



## Road Traffic Accidents in Iraq and the Seat Belts Benefit in Minimizing the Injuries

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### Abstract

Road traffic accidents (RTAs) are a leading cause of maxillofacial trauma and facial bone fractures. The present study aims to investigate the relationship between facial bone fractures, trauma severity, and the use of seat belts among passengers involved in road traffic accidents in Diyala Governorate, Iraq. To detect the relation of facial bone fractures and severity of trauma in relation to position of passenger and seat belts wearing during road traffic accident in Iraq, Diyala Governorate, especially these Governorate considered the main land road linking the capital and the southern governorates with the governorates of the Kurdistan province. This retrospective study examined patients with facial bone fractures admitted to Baquba Teaching Hospital in Diyala Governorate from October 2020 to September 2022. The study analyzed the data to determine the incidence of facial bone fractures and their severity in relation to the position of the passenger and the use of seat belts during road traffic accidents. Results: A total of 200 individuals were identified as having sustained 464 maxillofacial fractures as a result of road traffic accidents while seated inside a vehicle. The study revealed that the average number of fractures per patient was lowest (0.8 fractures per patient) among front passengers who were wearing seat belts. Drivers who wore seat belts had a slightly higher average number of fractures (2.8 fractures per patient). In contrast, rear passengers who did not wear seat belts had the highest average number of fractures (11 fractures per patient). CONCLUSION: The findings of this study emphasize the significant role of seat belts in reducing the occurrence of facial bone fractures, particularly for drivers and front passengers. In contrast, rear passengers who did not use seat belts were particularly vulnerable to facial bone fractures. These results underscore the importance of seat belt usage as an effective measure to minimize facial bone injuries in road traffic accidents. Further research with more comprehensive details is warranted to strengthen the understanding of the relationship between seat belt usage and facial bone fractures in Iraq.

## Introduction:

Maxillofacial fractures (MFs) are a common consequence of trauma, with road traffic accidents (RTAs) being a significant cause. The management and diagnosis of MFs require careful attention to avoid complications to vital anatomical structures in the head and neck region. The severity and distribution of these fractures can vary among the upper, middle, and lower thirds of the face.<sup>(1)</sup> RTAs have emerged as a major cause of maxillofacial trauma, particularly in developing countries, and their impact is expected to increase in the coming years.<sup>(2)</sup> Several factors contribute to the prominence of MFs as a significant public health concern. Increased speed of travel, rising rates of violence, crowded urban environments, and industrial accidents all play a role in the occurrence of MFs. These factors create a higher risk of facial trauma, as the face is exposed and vulnerable to direct impact during accidents.<sup>(3)</sup> The etiology of MFs exhibits significant variability across countries and even within the same country. This variation is influenced by socio-economic, cultural, and environmental factors. While RTAs consistently emerge as a leading cause of MFs in both developed and developing countries, there has been a decline in the incidence of RTA-related MFs in developed countries.<sup>(4)</sup> This decline can be attributed to various factors, including changes in societal behavior and attitudes towards road safety, implementation of regulations such as seat belt usage and mandatory helmet laws for motorcycle riders, reduced alcohol consumption while driving, improvements in road infrastructure, advancements in vehicle safety features, and stricter traffic regulations and enforcement.<sup>(5)</sup>

It is noteworthy that MFs predominantly affect males in their third decade of life. This demographic pattern emphasizes the importance of targeted interventions and preventive programs focused on this specific population. Understanding the demographic patterns and epidemiological data related to facial injuries is crucial for effective planning and management of

MFs. Such knowledge enables the development of preventive programs tailored to address the specific risk factors and behaviors prevalent in different populations.<sup>(6)</sup> Maxillofacial injuries often coexist with other injuries, such as cervical spine injuries, head trauma, and compromise to the airway. Therefore, comprehensive management of MFs requires a multidisciplinary approach involving specialists from various medical fields.<sup>(7)</sup> The primary goal of managing facial fractures is to restore normal anatomy and function while ensuring patient comfort and minimizing postoperative complications. Treatment approaches for MFs vary depending on the nature and severity of the fracture, ranging from non-surgical interventions for superficial wounds to surgical reduction and fixation for more complex fractures involving the nasal bones or mandible.<sup>(8)</sup> Road traffic accidents (RTAs) in Iraq pose a significant public health concern, leading to injuries and fatalities. These accidents result in a range of injuries, including maxillofacial trauma and facial bone fractures. Understanding the impact of safety measures, particularly seat belt usage, is crucial in minimizing the severity of injuries sustained during these accidents.<sup>(9)</sup> Seat belts act as a restraint system that helps prevent occupants from being ejected from the vehicle and reduces the risk of impact with the vehicle's interior. By wearing seat belts, individuals are better protected and have a higher chance of avoiding or minimizing facial bone fractures. Seat belt usage should be strongly promoted and enforced as a preventive measure to reduce the severity of injuries sustained in RTAs.<sup>(10)</sup> These findings highlight the importance of public awareness campaigns and educational programs aimed at promoting seat belt usage among all vehicle occupants. Additionally, effective legislation and law enforcement regarding seat belt usage can contribute to a safer road environment and a reduction in the number and severity of facial bone fractures caused by RTAs.

## Objective:

The objective of this study is to investigate the relationship between facial bone fractures, trauma severity, and seat belt

usage among passengers involved in road traffic accidents in Diyala Governorate, Iraq. Diyala Governorate is a significant transit route connecting the capital city and the southern governorates with the Kurdistan province.

## Materials and Methods:

A retrospective study performed to patients with fractures of facial bone who were admitted during a period From October 2020 to September 2022 these patient admitted to (Baquba teaching hospital, Diyala Governorate, Iraq).during this period, a database of 382 victims who suffer from fractures of facial bone and admitted to the emergency center, 287 had been involved in traffic accidents, among which 200 were inside passenger cars, while the other where in various means of transportation. The 200 patients who travelling by using passenger cars are target of this study, these patients are divided into groups depending on the site of seating in the cars at the moment of the accident (Driver, Front Passenger or Rear Passenger) and if these passengers or drivers are wear seat belts. During the selection of the data for this study we put in the mind about detection the sites of fracture line and the numbers of bone involved in each groups, also the number of bone fractured in each patient was calculated in each group to relate and permit the study of the relation between the postion of patient inside the cars and the amount of trauma involved the facial bones. Written informed consent was gained from the victims to publish this paper, If the victim was unconscious, their family member(s) signed the Free and Informed Consent Form.

### Excluded criteria:

The patients died whose relatives disagree to participate there information in this study, incomplete medical chart patients.

### Included criteria:

The cases that encountered the criteria of inclusion through the sample selection.

*The information below was taken from each victim in order to collect the Data:*

*Name*

*Age*

*Gender*

*Adress*

*Causes of trauma:*

*A/Tossed from car.*

*B/Position of seating in the car (Driver, Front Passenger or Rear Passenger)*

*C/Are you the driver.*

*D/Wearing of seat belts.*

*Clinical and radiological examination:*

*Facial bone Involved and number of fracture line:*

*a-Frontal*

*b-Orbit*

*c-Nasal*

*d-Maxilla*

*e-Mandible*

*f-Zygoma*

## Statistical analysis

SPSS programs used to doing statistical analysis to the measurements which is abbreviated of (statistical package for social sciences) version 19 computer software”, and data analysis was converted into a digital database structure.

## Results:

This study can reveal that 200 individuals suffered from 464 maxillofacial fractures as a consequence of (ART) when sitting inside the vehicle during an accident, craniofacial fractures as a result of being inside a car during the accident. The average age of enrolled patients was 37.96 years. The ratio of men to women was 1,63:1.

The data revealed that 40 out of the 60 drivers were wearing seat belts, 13 out of the 23 front-seat passengers were wearing seat belts, and none of the rear-seat passengers were wearing seat belts after dividing the 200 car occupants into groups based on seating position in the vehicle and the wearing of seat belts Table (1). There were 28 and 52 fracture lines detected among drivers who were wearing seat belts, respectively; 8 and 156 fracture lines were found among front-seat passengers who were not wearing seat belts respectively. There were 220 fracture

lines in the rear passengers, and none of them were wearing seat belts Table (2).

Result of table (1) show the total number of victims were (200), 60 driver, 60 front passenger and 80 rear passenger. The total number of seat belts wearing are ( 53), the drivers are wearing seat belts from the collected sample (40), while only (13) from the front passenger wearing the seat belts and no one from the rear passenger wearer the seat belts.

Table (2) show the total numbers of fractured bones in facial area were (464), the facial bones fracture in drivers 80, (28) in drivers wearing seat belts, while (52) in drivers not wearing seat belts also the table show the number of bones fracture in front passenger (164) , (8) in front passenger wearing seat belts while the number of bones fracture in front passenger not wearer seat belts (156) and for whom that seated in rear position the bones fracture were (220), no one of them wearer seat belts.

Table (3) show that the lower number of fractures bone per victims (0.8 fractures per patient) in front passenger wearing seat belts followed by drivers wearing seat belt (2.8 fractures per patient ), while the highest number of fractures bone in rear passenger not wearing seat belts(11 fractures per patient).

## Discussion:

In Iraq, particularly in Diyala Governorate, which serves as a main land road connecting the capital and southern governorates with the Kurdistan province, a retrospective study was conducted to examine the relationship between facial bone fractures, trauma severity, and seat belt usage among individuals involved in RTAs. The study, conducted from October 2020 to September 2022 at Baquba Teaching Hospital, aimed to provide insights into the effectiveness of seat belts in reducing the occurrence and severity of facial bone fractures.

The results of the study revealed that out of 200 individuals who suffered from 464 maxillofacial fractures as a result of RTAs, the highest number of fractures per patient (11 fractures per patient) was observed among rear passengers who were

not wearing seat belts. This finding highlights the vulnerability of rear passengers who neglect to use seat belts in RTAs. In contrast, front passengers who wore seat belts exhibited a lower number of fractures per patient (0.8 fractures per patient), indicating the protective effect of seat belt usage. Drivers who wore seat belts showed a slightly higher average number of fractures (2.8 fractures per patient), suggesting that the driver's position may expose them to more severe impacts during accidents.<sup>(11)</sup>

The study's conclusion emphasizes the significant role of seat belts in reducing the occurrence of facial bone fractures. The data clearly indicate that rear passengers who do not utilize seat belts are particularly susceptible to facial fractures. The absence of seat belt usage leaves individuals vulnerable to the forces generated during collisions, which can result in severe facial injuries.

Our study provides valuable insights into the prevalence of maxillofacial fractures in road traffic accidents in Iraq and the patterns of seat belt usage among the occupants. Among the 200 individuals included in the study, a total of 464 maxillofacial fractures were identified, emphasizing the significant burden of facial fractures resulting from these accidents. The average age of the patients was 37.96 years, highlighting the susceptibility of individuals across different age groups to maxillofacial fractures and underscoring the importance of preventive measures and increased road safety awareness among all age groups. The gender ratio of 1.63:1 (men to women) in the study population aligns with previous research indicating a higher incidence of maxillofacial fractures among males. Understanding these demographic patterns can aid in the development of targeted interventions and educational campaigns to address the specific risk factors and behaviors contributing to facial fractures in males.

The analysis of seat belt usage revealed concerning trends. Among the drivers, 40 out of 60 were wearing seat belts, while only 13 out of 23 front-seat passengers adhered to seat belt usage. Most alarmingly, none of the 80 rear-seat

passengers were wearing seat belts, highlighting the urgent need to improve compliance among this group. Further analysis demonstrated that drivers wearing seat belts had a lower number of fracture lines (28) compared to those not wearing seat belts (52). Similarly, front-seat passengers wearing seat belts had a significantly lower number of fracture lines (8) compared to those without seat belts (156). In contrast, rear passengers who did not use seat belts had the highest number of fracture lines (220).

The findings strongly emphasize the substantial protective effect of seat belt usage in minimizing the occurrence and severity of maxillofacial fractures in road traffic accidents. Urgent efforts are required to promote comprehensive seat belt compliance among all vehicle occupants, with particular attention given to rear-seat passengers who currently exhibit low rates of seat belt usage. Public awareness campaigns, educational programs, and stricter enforcement of seat belt laws are crucial in improving compliance and reducing the risk of facial fractures in accidents.

Several studies conducted worldwide consistently report the effectiveness of seat belt usage in reducing the severity of facial fractures. For instance, a study conducted in India demonstrated a significant reduction in the incidence of facial fractures among road traffic accident victims who wore seat belts<sup>12</sup>. Similarly, a study conducted in Taiwan and found a strong association between seat belt usage and a lower risk of facial fractures among car occupants<sup>13</sup>.

Developed countries, where seat belt usage rates are generally higher and regulations are strictly enforced, have observed a decline in facial fractures related to road traffic accidents. A study conducted in the United States and reported a reduction in the incidence of maxillofacial fractures due to increased seat belt usage and improvements in road safety measures<sup>14</sup>. Additionally, a study by done in Turkey revealed a decrease in facial fractures associated with road traffic accidents due to enhanced seat belt compliance and stricter traffic regulations<sup>15</sup>.

The current study's findings align with these previous research outcomes, indicating that seat belt usage plays a significant role in minimizing the occurrence and severity of facial fractures in road traffic accidents. However, the study also highlights the need for greater attention to rear-seat passengers who exhibit lower rates of seat belt usage. This is consistent with the findings of other studies that emphasize the vulnerability of rear passengers to facial fractures in the absence of seat belt restraints.<sup>16,17</sup>

Also our study revealed a total of 464 maxillofacial fractures among the 200 individuals analyzed. When considering the distribution of fractures based on seat belt usage, drivers wearing seat belts had 28 fractures, while drivers not wearing seat belts had 52 fractures. This indicates that seat belt usage among drivers played a role in reducing the severity and number of facial fractures. Among front passengers, 8 fractures were recorded among those wearing seat belts, whereas 156 fractures were observed among those not wearing seat belts. Rear passengers, who did not use seat belts, had the highest number of fractures, with 220 cases.

These findings align with previous studies that have demonstrated the protective effect of seat belt usage in reducing the incidence and severity of facial fractures in road traffic accidents. A study conducted in Taiwan and found that seat belt usage was associated with a lower risk of facial fractures among car occupants.<sup>13</sup> Similarly, a study in India reported a significant reduction in facial fractures among individuals who wore seat belts<sup>12</sup>. Furthermore, the study highlights the vulnerability of rear passengers who do not wear seat belts, as they had the highest number of facial fractures. This aligns with another research, which emphasized the increased risk of maxillofacial fractures among rear-seat passengers who neglect to wear seat belts.<sup>16,17</sup>

Collectively, these studies provide compelling evidence for the critical role of seat belt usage in minimizing the occurrence and severity of facial fractures in road traffic accidents. They underscore the need for comprehensive efforts to promote seat belt compliance among all

vehicle occupants, with particular attention to rear-seat passengers. Implementing public awareness campaigns, educational programs, and stricter enforcement of seat belt laws are essential steps in improving compliance rates and reducing the burden of facial fractures.

Our study examined the number of fractures per patient (F/PI) in different groups based on seat belt usage. Among front passengers wearing seat belts, the average number of fractures per patient was 0.8, indicating a significant reduction in facial bone fractures compared to those not wearing seat belts. For drivers wearing seat belts, the average number of fractures per patient was 2.8, slightly higher than front passengers wearing seat belts but still lower than rear passengers. This suggests that seat belt usage in the front passenger position played a crucial role in minimizing the number of facial fractures. When comparing our findings with other studies in the same field, additional insights into the impact of seat belt usage on facial fractures emerge. A study conducted in Taiwan and found that seat belt usage was associated with a lower risk of facial injuries among car occupants, reinforcing the importance of seat belt compliance<sup>13</sup>. Similarly, a study done in Turkey reported a decrease in facial fractures related to road traffic accidents in Turkey due to enhanced seat belt compliance and stricter traffic regulations<sup>15</sup>. These studies align with our findings, highlighting the role of seat belts in reducing facial bone fractures.

Notably, our study revealed that rear passengers who did not wear seat belts had the highest average number of fractures per patient, with 11 fractures. This emphasizes the vulnerability of rear passengers and the critical importance of seat belt usage for their safety. This finding is consistent with a study conducted in New Zealand, which highlighted the increased risk of facial fractures among rear-seat passengers who neglected to wear seat belts<sup>16</sup>.

In addition to the main study findings, it would be beneficial to consider the inclusion of online supplementary materials to provide further information

and enhance the understanding of the topic. These supplementary materials could include detailed tables, graphs, or figures illustrating the distribution of fractures, seat belt usage, and demographic characteristics of the study population. This would allow readers to visualize the data more effectively and facilitate a deeper analysis of the results.

Furthermore, it would be valuable to provide a discussion or analysis of the factors contributing to the observed patterns of seat belt usage among different groups of occupants. Exploring the reasons behind the low compliance rates among front and rear-seat passengers could shed light on barriers to seat belt usage and inform targeted interventions to improve safety behaviors.

Additionally, considering the long-term impact of facial fractures on the quality of life of individuals involved in road traffic accidents could provide a more comprehensive understanding of the significance of seat belt usage. Including information on the functional outcomes, psychological well-being, and aesthetic concerns resulting from maxillofacial fractures would provide a more holistic perspective on the importance of injury prevention measures.

In summary, the study investigated the relationship between maxillofacial fractures and seat belt usage in road traffic accidents in Iraq's Diyala Governorate. Among the 200 individuals included, 464 maxillofacial fractures were recorded. Seat belt usage was found to be low, with drivers showing better compliance compared to front-seat passengers and rear-seat passengers showing the lowest compliance. The study revealed that seat belt usage significantly reduced the number of fractures in drivers and front-seat passengers, while rear passengers had the highest number of fractures due to the lack of seat belt usage. These findings emphasize the importance of promoting seat belt compliance among all vehicle occupants, particularly rear-seat passengers. The study aligns with previous research, highlighting the protective effect of seat belt usage in reducing the incidence and severity of maxillofacial fractures. The inclusion of online

supplementary materials and further discussion on related factors is recommended to enhance the study's practical implications.

### Conclusion:

In conclusion, road traffic accidents in Iraq, particularly in Diyala Governorate, cause a high proportion of maxillofacial fractures. Seat belt use reduces these fractures. Seat belts reduced fractures in drivers and front-seat passengers. However, rear-seat passengers had the most fractures, emphasizing the necessity for seat belt compliance in this group. Public awareness campaigns, instructional initiatives, and stronger seat belt enforcement may reduce maxillofacial fractures in road traffic accidents. These results support earlier studies and provide insights for better prevention and intervention. Additional research and materials may increase road safety.

### Ethical Declarations

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#### Recommendations

Studying the same variable with large sample size, also take in consideration speed of car or collusion in regard to the fractures type or number.

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**Ethical clearance:** This study has been conducted following ethical approval from relevant body and approval has been acknowledged within the manuscript.

**Conflict of interest:** The author has no conflict of interest.

#### Authors' Contributions

Both authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Table (1): Number of patients per group.

Number of patients	With seat belt	Without seat belt	Total
Driver	40	20	60
Front Passenger	13	47	60
Rear Passenger	0	80	80
<b>Total</b>	53	147	200
<b>P value</b>	<b>&lt;0.01**</b>		

\*P value was calculated by chi-square test

Table (2): Number of fractures bones per group.

Number of patients	With seat belt	Without seat belt	Total
Driver	28	52	80
Front Passenger	8	156	164
Rear Passenger	0	220	220
Total	36	428	464
P value	<0.01**		

\*P value was calculated by chi-square test

Table (3) F/PI (number of fractures bone per patients) in different groups.

F/PI	With seat belt	Without seat belt	Total
Driver	2.8	10.4	13.2
Front Passenger	0.8	10.12	10.92
Rear Passenger	0	11	11
Total	3.6	31.52	35.12

Table (4): Number of fractured bones according to seat position and seatbelt among study population

Index	Mean $\pm$ SD	P value
Seat		
driver	1.3 $\pm$ 1	<0.01**
Front	2.7 $\pm$ 1.2	
Rear	2.7 $\pm$ 0.4	
Seat belt		
With seatbelt	0.7 $\pm$ 0.5	<0.01**
Without seatbelt	2.9 $\pm$ 0.5	

\*P values were calculated by ANOVA and independent sample T-test

Table (4) show number of fractured bones according to seat position and the mean  $\pm$  standard deviation for driver . also the table show the 0.01 <(1.3  $\pm$  1), front passenger (2.7  $\pm$  1.2) and rear passenger (2.7  $\pm$  0.4) also the p value seat belt wearing and not wearing (0.7  $\pm$  0.5),( 2.9  $\pm$  0.5) respectively and the p value <0.01.



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