

Incidence and aetiology of facial injuries resulting from motor vehicle accidents in Queensland for a three-year period

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Abstract

Background: No studies have been reported on the frequency and aetiology of facial injuries due to MVAs in Queensland. This study aims to investigate the incidence, aetiology, age and sex distribution of facial injuries resulting from MVAs for a period of three years.

Method: Cases were identified from the Motor Accident Insurance Commission, Queensland. Information including the type of injury sustained, the time, age and role of the patient in the accident were recorded and analysed.

Results: There was an average maxillofacial injury incidence of 4.8/100,000 per year, 53.5 per cent in males and 46.5 per cent in females. A peak incidence was found for both sexes aged 18 to 22 years. In males, 57 per cent of facial injuries occurred in this age group compared to 41 per cent in females.

Conclusions: Maxillofacial injuries as a result of MVAs are still relatively high regardless of the legislation for compulsory seatbelt use. Recent advances in seatbelt systems have the potential to reduce the risk of head and face impacts. The airbag is also well established as an effective means of preventing serious head and face injury. However, more research is required to further reduce the incidence of maxillofacial injuries as a result of MVAs.

Key words: Motor vehicle accidents, aetiology, incidence, maxillofacial injury.

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INTRODUCTION

Australia has one of the highest number of motor vehicle accidents (MVAs) as a rate per hundred thousand population,¹ with the head being the single body area most frequently injured in these accidents.^{1,2}

MVAs are also a significant cause of severe facial injuries. A study by Allen and Daly in Newcastle, Australia observed that MVAs were the cause of 21.5

per cent of mandible fractures.³ Probert et al, in Victoria in 1987 observed a total of 388 facial fracture injuries including mandibular fractures, maxillary/malar fractures and all other facial fractures as a result of MVAs.⁴

After the introduction of the seatbelt law, Henderson showed that a 25 per cent drop in the rate of car occupant fatalities in 1972 was statistically significant and attributable to the seatbelt law.⁵ Other studies have shown that people who were wearing seatbelts at the time of the accident suffered only minor injuries compared to those who were not.⁶ They also observed that more than half of the people who were admitted to a regional trauma centre with facial injuries as a result of a MVA tested positive for alcohol or drugs.^{6,7}

Whilst the introduction of compulsory seatbelt legislation has reduced both the number and severity of injuries sustained,^{1,8-10} MVAs remain a leading cause of facial injury for all age groups.^{7,11-13}

There have been no reported studies on the frequency and aetiology of facial injuries due to MVAs for the entire population of Queensland.

The aims of this study were to investigate the incidence, aetiology, age and sex distribution of facial injuries resulting from MVAs in Queensland for a period of three years. Seasonal variations were also investigated, as was the activity of the injured person at the time of the accident.

MATERIALS AND METHODS

Cases were identified from the data collected by the Motor Accident Insurance Commission (MAIC), Queensland, for all claims made for facial injuries in Queensland as a direct result of MVAs. The data were collected by reviewing medical reports and by coding the injuries as defined in the 1980 Abbreviated Injury Scale (AIS).¹⁴ The injuries were coded by type and severity and were collected routinely over the period September 1994 through to July 1997. The AIS codes included six digits, the first five digits used in this investigation (32101-32801) allowed the identification

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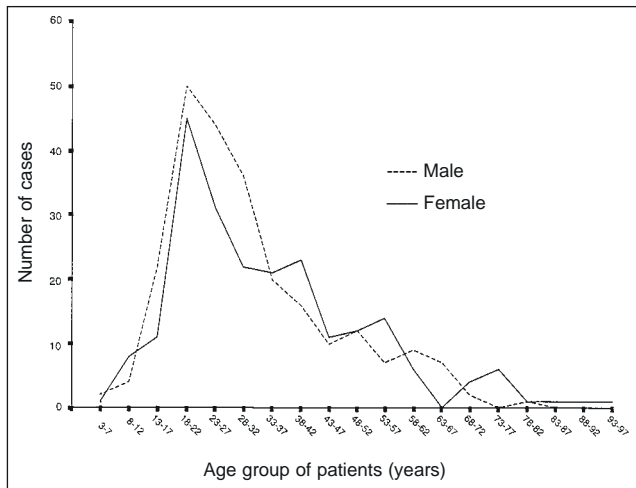


Fig. 1. Age-specific incidence of facial injuries as a result of MVAs in males and females in Queensland from 1994 to 1997. The distribution is shown in 5-year age groups from 3 to 97 years.

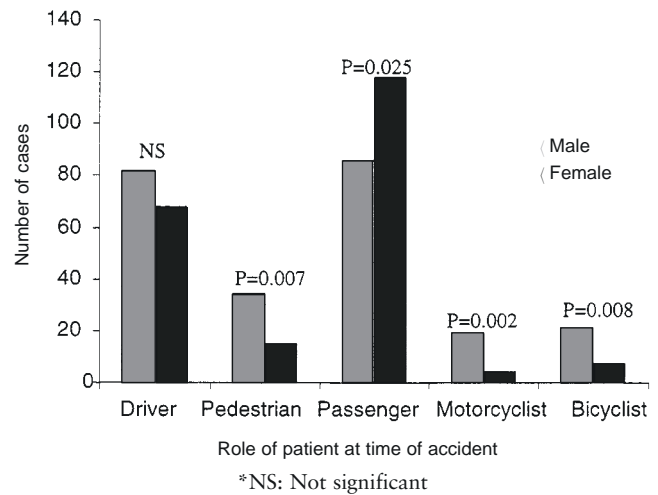


Fig. 2. The role of the injured person involved in the MVA.

of cases with injuries to the alveolar ridge, mandible, maxilla, nose, orbit, teeth, temporomandibular joint (TMJ) and the zygoma. The sixth digit was coded for severity of injury such as sprains, dislocations or fractures.

The five most severe injuries sustained by a patient as a result of a MVA were recorded in this database. Some cases suffering dental and facial trauma were therefore not recorded if other more severe injuries were sustained in conjunction with the facial injuries. Information including the time, age and role of the patient in the accident were also recorded and analysed.

Chi-square tests were performed to determine if any significant differences existed between the proportions of patients for each variable investigated. The incidence of recorded facial injuries as a result of MVAs was calculated using an estimate of the Queensland population obtained from the 1996 census of population and dwellings.¹⁵

RESULTS

There were 467 patients who sustained 566 injuries to the skeletal structure of the face as a result of MVAs in Queensland and recorded by MAIC in the three year period from September 1994 to July 1997. Given the population of Queensland which was estimated to be 3,339,109,¹² the average incidence of one or multiple maxillofacial injuries was 4.8/100,000 per year of the population as a result of MVAs. Of these recorded facial injuries, 53.5 per cent occurred in males

compared to 46.5 per cent in females. This overall gender difference was not significant.

Figure 1 shows the age-specific rates for males and females. A peak incidence was found for both males and females aged 18 to 22 years. In males, 57 per cent of facial injuries occurred in this age group compared to 41 per cent in females for the same group.

Figure 2 illustrates the activity of the patient at the time of the accident. Passengers in motor vehicles sustained most of the maxillofacial injuries (40.7 per cent), followed by the drivers of the motor vehicle (32.1 per cent) and pedestrians (10.5 per cent). Of the 51 injured motor cycle riders and cyclists, 78.4 per cent were males ($P < 0.001$). The age group most commonly affected by motorcycle accidents was the 23-27 year old age group for both males and females even though there were three times more motorcycle licensees in Queensland in the 40 to 49 year old age group.¹⁶

Table 1 describes the number of motorcycle and motor vehicle licensees in Queensland for the period ending July 1999. Although there were significantly more males who sustained injuries from motorcycle accidents, the proportion of injured females per motorcycle license was 1.5 times greater than males.

The number of patients who were injured whilst driving a motor car varied between age group and gender. Of all 150 drivers who were injured, 54.7 per cent were male. Most injured drivers were in the 18-22 year old age group (22.7 per cent) for both males and females and this was followed by the 33-37 (13.3 per cent) and 28-32 (12.0 per cent) year olds respectively

Table 1. Number of motor vehicle and motorcycle licence holders in Queensland.*

	Female		Male		Total	
	Number of licensees	Per cent of population	Number of licensees	Per cent of population	Number of licensees	Per cent of population
Driver's License	1,088,186	32.6	1,210,398	36.3	2,298,584	68.8
Motorcycle License	52,665	1.6	370,265	11.1	422,930	12.7

*Data obtained from Queensland Transport for July 1999.¹⁶

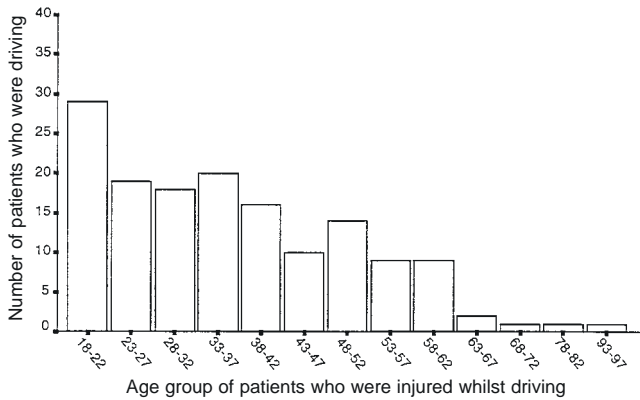


Fig. 3. The age group of patients sustaining maxillofacial injuries whilst driving a motor vehicle.

($P < 0.001$). Figure 3 illustrates the age distribution amongst all drivers who sustained maxillofacial injuries.

The most common maxillofacial injury recorded in this study was injury to the teeth. These amounted to a total of 307 injuries and included injuries that were not further specified (NFS), dislocation or loosening, fractures and avulsions. The next most common injury was zygoma fracture and included all types of fractures. Males outnumbered females in all maxillofacial injuries except alveolar ridge fractures and dental injuries. However, these differences were not significantly different. Males sustained 73.1 per cent of all fractures to the zygoma compared with 26.9 per cent in females. This difference, although large, was not statistically different when fractures were divided according to the role of the patient at the time of the accident. Only two patients sustained fractures to the alveolar ridge.

Figure 4 illustrates the time of day that the injuries occurred. Significantly more accidents occurred between 8 am and 4 pm ($P < 0.001$) with the peak incidence occurring between 3 and 4 pm. There were more than twice the number of accidents occurring between midnight and 8 am outside of the Brisbane metropolitan region, compared with all other regions in Queensland, 25.9 per cent and 11.4 per cent

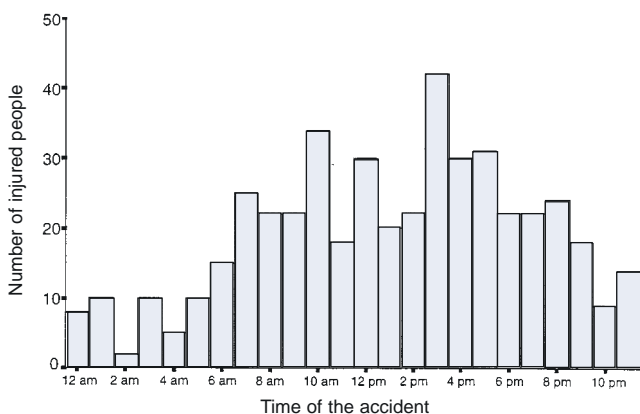


Fig. 4. Histogram of the number of injured people according to time of the day of the accident.

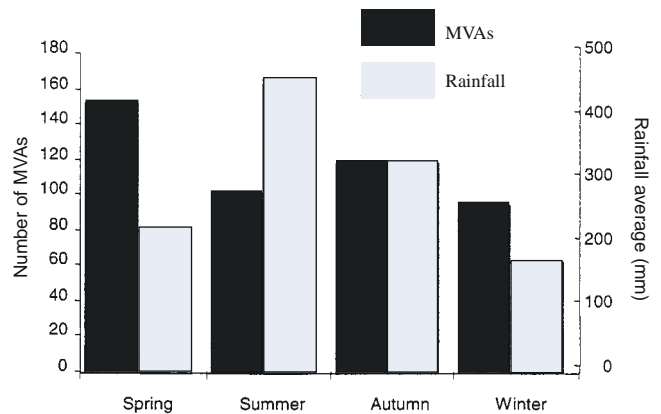


Fig. 5. A seasonal comparison of the frequency of maxillofacial injuries as a result of MVAs in Queensland between 1994-1997 and the average rainfall recorded in Brisbane for the previous 47 years.

respectively ($P = 0.03$). This difference in time of the accident was the only difference observed between metropolitan Brisbane and all other areas of Queensland.

There was a significant difference in the number of maxillofacial injuries as a result of MVAs between the different seasons of the year ($P < 0.001$). Most accidents occurred in spring (32.8 per cent) while winter recorded the lowest number of maxillofacial injuries of 20.3 per cent which coincided with the lowest average rainfall in Brisbane recorded for the last 47 years (Fig. 5).¹⁷

DISCUSSION

There is considerable under-reporting of cases from MVAs using police and hospital records and this is greatest in cases with less severe injuries.^{18,19} An RACQ survey of insurance claim forms indicated that fewer than half of the MVAs resulting in damage in excess of \$1,000 had in fact been reported to the police. Many people with minor injuries obtained treatment from their own personal medical practitioners, and reported neither the MVA nor the injury.²⁰

Whilst the incidence of maxillofacial injuries was 4.8/100,000 per year for the total Queensland population in this study, the true incidence of facial injuries would be higher than this figure suggests because of the sample selection procedure. Only patients sustaining maxillofacial injuries that were regarded as among the five most severe injuries sustained as a result of a MVA were coded in the database. Those patients who suffered five more severe injuries to other parts of their bodies as well as maxillofacial injuries were coded only for those injuries even though maxillofacial injuries may have been sustained. Another source for an underestimation of the true incidence was those patients sustaining only minor facial injuries and who did not seek third party compensation. Despite sampling problems, a generalised view of the spectrum of facial injuries sustained following MVAs can be established.

Most commonly affected with maxillofacial injuries as a result of MVAs was the 18 to 22 year old age group

for both males and females. This trend is consistent with other Australian and international studies of MVAs.^{7,21,22} This probably reflects the inexperience of this age group augmented by speeding and drink driving. The 18-24 year old age group made up one third of all drink driving offences for the period 1994-1997.²³

In this study, there were more injured passengers than drivers. A large proportion, approximately 36 per cent, comprised back seat passengers who suffered maxillofacial injuries. MAIC did not record the use of safety devices such as seatbelts or airbags at the time of the impact and no conclusions can be made regarding the benefits of these devices.

There were significantly more males than females who were involved with motorcycle, bicycle and pedestrian accidents. However, this could be explained by the larger proportion of males riding motorcycles and bicycles, compared with females. There are seven times more male motorcycle licensees compared with females in Queensland.¹⁶ However, when comparing injuries sustained as a result of motorcycle injuries per motorcycle license, females outnumbered males, 1.5:1.0.

The most common injury in this study was injury to the teeth followed by zygoma fractures. Whilst a MVA study conducted in Melbourne, Victoria between 1989 and 1992 had a similar age and sex distribution to our study, the types of injuries sustained could not be compared. The most common facial injury in their study was fractures or dislocations followed by contusions and sprains and strains.²

It is interesting to note that the pattern of injury differed somewhat to a Birmingham study by Rogers et al.²⁴ Their study examined maxillofacial injuries following steering wheel contact by drivers using seat belts. The most common bony injury in their study was closed fracture to the nose (43.8 per cent) followed by loosened, avulsed or fractured teeth (14.6 per cent). The most common injury in drivers in this study was injury to the teeth (55.4 per cent) followed by injury to the temporomandibular joint (12 per cent).

Most injuries were recorded between 8 am and 4 pm with the peak incidence occurring between 3pm and 4 pm. Ryan et al, also observed that the majority of accidents in their study occurred during daylight hours, particularly in the oldest age group.²² Fewer maxillofacial injuries (32.8 per cent) were recorded in winter in Queensland between 1994 and 1997. Although the climatic differences in this large state are vast, winter produces the lowest rainfall in Brisbane, which is also the region where the majority of accidents occurred.

SUMMARY

Australia has one of the highest numbers of MVAs as a rate per hundred thousand population, almost twice as high as in Britain. This may well be related to the high proportion of the population which is motorised, and the large areas of Australia with open roads.¹

Maxillofacial injuries as a result of MVAs are still relatively high regardless of the legislation for compulsory seatbelt use. Although the major benefit provided by a seatbelt is the prevention of ejection from the car, recent advances in seatbelt systems have the potential to reduce the risk of head and face impacts to front seat occupants in a frontal collision. This is achieved primarily by reducing the slack in the belt system by means of webbing locks and/or pretensioning devices.² Rogers et al, have also observed that minor soft tissue contusion/abrasions were often the only injury that occurred with contacts with steering wheels made of soft materials, whilst lacerations and head injuries were seen in greater numbers after hard material contact.²⁴ Softer and more deformable material in the steering wheel and dashboard may reduce the severity of injury upon contact.

The airbag is now well established as an effective means of preventing serious head and face injury in frontal impacts.² Recently developed side mounted air bags were and are intended primarily to protect the torso from injury but airbags specifically designed to protect the head in a side impact are now coming onto the market.²

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