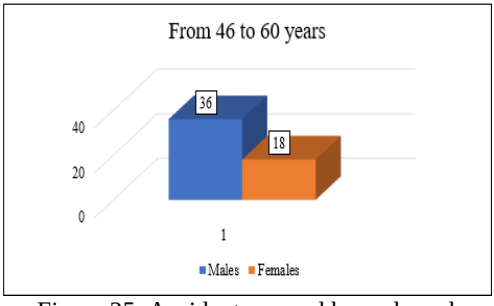

Figure 25: Accidents caused by male and female drivers aged from 46 to 60 years old

Figure 26 shows the number of vehicle accidents caused by male and female drivers for a group age greater than 60 years old. As shown in the figure, male causes the highest number of vehicle accidents. For the lowest number of vehicle accidents caused by females.

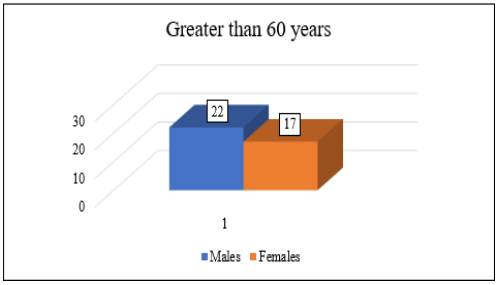

Figure 26: Accidents caused by males and female drivers age greater than 60 years old

Discussion of the Results

This kind of study desired to identify the factors causing vehicle accidents in the United Arab Emirates. The reasons for vehicle accidents display 78.70% of accidents resulted from drivers' error, the second 18.05% from road situation, and the third 0.75% performed from vehicle defects, and fourth 2.5% from the pedestrian mistake. Car accidents are divided into three major types; run-over accidents, car collision accidents, and rollover accidents. The total number of collision accidents is 21248 accidents that happened in 2016 and 2017, 99.43% of these accidents were caused by drivers' error, 0.07% caused by road situation, for pedestrian mistake 0.50% and none by vehicle defects. For turnover the number of accidents is 4360 accidents, some of these accidents come from drivers' error with 94.61%, for pedestrian mistake 5.39%, and for road situation, vehicle defects are none. For rollover, the number of accidents is 639 accidents, it is divided into driver error with 66.67%, then road situation 17.06%, then pedestrian mistake 16.28%, nothing for vehicle defects. So, the errors of driving people were prepared and distributed over 11 error kinds. E1, sudden deviation of the vehicle, is the heights number of accidents, next comes E2, neglect, and lack of attention. For the lowest number of accidents caused by three errors which are E6, E8, and E10, failure to comply with the road line, under the influence of alcohol or anesthetic and

explosion wheels. Sudden deviation of the vehicle, it is the sudden movement toward other vehicles to shift from one route to another to enter a place where the driver is about to pass without paying attention or making sure that the other routes are unoccupied by other vehicles.

The error that leads to the maximum rate of all three kinds of accidents; collisions, rollover, and run over is E1, that is, the sudden deviation of the vehicle. E2 was the cause of the highest number of fatalities, neglect, and lack of attention.

Comparison between males and females in causing accidents for drivers' errors, in the results, it has been found that male drivers caused 85 collision accidents which represents 72% of the total collision accidents. On the other hand, female drivers caused 24 collision accidents which represents 28% of the total, which is high percentages for female drivers, who represent only 20% of the total drivers. In the case of run-overs, the accidents caused by male drivers were seventy, which forms 59% of the total accidents of this type, while only 48 run-overs were caused by females, which formed 41% of the total run-overs. That shows males are causing much more run-over accidents that females consider all age categories. In the case of rollovers, 51 accidents were caused by males, which is almost 51% of the total rollovers. On the other hand, female drivers caused the rest, which is 41 accidents and so 41% of the total. So, in this type of accidents, both male and female drivers are equally sharing the responsibility of causing these accidents.

For each male and female driver, they are divided into five categories of age. Males below 18 years old were classified in the first age category. While males with ages between 18 and 30 years old are placed in the second age category and the next age category is for male drivers from 31 to 45 years old, the fourth category when the driver from 46 to 60 years old and the fifth category when the driver is greater than 60 years old. It was found that the number of male and female drivers' collision accidents are affected by E1. However, in the situation of males, males from 18 to 30 years old caused the highest number of collision accidents with E1. Furthermore, females who located in the age category 18 to 30 and did E1, made the highest rate of collisions. While ignoring the flashing signals before changing the route was the main reason of accidents caused by males, and in the case of female drivers, it was the ability of driving. In all types of drivers' errors, male drivers are affecting more collisions than females except for E9, where females are higher than males in the number of collision accidents. E4 has been found to cause most of the male drivers run-over accidents. On the other hand, E3 is the error that is causing most of the female drivers' run-over accidents. The maximum number of run-overs caused by males came from making E8 and from males who are less than 18 years old. The same age category of female drivers who made E9 caused the highest rate of run-overs. That is an expected outcome for such young drivers who have less driving experience and maybe lower driving skills but driving at higher speeds. For the whole types of drivers' errors, excluding E3, E7, and E9, male drivers are causing more run-over accidents than female drivers, where female drivers are causing more accidents because of those three mentioned errors.

For both male and female drivers, E2 and E7 are causing most of the rollover accidents. Moreover, for both, drivers below 18 years old were causing the highest rate of run-overs. In the case of males, they made those accidents with E5 and for female drivers, they made them by E2. Male and female drivers, with all ages, made the same accident numbers of the rollover type. That demonstrates combined causes of accidents for drivers of both sexes. Males have the highest number of rollover accidents than females considering all error types. For E10, no rollover accidents caused by the female.

For all accidents, the largest number of male and female drivers' accidents has caused from E1 to age category less than 18 years old. On the

other hand, the lowest number of male and female driver accidents has caused by E5.

Suggested Methods for Reducing the Traffic Accidents in UAE

Road traffic accidents have become a massive issue in the United Arab Emirates. As is the case for all health issues, reducing traffic accidents and the consequences of that does not depend on certain procedures to be followed, rather than on commitment and following the right actions by all drivers. It has been shown from the results of this research that male drivers cause accidents more than female drivers with the age of 18 to 30 years old with a drivers' error E1, sudden deviation of the vehicle and E2, neglect and lack of attention.

There are some ways to avoid sudden deviation of the vehicle. First, the driver needs to use flashing signals before changing the line. Second, the driver needs to maintain the same speed while he/she can transition between two lanes. Third, the driver moves from a lane to another lane with the gradual manner of the speed of the vehicle.

For neglect and lack of attention, drivers face much distraction while driving, which causes a lack of focus and attention for a period. Distraction in vehicle accidents occurs while playing on the radio or while driving, eating, or drinking, talking to the fellow rider, and using a phone.

For the gender and age of drivers, there are many ways to avoid vehicle accidents; they must attend a training session. This session will teach all genders, the driving rules on the road and how to drive safely to avoid accidents. Moreover, in this lecture, all drivers will improve their driving skills.

CONCLUSIONS

The worldwide problem of road traffic accidents is the riskiest issue in UAE. The causes of road traffic accidents for both the years 2021 and 2022 have been studied in this research. Errors of drivers are causing the highest percentage of car accidents (78.70%), by road situation (18.05%), pedestrian mistake (2.5%), and the lowest one by vehicle defects (0.75%). In the collision, accidents were caused by drivers' error (99.43%), pedestrian mistake (0.50%), and road situation (0.07%). While drivers' errors caused around (94.61%) of roll-over accidents, the pedestrian mistakes caused around (5.39%) of roll-over accidents. Rollover accidents caused by drivers' errors (66.67%), road situation (17.06%), and pedestrian mistake (16.28%). So, errors of humans are found to be the main cause for road traffic accidents in UAE.

The drivers' errors are divided into eleven types causing car accidents. The highest two errors causing accidents were sudden deviation of the vehicle and neglect and lack of attention. The third main driver error causing accidents is entering the main road without making sure it is an empty road. That is related to ignoring the priority, especially for light signals. The use of incorrect lanes and using the mobile phone while driving represent the two main car accident fatal causes. It was found that male to group age from 18 to 30 years old is causing more accidents than other age categories. In the case of less than eighteen years old females, they caused fewer accidents than the other two age categories of middle age and old age, who caused the greatest rate of accidents. Whereas the official statistics showed that 20% of people driving in the country are females, but those females are causing 28% of collision accidents. So, male drivers caused more collision accidents than female drivers. Female drivers caused only 41% of run-over accidents, which means male drivers are causing much more run-overs compared to female drivers. 49.02% of rollover accidents were made by female drivers, which concludes that both males and females are sharing almost the same percentage of causing this type of accidents, but taking into considerations, males, females should drive more carefully to avoid rollover and run-over accidents.

In UAE, the problem of road traffic incidents has been reported to be one of the main leading causes of death for many years. As human error is the major cause of car accidents, there are some suggestions to reduce human errors in driving, like traffic calming measures, traffic campaigns, and many more. One solution for avoiding human errors in driving is using the intelligent system of driving, which might assist the driver and avoid making human mistakes.

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