# EVALUATION OF THE PATTERNS OF INJURIES IN ROAD TRAFFIC ACCIDENTS IN GREAT CAIRO, EGYPT

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## ABSTRACT

**Background:** Road traffic accidents (RTAs) are the leading cause of death among those aged from 15 to 44 years worldwide. In Egypt, the rapid increase in the number of vehicles, the overpopulation and the lack of proper strategy for prevention of RTAs**,** contribute to make Egypt one of the highest world's RTAs rate. **Aim of the study:** To evaluate patterns of injuries in cases of motor vehicle accidents. **Material and methods:** data of 150 victims of RTAs admitted to the Emergency Department, in El Sahel Teaching Hospital, from May 2013 to November 2013 were recorded including their demographic data, injuries, their outcome and different types of vehicles involved in the accidents. **Results:** private cars were more involved in RTAs followed by motorcycles. Males constituted the major victims of RTAs with statistically significant percentage (76% of pedestrians and 95% of vehicle occupants). In pedestrians, the most common affected body regions were the lower limbs (66%), head (54%), and upper limbs (26%). Contusions occurred in all pedestrians. Fracture and joint dislocation occurred in 74% of the cases. Most pedestrians recovered completely (78%), 8% had complications and 14% of cases died. Most common cause of death was head injury induced complications (12%). As regards vehicle occupants, most common injured body parts were lower limbs (54%), head (45%) and upper limbs (24%). Contusions and fracture with joint dislocation occurred in 99% and 78% respectively. Most vehicle occupants had complete recovery (82%), 16% had complicated recovery and 2% of cases died due to complications of head and chest injuries. **Conclusion:** the results of this study demonstrated the types and distribution of injuries in victims of RTAs. These results may help health care providers to anticipate the injuries in patients with subsequent early diagnosis and treatment of RTAs victims. Moreover, results may enable concerned authorities to reconstruct the accident when needed.

**Keywords**: Road traffic accidents - Pedestrians - Drivers - Vehicle occupants - Pattern of injuries

## INTRODUCTION

Globally, road traffic accidents (RTAs) are responsible for more than 1.2 million deaths every year, and are the leading cause of death among those aged from 15 to 44 years **(Hofman et al., 2005)**. Egypt is one of countries having the highest world's RTAs rate. According to statistics of **Egyptian General Traffic Administration (2008),** the number of injured and dead victims, as a result of RTAs, in Great Cairo from the year 2000 to 2007 was 13374 and 3607 respectively. In addition, RTAs represent not only a social problem that kills a lot of people

but it is also an economic problem that costs the society a lot of money and adds an undesirable economic burden on it **(Ismail and Abdelmageed, 2010)**. World Health Organization confirmed that the financial losses due to RTAs around the world are more than 500 billion dollars and the financial losses in Egypt are around 6 to 8 billion Egyptian pounds **(Abd El Moaty, 2008).**

Road traffic accidents may affect drivers, passengers of vehicles or pedestrians **(World health organization, 2012)**.

Investigations of transport and traffic related injuries may call upon the entire spectrum of forensic sciences and medico legal expertise **(James et al., 2003).** Forensic investigations of RTAs require evaluation of risk factors and cause of death. In addition, the forensic medicine specialists determine whether a RTA has caused disability and if it has been so, they make the estimation of disability percentages **(Esiyok et al., 2005)**.

Therefore, the aim of this study was to evaluate the patterns of injuries in cases of motor vehicle accidents.

## SUBJECTS & METHODS

This prospective study was performed at the Emergency Department of El-Sahel Teaching Hospital, Cairo, from the 1st of May 2013 to the 30th of November 2013. The study design was approved by the Research Ethics Committee of Tanta Faculty of Medicine, Tanta University. Written informed consent was obtained from each patient or his/her guardians (if the patient was unable to participate in the consent process). Confidentiality of the data was maintained by making code numbers (available to investigators only) for each patient. All data were analyzed anonymously.

**Inclusion criteria:**

All victims of motor vehicle accidents admitted to El-Sahel teaching hospital from the 1st of May 2013 to the 30th of November 2013.

**Exclusion criteria:**

Any patient admitted to El-Sahel teaching hospital due to any cause rather than motor vehicle accidents.

**Interventions:**

Patients were classified into two main groups as follows:

☒ **Group I (Pedestrians):** 50 cases were studied and further subdivided according to the side of impact into frontal, lateral and rear impact victims.

☒ **Group II (Vehicle occupants):** 100 cases were studied and divided into subgroups as follows:

- **Drivers**: 50 cases.
- **Front seat passengers**: 33 cases.
- **Rear seat passengers**: 17 cases.

The data collection sheet included patient code, demographic data (age, sex, and time of admission), accident history (type of vehicle, position of the victim during accident and site of impact), and description of the injuries resulting from the RTA, patient outcome and hospital stay period.

**Statistical analysis:**

The collected data were organized and statistically analyzed using SPSS software statistical computer package for windows version 22. For quantitative data, the Shapiro-Wilk test for normality was performed. For data that were not normally distributed, median and interquartile range (expressed as 25th-75th percentiles) were calculated and Kruskal-Wallis test was used for comparison between

groups. For normally distributed data, values were expressed as mean ± standard deviation and one way analysis of variance test (one way ANOVA) was used for comparison followed by the appropriate post hoc test. For qualitative data, values were expressed as number and percentage and Chi Square goodness of fit and Pearson's Chi Square test were calculated. Significance was adopted at $p < 0.05$ for interpretation of results of tests **(Dawson and Trapp, 2001).**

## RESULTS

Figure (1) shows different vehicle types that were encountered in motor vehicle accidents in this study. Private cars had significantly the highest incidence (28%) followed by motorcycles (22%), microbuses (20%), pickup trucks (14%), large trucks (9%) and lastly tuktuks (6%) ($p <0.001$).

**I) Studied pedestrians:**

Table (1) shows age and gender of studied pedestrians. The highest incidence of all injured pedestrians was in the age group 10-<20 years old (30%) followed by < 10 years old group (22%). In frontal impacts, both age groups had the same incidence (26.31%) while in lateral impacts age group < 10 years was higher (38.9%). In rear impacts the age group 10-<20 years was higher in incidence. These differences were not statistically significant ($P = 0.625$). As regards gender of injured pedestrians, male victims had a significantly higher incidence (76%) than females (24%) ($P = 0.024$).

Table (2) shows the site of injuries in the studied pedestrians. In all types of impact, lower limbs were the most frequent site affected followed by head and neck (66% and 54% respectively).

Regarding types of injuries among studied pedestrians, table (3) shows that contusions and fractures to skeleton and joints were more frequent in all injured pedestrians (100% and 74% respectively). These results were not statistically significant among the different pedestrian groups. The incidence of lacerations was significantly higher in cases of frontal impact ($p = 0.006$).

The outcome of the studied pedestrians is shown in figure (2). Complete recovery was the most common outcome (78%) in all injured pedestrians followed by death (14%) then complicated recovery (8%). Death occurred more in lateral impact victims (22.2%) while complicated recovery occurred more frequently in victims of rear impact. These differences were not statistically significant ($P = 0.195$).

The following complications were encountered in the studied pedestrians: shoulder disfigurement (2%), limping (2%) and amputation (2%), all were subjected to rear impact. Trephine operation was performed in 2% of pedestrians with lateral impact. Death occurred in 7 cases (14%), in 6 cases death was due to head trauma and in one case it was due to chest trauma.

Table (4) shows the duration of hospital stay for the studied pedestrians which ranged from less than one day to 21 days. The duration of hospital stay was nearly similar among the studied pedestrians where the median hospital stay for frontal impact pedestrians was 3 days with interquartile range (IQR) of 5 and lateral impact pedestrians' median was 3 with IQR of 3. Rear impact pedestrians' median was 3 with IQR of 2. No statistically significant

difference was found between the studied pedestrian groups (P = 0.928).

**II) Studied vehicle occupants:**

Table (5) shows the age and gender of studied vehicle occupants. Age distribution showed a statistically significant difference as 46% of drivers were in age group 20 - <30 years old while 27.3% and 24.2% of front seat passengers were in age group <10 years and 20- <30 years respectively (P <0.001). Female victims were encountered only as rear seat passengers with a statistically significant difference between male and female victims (P <0.001).

Table (6) demonstrates the distribution of regional injuries in studied vehicle occupants. Lower limbs and head were the most commonly injured body regions (54% and 45% respectively). Upper limbs, head and chest injuries were seen more frequently in drivers. Injuries to abdomen and pelvis were significantly higher in rear seat passengers (P =0.01).

Table (7) shows types of injuries in studied vehicle occupants. Contusions were detected in all cases of drivers and front seat passengers and in 94.12% of rear seat passengers. The second most frequently encountered injury was fractures and dislocation injuries (80% in drivers, 84.85% in front seat passengers and 58.52% in rear seat passengers). Amputation was detected only in front seat victims. Liver and lung injuries showed a significantly higher incidence in rear seat passengers (liver injuries P =0.006, lung injuries P =0.049).

Figure (3) shows the outcome in vehicle occupants. Complete recovery was the most common outcome (82% of all vehicle occupants, 88% in drivers, 69.7% in front seat passengers and 88.2% in rear seat passengers). Complicated recovery occurred in 16% of cases and was more frequent in front seat passengers. Death occurred in 2 cases (2%). These differences were not statistically significant (P = 0.195).

Complications in studied motor vehicle occupants included trephine operation in 5% of vehicle occupants, Parkinsonism in 1%, amputation of left middle finger in 2%, joint replacement in 2%, below knee amputation in 2%, limping in 3% and amputation of toes in 1% of motor vehicle occupants. Two cases died: one driver due to head injuries and a rear seat passenger due to chest injuries.

Table (8) shows the duration of hospital stay for vehicle occupants. Hospital stay ranged between <1 day to 15 days for drivers and <1-14 days for passengers. Median period of hospital stay was 3 days with IQR of 2.5 days for drivers, median of 5 days with IQR of 4 for front seat passengers and 3 days with IQR of 3.5 for rear seat passengers. No statistically significant difference was detected between the studied groups (P = 0.381).

**Table (1):** Distribution of studied pedestrians according to age and gender

| | | Studied pedestrians | | | | | | | | Pearson's Chi-square test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Frontal impact (N = 19) | | Lateral impact (N = 18) | | Rear impact (N= 13) | | Total (N = 50) | | $X^2$ | P |
| | | N | % | N | % | N | % | N | % | | |
| Age (years) | <10 | 5 | 26.3 | 7 | 38.9 | 2 | 15.4 | 11 | 22 | 9.899 | 0.625 |
| | 10-<20 | 5 | 26.3 | 6 | 33.3 | 4 | 30.8 | 15 | 30 | | |
| | 20-<30 | 3 | 15.8 | 2 | 11.1 | 2 | 15.4 | 7 | 14 | | |
| | 30-<40 | 2 | 10.5 | 0 | 0.0 | 2 | 15.4 | 4 | 8 | | |
| | 40-<50 | 3 | 15.8 | 2 | 11.1 | 1 | 7.7 | 6 | 12 | | |
| | 50 –< 60 | 1 | 5.3 | 0 | 0.0 | 1 | 7.7 | 2 | 4 | | |
| | >60 | 0 | 0.00 | 1 | 5.6 | 1 | 7.7 | 2 | 4 | | |
| Gender | Male | 11 | 57.9 | 17 | 94.4 | 10 | 76.9 | 38 | 76 | 7.47 | 0.024* |
| | Female | 8 | 42.1 | 1 | 5.6 | 3 | 23.1 | 12 | 24 | | |

**N = number of cases, * significant at p <0.05**

**Table (2):** Distribution of regional injuries among studied pedestrians

| | Studied pedestrians | | | | | | Total (N = 50) | | Pearson's Chi-square test | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Frontal impact (N = 19) | | Lateral impact (N = 18) | | Rear impact (N= 13) | | | | $X^2$ | P |
| | N | % | N | % | N | % | N | % | | |
| Head & Neck | 12 | 63.3 | 9 | 50.0 | 6 | 46.2 | 27 | 54 | 1.080 | 0.583 |
| Chest | 1 | 5.3 | 4 | 22.2 | 3 | 23.1 | 8 | 16 | 3.017 | 0.221 |
| Abdomen & pelvis | 2 | 10.5 | 2 | 11.1 | 2 | 15.4 | 6 | 12 | 0.185 | 0.912 |
| Spine | 1 | 5.3 | 1 | 5.6 | 1 | 7.7 | 3 | 6 | - | - |
| Upper limb | 5 | 26.3 | 6 | 33.3 | 2 | 15.4 | 13 | 26 | 1.328 | 0.515 |
| Lower limb | 15 | 79.0 | 11 | 61.1 | 7 | 53.9 | 33 | 66 | 2.545 | 0.280 |

**N = number of cases, * significant at p <0.05.**

**Table (3):** Injury patterns in studied pedestrians

| | | Studied pedestrians | | | | | | Total (N = 50) | | Pearson's Chi-square test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Frontal impact (N = 19) | | Lateral impact (N = 18) | | Rear impact (N= 13) | | | | $X^2$ | P |
| | | N | % | N | % | N | % | N | % | | |
| Skin abrasions | | 5 | 26.3 | 5 | 27.8 | 2 | 15.4 | 12 | 24 | 0.775 | 0.679 |
| Contusions | | 19 | 100 | 18 | 100 | 13 | 100 | 50 | 100 | - | - |
| Lacerations | | 5 | 26.3 | 1 | 5.6 | 2 | 15.4 | 8 | 16 | 16.000 | 0.006* |
| Organs | Brain | 2 | 10.5 | 4 | 22.2 | 2 | 15.4 | 8 | 16 | 0.946 | 0.623 |
| | Lung | 0 | 0.0 | 1 | 5.6 | 2 | 15.4 | 3 | 6 | 3.249 | 0.197 |
| Fractures and dislocation | | 13 | 68.4 | 12 | 66.7 | 12 | 92.3 | 37 | 74 | 3.641 | 0.162 |

**N = number of cases, * significant at p <0.05**

**Table (4):** Duration of hospital stay (in days) in the studied pedestrians

| Hospital stay (days) | Studied pedestrians | | | Kruskal-Wallis Test | |
|---|---|---|---|---|---|
| | Frontal impact | Lateral impact | Rear impact | Z | P-value |
| Minimum-Maximum | <1 – 14 | <1 – 21 | <1 - 14 | 0.150 | 0.928 |
| Median (IQR) | 3(5) | 3(3) | 3(2) | | |

**IQR= interquartile range, * significant at p <0.05**

**Table (5):** Age and gender of studied vehicle occupants

| | | Studied vehicle occupants | | | | | | | | Pearson's Chi-square test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Drivers (N= 50) | | Front seat passengers (N=33) | | Rear seat passengers (N = 17) | | Total (N=100) | | $X^2$ | P-value |
| | | N | % | N | % | N | % | N | % | | |
| Age (Years) | <10 | 0 | 0.0 | 9 | 27.3 | 2 | 11.8 | 11 | 11 | 30.04 | <0.001* |
| | 10 -<20 | 8 | 16.0 | 4 | 12.1 | 4 | 23.5 | 16 | 16 | | |
| | 20 - <30 | 23 | 46.0 | 8 | 24.2 | 2 | 11.8 | 33 | 33 | | |
| | 30 -<40 | 11 | 22.0 | 3 | 9.1 | 2 | 11.8 | 16 | 16 | | |
| | 40 -<50 | 5 | 10.0 | 5 | 15.2 | 3 | 17.7 | 13 | 13 | | |
| | 50 -<60 | 3 | 6.0 | 4 | 12.1 | 4 | 23.5 | 11 | 11 | | |
| | >60 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 0 | 0 | | |
| Gender | Male | 50 | 100 | 33 | 100 | 12 | 70.6 | 95 | 95 | 25.697 | <0.001* |
| | Female | 0 | 0.0 | 0 | 0.0 | 5 | 29.4 | 5 | 5 | | |

**N = number of cases, * significant at p <0.05**

**Table (6):** Site of injuries in studied vehicle occupants

| | Studied vehicle occupants | | | | | | | | Pearson's Chi-square test | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Drivers (N= 50) | | Front seat passengers (N=33) | | Rear seat passengers (N = 17) | | Total (N=100) | | $X^2$ | P-value |
| | N | % | N | % | N | % | N | % | | |
| **Head** | 24 | 48 | 13 | 39.4 | 8 | 47.1 | 45 | 45 | 0.63 | 0.73 |
| **Chest** | 13 | 26 | 6 | 18.2 | 3 | 17.7 | 22 | 22 | 0.94 | 0.63 |
| **Abdomen & pelvis** | 5 | 10 | 3 | 9.1 | 7 | 41.2 | 15 | 15 | 8.89 | 0.01* |
| **Cervical spine** | 3 | 6 | 2 | 6.1 | 0 | 0.0 | 5 | 5 | 1.92 | 0.38 |
| **Upper limbs** | 16 | 32 | 5 | 15.2 | 3 | 17.7 | 24 | 24 | 3.61 | 0.16 |
| **Lower limbs** | 28 | 56 | 18 | 54.6 | 8 | 47.1 | 54 | 54 | 0.41 | 0.81 |

**N = number of cases, * significant at p <0.05**

**Table (7):** Types of injuries in studied vehicle occupants

| | | Studied vehicle occupants | | | | | | | | Pearson's Chi-square test | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Drivers (N= 50) | | Front seat passengers (N=33) | | Rear seat passengers (N = 17) | | Total (N=100) | | $X^2$ | P-value |
| | | N | % | N | % | N | % | N | % | | |
| **Skin abrasions** | | 10 | 20 | 4 | 12.1 | 2 | 11.8 | 16 | 16 | 1.203 | 0.548 |
| **Contusions** | | 50 | 100 | 33 | 100 | 16 | 94.1 | 99 | 99 | 3.594 | 0.166 |
| **Contused wound** | **Lacerations** | 7 | 14 | 11 | 33.3 | 2 | 11.8 | 20 | 20 | 5.259 | 0.072 |
| | **Avulsions** | 1 | 2 | 2 | 6.1 | 2 | 11.8 | 5 | 5 | 2.494 | 0.287 |
| | **Degloving** | 3 | 6 | 0 | 0.0 | 1 | 5.9 | 4 | 4 | 3.286 | 0.193 |
| | **Amputation** | 0 | 0 | 2 | 6.1 | 0 | 0.0 | 2 | 2 | 4.518 | 0.104 |
| **Organs** | **Brain** | 2 | 6 | 1 | 3.0 | 2 | 11.8 | 5 | 5 | 2.013 | 0.366 |
| | **Liver** | 1 | 2 | 0 | 0.0 | 3 | 17.6 | 4 | 4 | 10.141 | 0.006* |
| | **Lung** | 0 | 0 | 1 | 3.0 | 2 | 11.8 | 3 | 3 | 6.034 | 0.049* |
| | **Spleen** | 0 | 0 | 0 | 0.0 | 1 | 5.9 | 1 | 1 | 4.932 | 0.085 |
| | **Urinary bladder** | 0 | 0 | 0 | 0.0 | 1 | 5.9 | 1 | 1 | 4.932 | 0.085 |
| **Fracture and dislocation** | | 40 | 80 | 28 | 84.9 | 10 | 58.8 | 78 | 78 | 4.662 | 0.097 |

**N = number of cases, * significant at p <0.05**

**Table (8):** Duration of hospital stay (in days) for motor vehicle occupants

| Hospital stay (days) | Studied vehicle occupants | | | Kruskal-Wallis Test | |
|---|---|---|---|---|---|
| | Drivers | Front seat passengers | Rear seat passengers | Z | P-value |
| **Minimum - Maximum** | <1 – 15 | <1 - 14 | <1 – 14 | 1.927 | 0.381 |
| **Median (IQR)** | 3 (2.5) | 5 (4) | 3 (3.5) | | |

**IQR= interquartile range**

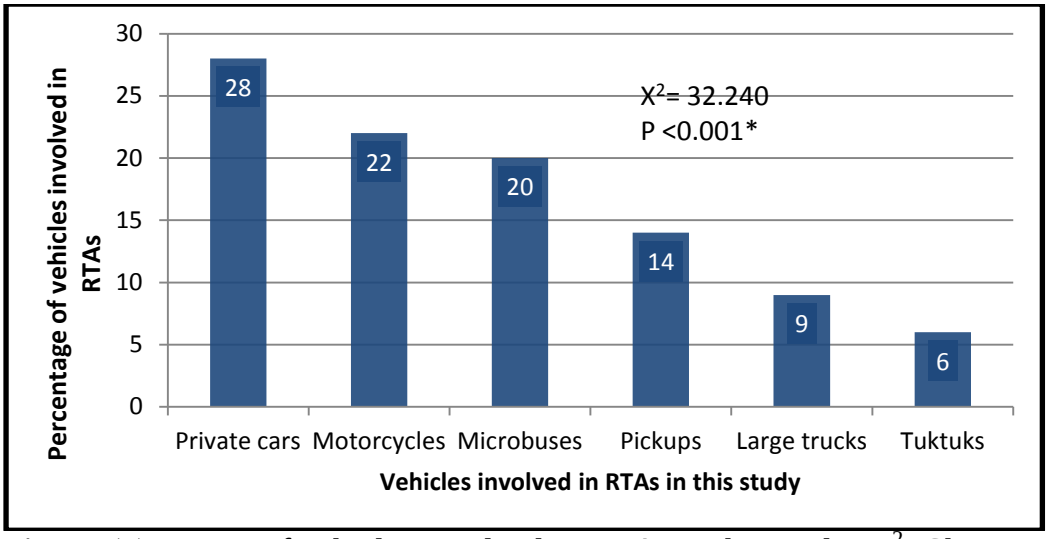


**Figure (1):** Types of vehicles involved in RTAs in this study. $X^2$: Chi square goodness of fit test, * significant at p <0.05

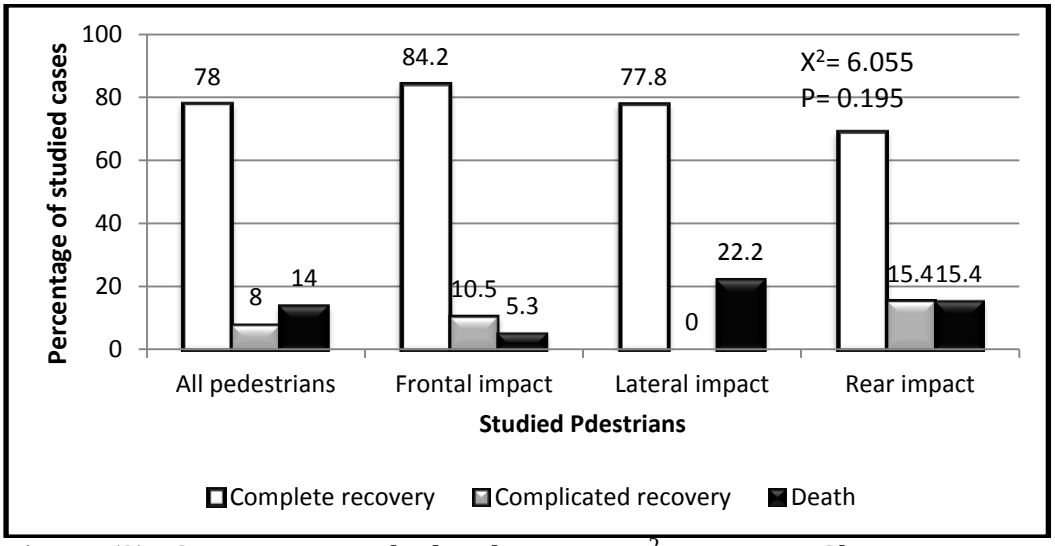


**Figure (2):** Outcome in studied pedestrians. $X^2$: Pearson's Chi square

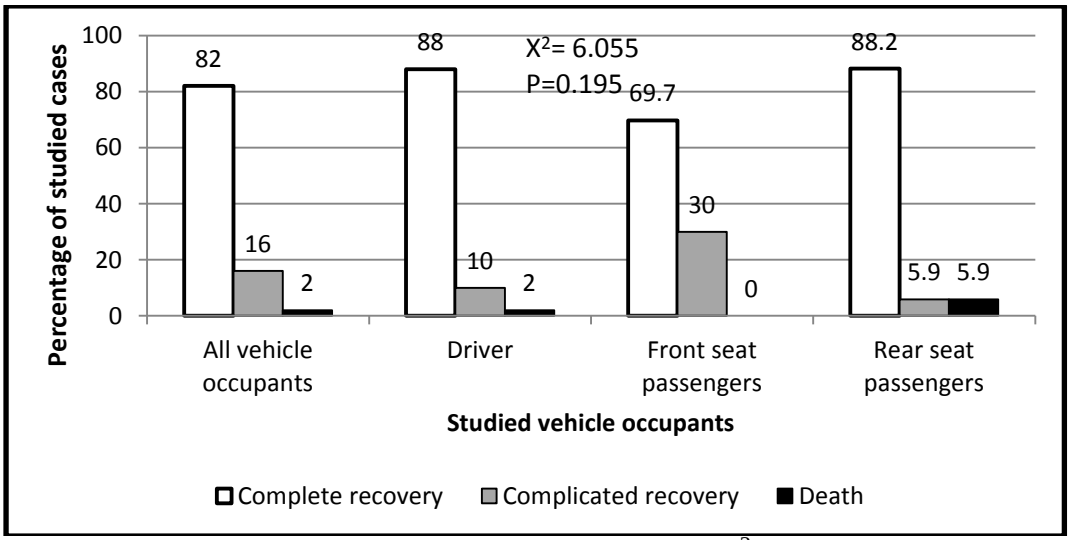


**Figure (3):** Outcome in studied vehicle occupants. $X^2$: Pearson's Chi square test.

## DISCUSSION

In Egypt, there are more than 12000 fatalities each year from RTAs. Thousands more are injured and some are suffering long-term disabilities as a result **(World health organization, 2012)**.

Characterization of the commonly encountered injuries due to accidents, and establishment of corresponding precautions might reduce RTA related morbidity and mortality **(Abdulla, 2012)**.

This study has been carried out to evaluate patterns of injuries in cases of motor vehicle accidents.

This prospective study included 150 victims of RTA who were admitted to the emergency Department in El-Sahel teaching Hospital through the period from the 1st of May 2013 to the 30th of November 2013. The studied subjects included 50 pedestrians, 50 drivers, 33 front seat passengers and 17 rear seat passengers.

**Regarding vehicle type,** this study showed that private cars had a higher incidence of motor vehicle accidents (28%), followed by motorcycles (22%) and microbuses (20%). These results are in accordance with those of **Naci et al., (2009)** in low income countries and **Nefad et al. (2012)** in Cairo, Egypt. Private cars were more encountered in motor vehicle accident in our study because of large number of private cars in Cairo (the place of the study) and the overcrowded roads which were not designed to accommodate this large number of cars. On the other hand, **Jha et al. (2004)** reported a higher incidence of trucks, buses and two wheelers in South India. **Verma and Tewari (2004)** in Delhi, India, **Gupta et al., (2007)** in Bengal and **Labinjo et al (2009)** in Nigeria reported that motorcycles were the most commonly encountered vehicles in RTAs.

**Regarding the results of the studied pedestrian groups,** the highest percentage of injured pedestrians were in the age group 10 – 20 years (30%) followed by age group <10 years (22%) and then by age group 20-<30 years (14%). Males were more injured (76%) than females. This result was in agreement with **Singh et al., (2007)** in Haryana, India**, Lin and Kraus (2009)** in Taiwan**, Hashim** et al**. (2011)** in Malaysia, **Abdulla (2012)** in Aden, Yemen and **Parkinson et al. (2013)** in South Africa who found that most victims were males aged less than 30 years old. On the other hand, **Yadukul (2013)** in Bangalore, India revealed that pedestrian victims in his study included 49% male and 51% female and the most common age of pedestrians encountered in RTA was 20-29 years (16.1%) followed by 70-79 years (13.4%). The involvement of young age groups in RTAs found in this study could be explained on the basis that this is the most active phase of life, physically and socially, and the most productive age group of society. Furthermore, male victims outnumbered females because of their more impulsive behavior and greater risk of exposure.

In the present study, the most frequently injured body regions were lower limbs (66%), head and neck (54%) and then upper limb injuries (26%). This result is in agreement to findings of **Eid et al., (2009)** in Alin, United Arab Emirates**, Yang et al., (2005)** in Germany**, Martin et al, (2011)** in France**, Abdulla (2012)** in Aden, Yemen and **Yadukul (2013)** in Bangalore, India. However, **Markogiannakis et al. (2006)** in

Greece displayed a higher incidence of head injuries followed by lower limb injuries. This discrepancy could be attributed to the differences in vehicle types involved in RTAs and the age of the study population which affect the site of injury. The predilection of extremities and head as common sites for injury in pedestrians could be explained by the fact that pedestrian victims sustain three impacts: (i) the impact of the vehicle bumper, (ii) impact with the bonnet and windscreen, and (iii) impact with the ground. This is translated into: (i) lower limb injuries, (ii) head and torso injuries, and (iii) head and 'outstretched' upper limb injuries **(Parkinson et al., 2013)**.

**As regards injury pattern,** contusions occurred in all cases followed by fracture and dislocation injuries (74%) then skin abrasions and organ injuries (24% and 22% respectively). However, **Singh and Dhattarwal (2004)** in Harayana, India reported that dislocation and lacerations were the commonest seen injuries followed by abrasions while **Abdulla (2012)** in Aden, Yemen and **Siddaramanna and Kumar *(*2014)** in Karnataka, India found that abrasions were the most common injuries followed by lacerations then contusions.

All pedestrians sustained contusions in the current study because of the nature of offending agent (motor vehicle parts and the ground) as they are blunt objects with high impact kinetic energy, also skeletal and joint injuries were of higher frequency because of the biomechanics of the trauma between the vehicle and the malpositioned lower limbs and the strike of malpositioned lower and upper limbs against the ground.

**As regards the outcome of injured pedestrians**, this study showed that 78% of pedestrian victims recovered completely while 8% had complicated recovery and 14% died due to trauma consequences. It was noted that death occurred more frequently in pedestrian victims of lateral impacts (22.2%). In agreement to this result, **Shalaby et al., (2008)** in their study in Great Cairo showed that more than half the cases improved completely while 11.1% had disabilities due to the nature of the injuries.

**As regards the period of hospital stay,** this study showed that the median period of hospital stay for pedestrians was 3 days. Similarly, **Cassell et al., 2010** study in Victoria, Australia revealed that average length of hospital stay for pedestrians was 4.9 days. On the other hand, longer duration of hospital stay was reported for injured pedestrians by **Canadian Institute for Health Information (2004), National trauma registry analysis in brief (2007)** in Canada**, Berry and Harrison (2008)** in Australia**, Ontario Injury Prevention Resource Centre (2009), Sheridan et al. (2011)** in Ireland**, Broughton et al. (2012)** in Europe**, Traffic data linkage project (2012)** in Oklahoma, United States and **Parkinson et al. (2013)** in South Africa**.**

**Regarding the results of the studied vehicle occupants,** this study showed that 46% of drivers were in the age group 20-< 30 years old, while front seat passengers were more commonly in the age group <10 years old (27.3%) and 20-<30 years old (24.2%). Male victims outnumbered females (95%). It was also noted that all female victims were rear seat

passengers. This result is in agreement with those obtained by **Abdel Hady and Abdel Monem, (2001)** in Assiut, Egypt**, Jha et al., (2004)** in South India**, Verma and Tewari (2004)** in Delhi, India**, Ganveer and Tiwari (2005)** in Central India**, Hashim et al., (2011)** in Malaysia, **Parkinson et al., (2013)** in South Africa and **Yadukul (2013)** in Bangalore, India. The affection of youth particularly males could be attributed to the risk taking behaviour of youths. Males are the bread earners for the family and therefore they are involved usually in outdoor activities exposing themselves to accidents. This results in double loss to the country. Firstly, expenditure is incurred in the treatment of these victims and secondly, being the most productive age group, it results in huge productive loss. Moreover, affection of children less than 10 years old could be attributed to negligence of parents and care takers as children shouldn't be placed in front seat and the use of seat belts designed for children or adjusted for them is not followed. The less incidence of female victims of RTAs found in this study could be explained also by the lower number of female drivers compared to males in our country and the tendency of male drivers to expect slow driving of females so they keep a distance between their vehicles and those driven by females.

**As regards the site of injuries in the vehicle occupants,** this study showed that lower limbs and head were the most common injured parts in the body (54% and 45% respectively) in all vehicle occupants. Upper limb injuries were more common in drivers while abdominal and pelvic injuries were more common in rear seat passengers. These results were in partial agreement to those by **Markogiannakis et al., (2006)** in Greece who revealed that extremities injuries were the commonest (37.3%) followed by head injuries (34.9%) then thoracic injuries (29.7%). On the other hand, different body regions were reported to be the most common sites of injuries by other studies. **Eid et al., (2009)** in Alin, United Arab Emirates stated that head injuries were followed by chest then extremities in drivers, while upper limb injuries were followed by head then chest in front seat passengers. Injuries to extremities were more frequent than head injuries in rear seat passengers. **Hashim et al., (2011)** in Malaysia reported that injuries suffered by passengers occurred at the head region (38.9%), followed by lower limbs (35.7%), chest (19.1%), and abdomen (4%). **Abdulla (2012)** in Aden, Yemen reported that the commonest body regions affected were: head and face (82%), chest (60%), and lower limbs (50%) in drivers; lower limbs (51.7%), head and face (48.27%), then neck and spine (3.44%) in front seat passengers; and head and face 9.5%, upper limbs 7.6%, and lower limbs 7.6% in rear seat passengers. **Yadukul (2013)** in Bangalore, India revealed that the most injured regions were neck (39.1%) followed by chest injuries (13.9%) then lower limbs (11.9%).

The susceptibility of extremities to injury in vehicle occupants reported in this study could be attributed to the position of El-Sahel hospital inside the city, thus most victims were encountered in low speed accidents as it is not near enough to the high way. In low speed motor vehicle accidents, the driver exerts severe stress on his lower limbs trying to press the brakes and the

front seat passenger does the same as if he is pressing the brakes **(Knight, 1996)**. So both upper and lower limb injuries in this situation could be considered as defence injuries.

**As regards injury type,** this study showed that contusions (99%) and fracture and dislocation injuries (78%) were the commonest. Amputations were noted only in front seat passengers. However, **Gunjan** et al. **(2005**) reported that fracture of the bones was the most common injury followed by abrasions and lacerations. **Abdulla (2012)** reported that the most common injuries for drivers and front seat passengers included abrasions, fractures, contusions, and lacerations while rear seat passengers had contusions followed by abrasions, lacerations, and fractures.

Most studies revealed that, in RTAs, blunt injuries (contusions, abrasions, fractures and dislocations) were the most common injuries in motor vehicle occupants because of the similarity between the offending agents. Inside the vehicles the offending traumatic agent may be: Impaction of the individual on some portion of the interior of the car or violation of the integrity of the passenger compartment by intrusion of part of the car or of another object, e.g., another vehicle or lamppost, into the passenger compartment or throwing the rear seat passengers to the front.

**As regards the outcome of vehicle occupants,** this study showed that complete recovery occurred in 82% of motor vehicle occupants, complicated recovery occurred in 16% of cases and death occurred in 2% of cases. Complicated recovery was significantly higher in front seat passengers. The higher incidence of complications encountered in front passengers could be explained by the fact that this position in the vehicles is more dangerous than that of the driver. The absence of steering wheel results in an increased collision with the windscreen. Moreover, drivers have a momentary warning of an impending crash, compared with the passenger who may be not be aware of the imminent accident and fail to take precautions for the impact.

**As regards the duration of hospital stay,** front seat passengers had longer median hospital stay (5 days) than drivers and rear seat passengers (3 days each). In accordance with these results, **National trauma registry analysis in brief (2007)** study in United States showed that the average durations of hospital stay for drivers and passengers were 3 and 4 days respectively. **Berry and Harrison (2008)** in Australia revealed that the mean duration of hospital stay for motor vehicle occupants and drivers were 5.0 days and 4.9 respectively. On the other hand, a longer duration of hospital stay was reported in other studies. **Parkinson et al. (2013)** in South Africa revealed that the average length of stay for car occupants was 21 days. **Bergen et al. (2014)** in USA revealed that the average length of stay for motor vehicle occupants was 5.6 days.

## CONCLUSIONS

The results of this study demonstrated the types and distribution of injuries in victims of RTAs. These results may help health care providers to anticipate the injuries in patients with subsequent early diagnosis and treatment of RTAs victims. Moreover, these results may enable concerned

authorities to reconstruct the accident when needed.

## RECOMMENDATIONS

From this study, the authors recommend:

**1.** Increasing awareness and promoting knowledge of health care providers about the most commonly expected injuries in victims of RTAs in order to enhance early diagnosis and to prevent complications.

**2.** Increasing awareness of all people via different mass media, schools and universities about the dangers of not following the traffic rules particularly placing children in front seats of vehicles and not using seatbelts adjusted for children.

**3.** Carrying out further researches concerning RTAs' causes, types of vehicles and toxicological screening to cover the problem as much as possible to help concerned authorities to track the problem and thus finding solutions to save lives and economy.

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## الملخص العربى

# تقييم لأنماط الاصابات في حوادث الطرق في القاهرة الكبري، مصر

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**خلفية علمية:** تتسبب حوادث الطرق في أكثر من 1.2 مليون حالة وفاة كل عام علي مستوي العالم وهي السبب الرئيسي للوفاة بين الشباب من سن 15 حتي 45 عاما .

في مصر ساهمت الزيادة السريعة في عدد المركبات بالإضافة إلي كثرة السكان وعدم وجود استراتيجية مناسبة للوقاية من حوادث الطرق في جعل مصر واحدة من أعلي الدول من حيث معدلات حوادث الطرق في العالم.

**الهدف من البحث**: تقييم أنماط الإصابات لضحايا حوادث الطرق

**طريقة البحث:** قامت هذه الدراسة بفحص 150 حالة من حوادث الطرق في مصر الواردة إلي قسم الطوارئ، في مستشفى الساحل التعليمي، في الفتره ما بين مايو الي نوفمبر لعام 2013. وتم جمع بيانات المصابين، و موقعهم اثناء الحادث و نوع المركبة، و انواع الإصابات الناتجة و موضعها من الجسم و فترة المكوث بالمستشفي و ما آل إليه حال المصاب.

**النتائج:** أظهرت النتائج أن السيارات الخاصة من أكثر المركبات المتضمنة في حوادث السيارات (28% من الحالات) تليها الدراجات النارية (22% من الحالات). و شكل الذكور الأغلبية العظمى من ضحايا حوادث الطرق بنسبة ذات دلالة إحصائية (76٪ من المشاة و 95٪ من راكبي السيارة). كانت الإصابات الأكثر شيوعا للمشاة من حيث المكان في الأطراف السفلية (66٪) و الرأس ( 54٪) ،والأطراف العلوية (26٪). وجدت الكدمات في جميع حالات المشاة ،و كسور العظام وخلع المفاصل في 74٪ من الحالات. معظم المشاة تماثلوا للشفاء الكامل في 78٪ من الحالات ، وحدثت مضاعفات في 8٪ والوفاة في 14٪ من الحالات و كان السبب الأكثر شيوعا للوفاة في ضحايا المشاة هو المضاعفات الناشئة عن إصابات الرأس. أما بالنسبة لركاب السيارة والسائقين فكانت الإصابات الأكثر شيوعا في الأطراف السفلية (54٪) و الرأس (45 ٪) والأطراف العلوية (24٪). كانت أنماط الإصابات الأكثر شيوعا لركاب السيارة والسائقين هي الكدمات (99٪) ، و الكسور وخلع المفاصل (78٪). كانت نتيجة الإصابة لركاب السيارة والسائقين هي الشفاء الكامل في 82٪ من الحالات ، وحدوث مضاعفات في 16٪ والوفاة في 2٪ من الحالات. وكانت الوفاة بسبب إصابات في الرأس والصدر.

**الاستنتاج**: إن نتائج هذه الدراسة توضح نمط الإصابات في ضحايا حوادث الطرق سواء المشاة أو راكبي المركبات. هذه النتائج قد تساعد مقدمي الرعاية الصحية في توقع الإصابات في ضحايا الحوادث و التشخيص و العلاج المبكر. بالإضافة لذلك فقد تعين السلطات المختصة علي إعادة بناء الحادث.