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A retrospective study of oral and maxillofacial injuries in Seremban Hospital, Malaysia

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Abstract – *Introduction*: Aetiology of oral and maxillofacial injuries in this country includes motorvehicle accident (MVA), fall, industrial accidents and others. Among these causes, MVA accident is the predominant cause of injury in Malaysia. *Materials and methods*: A retrospective record review was carried out using hospital records of all patients who sustained oral and maxillofacial injury at the Department of Oral Surgery, Seremban Hospital, Negeri Sembilan, Malaysia between 1998 and 2002. Information related to demographics, aetiology of trauma, vehicles involved in collision, location of injuries and treatment modalities were reviewed. *Results*: Two thousand nine hundred and eighty-six patients sustained oral and maxillofacial injuries. Of these patients, 79.2% were men and the remaining were women. Among all the races, Malays had the highest involvement (50.6%) followed by Indians (24.5%), Chinese (19.6%) and others (5.3%). There were statistically significant results on the association of aetiology and the ethnic groups, in the age group of 30 years or less and male gender ($P < 0.001$). The most common injury was the soft-tissue injury followed by dental and dentoalveolar injuries and bony fracture. Among all facial fractures, 66.3% were managed conservatively, 13% were treated surgically and 19.7% did not have any intervention. In relation to dental and dentoalveolar injuries, 64.8% had treatment in the form of splinting, restorations or dental extraction. The rest of the patients (35.2%) were referred to their dentists or did not have any active treatment at Seremban Hospital. *Conclusion*: Most of the dental and facial injuries in Seremban Hospital were caused by MVA and were predominantly managed using conservative methods.

Like many developing countries, the most predominant cause of trauma in this country is motorvehicle accident (MVA), followed by assault, fall and industrial accidents (1). It has been shown that Malaysia had one of the highest fatality risks in the world resulting from MVA (2). Among all the MVA, 45% involved motorcyclists, and moreover, 60% of motorcycle accidents resulted in fatal outcome (3).

Our previous study in a different state in Malaysia showed that Malay men aged 21–30 constituted the highest group with maxillofacial injuries and mostly were caused by MVA (1). In relation to the anatomical location of injury among all the facial bones, the mandible was the most frequent bone to fracture, while the most common mid-facial fracture involved the zygomatic complex (1, 4, 5). Seremban Hospital is a government tertiary referral centre in the state of Negeri Sembilan situated to the south of capital Kuala Lumpur, and it is located strategically at the hub of one of the exits along the North–South Highway. Seremban Hospital is located in the state that has high incidence of MVA (6).

The aim of this study was to determine the demographic data as well as other relevant information such as aetiology, types of vehicle involvement, types of facial injury and treatment rendered in a selected government hospital.

Materials and methods

A retrospective record review was carried out using medical records of patients who were diagnosed of having oral and maxillofacial injuries between January 1998 and December 2002. The records were obtained from the Department of Oral Surgery, Seremban Hospital, Negeri Sembilan, Malaysia. A detailed proforma was used to record data related to sociodemographic profiles (age, gender, race), aetiology of trauma, vehicles or objects involved in collision, locations of injuries on the face and oral cavity and treatment modalities.

All patients diagnosed with oral and maxillofacial injuries whether they were seen at the Emergency Department, outpatient Oral Surgery clinic or admitted

as inpatients were included in the study. However, those who sustained isolated nasal injuries were excluded as these patients were commonly discharged from the Emergency Department and were quite difficult to trace them.

SPSS version 12.0 statistical software was used for data entry and data analysis. Descriptive statistics such as median and interquartile ranges (IQR) for continuous variables and frequency and percentages for categorical variables were calculated. The association between aetiology of injuries, gender, ethnic groups and the age group (younger or older than 30 years) was approached using chi-square test. The level of significance was set at 0.05.

This research was approved by the Research Committee of Faculty of Dentistry, Universiti Kebangsaan Malaysia, Kuala Lumpur, Malaysia.

Results

Three thousand and twenty-eight patients with maxillofacial injuries were seen between 1998 and 2002. However, only 2986 records were included as the rest were not complete.

Demographic profile of the patients

Among the patients, 79.2% were men giving male-to-female ratio of 3.8:1. The age ranged between 1 and 90 years with median of 23 years (IQR: 18). Among all the races, Malays had the highest involvement (50.6%) followed by Indians (24.5%), Chinese (19.6%) and others (5.3%).

Aetiology of trauma

Overall, throughout the 5-year period, MVA was shown to be the main cause of injuries. However, the most common aetiology differed according to year. Below is the breakdown of the three most common aetiologies according to year:

1 1998 – industrial accident (27.0%) followed by fall (25.1%) and others (25.0%).
2 1999 – MVA (20.4%) followed by others (18.8%) and assault (18.1%).
3 2000 – industrial accident (24.3%) followed by MVA (23.3%) and assault (20.2%).
4 2001 – sports accident (23.1%) followed by fall (20.3%) and assault (19.7%).
5 2002 – industrial accident (27.0%) followed by assault (20.2%) and MVA (19.3%) (Fig. 1).

Association between aetiology of trauma and gender, ethnic groups and age groups

Association of aetiology of trauma and ethnic groups
Chi-squared test was used and showed significant association between ethnic groups and aetiology. MVA was found to be significantly higher in Malays (53.8%), assault was higher in Indians (41.0%), fall was higher in Malays (41.7%), sport accidents was higher in Malays (48.7%), industrial accident was higher in Chinese (37.8%) and other aetiologies were higher in Malays (52.1%); $\chi^2(\text{df}) = 20\ (1)$, $P < 0.05$ (Table 1).

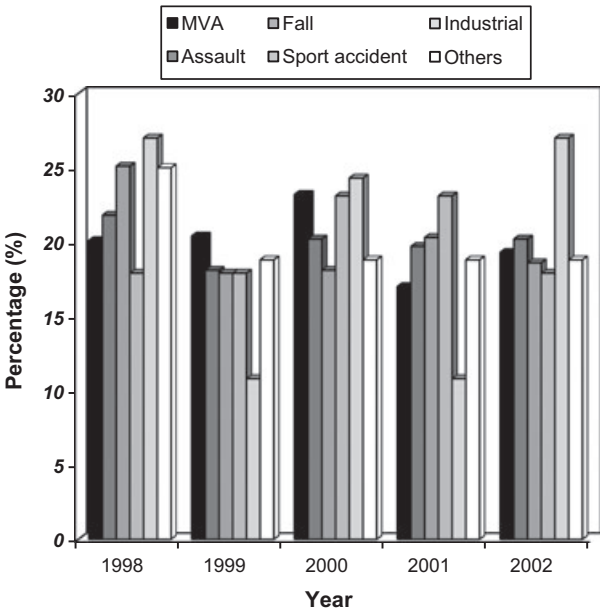

Fig. 1. Bar chart shows different aetiology according to years from 1998 to 2002.

Association of aetiology of trauma and age groups
Overall, the most common aetiology was MVA, and this involved age groups of 11–70 years, especially in the 11–20 (85.6%) and 21–30 years (81.7%). Fall was slightly higher in the 0–10 (60.2%) and above 81 years (50%).

Further analysis was carried out by dividing the age group into two i.e. younger than 30 years and older than 30 years. There was a significant association between age group and aetiology of trauma. Those who were in the younger age group were found to be significantly higher involved in MVA (69.3%), assault (50.5%), fall (71.7%), sport accidents (87.2%) and others (75.0%) compared to older age group ($P < 0.001$). However, the older age group was found to involve slightly more in industrial accident (48.6%) compared to younger age group (Table 2).

Association of aetiology of trauma and gender
Men showed significant involvement in MVA (80.7%), assault (78.7%), fall (69.0%), sport accident (92.3%), industrial accident (97.3%) and others (70.8%) ($P < 0.001$) (Table 3).

Involvement of vehicle/road users in MVA

The most common vehicle involved in MVA was motorcycle especially in single vehicle collision (62.8%) i.e. loss of control or collision with other objects (31.9%) i.e. tree, lamp post and others (listed as 'others' on Table 4a).

Table 4b shows significant involvement of motorcyclists (62.8%) in MVA compared to other vehicle/road users ($P < 0.001$).

Table 1. The association between ethnic groups and aetiology of trauma

Variable	*n*	Motorvehicle accident *n* (%)	Assault *n* (%)	Fall *n* (%)	Sport accident *n* (%)	Industrial *n* (%)	Others *n* (%)
Ethnic group							
Malay	1512	1224* (81.0)	67 (4.4)	168* (11.1)	19* (1.3)	9 (0.6)	25 (1.7)
Chinese	585	451 (77.1)	25 (4.3)	83 (14.2)	4 (0.7)	14* (2.4)	8 (1.4)
Indian	733	499 (68.1)	77* (10.5)	127 (17.3)	14 (1.9)	5 (0.7)	11 (1.5)
Others	156	97 (61.9)	19 (12.3)	25 (16.1)	2 (1.3)	9 (5.8)	4 (2.6)

*$P < 0.05$.

Table 2. The association between age group and aetiology trauma

Variable	*n*	Motorvehicle accident *n* (%)	Assault *n* (%)	Fall *n* (%)	Sport accident *n* (%)	Industrial *n* (%)	Others *n* (%)	χ^2 Statistic[1] (df)	*P* value
Age									
30 years old and less	2045	1573 (76.9)	95 (4.6)	289 (14.1)	34 (1.7)	18 (0.9)	36 (1.8)	5 (1)	<0.001
More than 30 years old	941	698 (74.2)	93 (9.9)	114 (12.1)	5 (0.5)	19 (2.0)	12 (1.3)		

[1]Chi-square test for independence.

Table 3. The association between gender and aetiology of trauma

Variable	*n*	Motorvehicle accident *n* (%)	Assault *n* (%)	Fall *n* (%)	Sport accident *n* (%)	Industrial *n* (%)	Others *n* (%)	χ^2 Statistic[1] (df)	*P* value
Gender									
Male	2365	1833 (77.5)	148 (6.3)	278 (11.8)	36 (1.5)	36 (1.5)	34 (1.4)	5 (1)	<0.001
Female	621	438 (70.5)	40 (6.4)	125 (20.1)	3 (0.5)	1 (0.2)	14 (2.3)		

[1]Chi-square test for independence.

Table 4. Anatomical sites of maxillofacial fractures in Seremban Hospital between 1998 and 2002

	n	%
(a) Mandibular fracture		
Symphysis	55	8.6
Parasymphysis	122	19.0
Body	167	26.0
Angle	114	17.7
Condyle	185	28.8
Total	643	100.1
(b) Mid-facial fracture		
Zygomatic complex	284	55.4
Le Fort I	31	6.0
Le Fort II	78	15.2
Le Fort III	13	2.5
Other maxillary fractures	77	15.0
Orbital fracture	30	5.8
Total	513	99.9

Injuries

Soft-tissue injuries accounted for 95.5%, dental and dentoalveolar injuries, 41.4%, while bone fractures, 20.7%.

Soft-tissue injuries were shown to occur concurrently with dental (92.6%), dentoalveolar (93%) and facial bone fractures (93.8%).

In relation to fractures, mandible was the most common facial bone to fracture. There were 643 sites involved in mandibular and 513 sites in the mid-facial fractures with the zygomatic complex being the most common (55.4%) (Table 5).

Treatment

In general, there were three categories of treatment – soft-tissue management, treatment of bony fractures and management dental/dentoalveolar injuries.

Soft-tissue injuries

Soft-tissue injuries management involved 74.8% patients. This basically involved wound cleansing or debridement, suturing and dressing.

Bony fractures

Among all patients with bony fractures, 66.3% of the patients were managed conservatively i.e. closed reduction and soft diet and 13% were treated surgically i.e. open reduction with internal fixation. The remaining 19.7% of bony injuries did not have any active intervention.

Dental/dentoalveolar injuries

Among the patients with dental/dentoalveolar injuries, 64.8% had their treatment in the form of splinting,

Table 5. Type of vehicles involved in motorvehicle accident

	Car *n* (%)	Motorcycle *n* (%)	Larger vehicle *n* (%)	Pedestrian *n* (%)	Others *n* (%)	Total *n* (%)
Car vs	123 (5.4)	12 (0.5)	75 (3.3)	2 (0.1)	138 (6.1)	350 (15.4)
Motorcycle vs	311 (13.7)	208 (9.2)	164 (7.2)	14 (0.6)	770 (33.9)	1467 (64.6)
Bicycle vs	17 (0.7)	5 (0.2)	4 (0.2)	–	97 (4.3)	123 (5.4)
Pedestrian vs	34 (1.5)	52 (2.3)	12 (0.5)	–	7 (0.3)	105 (4.6)
Larger vehicle vs	17 (0.7)	4 (0.2)	–	1 (0.04)	93 (4.1)	115 (5.0)
Others	–	–	–	–	111 (4.9)	111 (4.9)
Total	502 (22.1)	281 (12.4)	255 (11.2)	17 (0.7)	1216 (53.6)	2271 (100)

restorations or dental extraction. The rest of the patients (35.2%) were referred to their dentists or did not have any active treatment at Seremban Hospital.

Discussion

Malaysia is a rapidly developing multiracial nation encompassing approximately 25 million population comprising Malays as the majority followed by Chinese, Indians and other races. The total population in the state of Negeri Sembilan was shown to be 859 924, where Malays were encountered for 57.9%, Chinese 25.6%, while Indians 16% (7).

Because of enormous expansion in economy, vehicles have increased significantly from 7 210 089 in 1994 to 13 878 000 in 2004, and almost half of this number were motorcyclists (8). Motorcycles are regarded as important mode of daily transportation as people can get to their destination faster and cheaper. In contrast, in most of the developed countries motorcycles are used for recreation and leisure. Other reasons for high motorcycle ownerships in this country are because of low purchase price, low insurance surcharge rate and early age for licensing, which is 16 years. It was not unforeseen that motorcyclists were also documented as the highest casualties in MVA (8). Our study showed that among the MVA group, 62.8% were motorcyclists, and this was statistically significant ($P < 0.001$). A study showed that a typical profile of a motorcyclist with higher probability to be involved in MVA is usually a young man between 16 and 25 years old with a riding licence of < 3 years. This rider uses a motorcycle with engine capacity of more than 150cc and has poor attitudes towards traffic rules, speeding and compliance in safety (9, 10). It has been shown that the most registered motorcycles in this country are those between 101 and 250cc engine capacity (11).

Besides motorcycle accidents, our study showed that injuries were caused by other vehicles collisions e.g. cars, bicycles, larger vehicles and others (Table 4a).

Although MVA constituted as the highest overall proportion in causing injuries, Fig. 1 showed that aetiology according to year was not entirely because of MVA. In fact, industrial accident was shown as one of the main contributors in causing injuries. Major industries in Seremban include electric and electronics, plastic industry, timber and woods and many others (12).

In relation to demographic data, male predominance was evident with a ratio of male to female of 3.8:1. However, this ratio was lower compared to some studies in Malaysia (4, 5). Majority of patients were 30 years old or below, and this was shown as statistically significant ($P < 0.001$) compared to those aged above 30 years and correlates with other studies in this country (1, 4, 5).

The most frequent injury documented in Seremban Hospital was soft-tissue injury, and these patients received outpatient treatment. The most common facial bone fracture was the mandible particularly the condyle (28.8%), followed by the body of mandible (26.0%), parasymphysis (19.0%), angle of mandible (17.7%) and symphysis (8.6%). This finding was similar with our previous study in Kajang Hospital (1), but study from a different centre in Malaysia showed more preponderance in body fractures (4), which was in accordance with studies from Iran and Anatolia, respectively (13, 14), while other studies showed preponderance in different sites i.e. parasymphysis (15) and angle of mandible (16, 17). In relation to mid-facial fractures, the zygomatic complex and maxillary fractures were the most common fractures, and this was in agreement with Kajang Hospital and University of Malaya (1, 5).

Majority of the fractures were treated with closed reduction and intermaxillary fixation in Seremban Hospital, and this was also in agreement with Kajang Hospital (1), whereas University of Malaya showed inclination towards internal fixation particularly from 1986–1996 onwards (4).

The Malaysian Government regards road safety as an important national agenda as it is one of the major public health issues in this country. Preventive strategy includes three major components i.e. human, vehicle and the environment.

Speed management, reckless behaviour reshaping programme and enforcement against serious violations are among the human behaviour programme. Education on road safety is being implemented continuously at various levels. School children are exposed early on road safety (18). In addition, the media plays an important role in advocating safety particularly at addressing high-risk behaviour and during peak season i.e. the festive seasons when the statistics are extremely disturbing.

Road-engineering programme involves red light camera to capture motorcyclists who still run despite of red light, safety audit, blackspots treatment, crash barriers and individual motorcycle and pedestrian lanes (18).

Vehicle conspicuity has been an ongoing programme since 1990s, and this includes running headlight at all times, highly visibility painted motorcycles and visibility enhancement sticker (18).

Pedestrians are also given ample consideration. Among the programmes are road-crossing facilities, street lighting and shelter, pedestrian safety on walkways and roadways and at school crossings (18).

To achieve reasonable target to reduce casualty numbers, re-enforcement and re-evaluation will have to be carried out regularly to monitor the progress and correcting potential pitfalls.

Conclusion

Dental and facial injuries prevalence is high in Seremban Hospital, mostly caused by MVA, particularly involving motorcycles. The most common form of treatment at this hospital was conservative measures. To date, many preventive measures have been carried out and most are still ongoing.

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