

Short Communication

Pattern of Mandibular Fractures in Northern of Jordan

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Abstract

Purpose: The aim of this retrospective cohort study is to investigate the incidence and etiology the pattern of mandibular fractures in Northern of Jordan.

Methods: This was a retrospective cohort study of clinical records and radiographs of patients with mandibular fractures treated during the 4-year period from January 2018 to December 2021 were retrieved and analyzed regarding age, sex, etiology anatomical site of fracture, type of fracture, type of injury, type facial injury, and treatment modality. Data were analyzed using IBM SPSS Statistics software, (Version 27; IBM, NY, USA). Categorical data were presented as frequency and percentages. A Chi-Square test was performed to compare proportions. A value of $p \leq 0.05$ was considered statistically significant.

Results: A total of 295 patients had 525 between the age of 4 and 66 years of whom 112 patients with 181 mandibular fractures were analyzed. Of these, males were 90(80.36%) and females were 22(19.64%) (Male: female ratio was 4:1). Road traffic accident (RTA) was the most common cause of mandibular fractures 74(66.07%). Open reduction and internal fixation (ORIF) were the predominant treatment modality in 93(83.0%) patients.

Conclusion: Mandibular fractures are predominant and are most common of all maxillofacial fractures. Mostly common combination fractures and involve any of the anatomic sites with simultaneous multiple sites involvement. Still the RTA is the most common cause of maxillofacial fractures in developing countries. Treatments generally vary according to fracture type, number and location, surgeon performance, and patient age.

INTRODUCTION

Mandibular fractures occur in people of various ages and races, previous studies have reported that mandibular fractures are the most common of all maxillofacial fractures and occur twice as frequently as midfacial fractures. Haug et al., reported that mandibular fractures outranked zygomatic and maxillary fractures [1]. Epidemiological studies are also valuable in identifying new frequencies and patterns of these fractures.

Mandibular fractures comprise 15.5%-59% of all maxillofacial fractures [2]. Several variables are related to the study of mandibular fractures due to differences in demographic characteristics reported in the literature [3]. Socio-economic trends, geographic locations, and local behavior have a considerable impact on the etiology of the injury, which sequentially influences the distribution of fracture sites [4].

Fracture characteristics will vary depending on the mechanism of injury.

Fractures can occur in different anatomical regions of the mandible depending on the mechanism of the trauma [5]. Different treatment approaches can be applied to the mandibular fractures depending on various factors, such as patient characteristics, fracture type and localization, and the preference of the surgeon treating the patient [6,7]. The type and etiology of fractures and the anatomical region where mandibular fractures are reported occur at different rates in studies conducted on different populations or in different geographic locations [8,9].

The aim of this retrospective cohort study is to investigate the incidence and etiology the pattern of mandibular fractures in Northern of Jordan.

MATERIAL AND METHODS

This was a retrospective cohort study of clinical records and radiographs of patients with mandibular fractures treated in the Department of Oral and Maxillofacial Surgery at the King Abdullah University Hospital/ Jordan University of Science and Technology. During the 4-year period from January 2018 to December 2021 were retrieved and analyzed regarding age, sex, etiology classified into fall, road traffic accidents, violence, sports injury and gunshot, anatomical site of fracture were classified into dentoalveolar, symphysis, parasymphysis, body, angle, ramus, condyle, and coronoid process. Type of fracture was classified into simple, compound and comminuted, type facial injury was classified into single and multiple, and treatment modality was classified into closed reduction and arch bar (IMF), open reduction and internal fixation (ORIF) and conservative.

The inclusion criteria were patients for whom all records were complete with maxillofacial fractures, whether admitted to the hospital or treated as outpatients. The exclusion criteria were patients for whom all records had incomplete information in their medical record or having a history of pathological or previous maxillofacial fractures.

This ethical approval was waived by the Institutional Ethical Review Committee of the university due to the retrospective nature of this study, and was conducted according to the Declaration of Helsinki.

Data was analyzed using IBM SPSS Statistics software, (Version 27; IBM, NY, USA). Categorical data were presented as frequency and percentages. A Chi-Square test was performed to compare proportions. A value of $p \leq 0.05$ was considered statistically significant.

RESULTS

A total of 295 patients had 525 different maxillofacial fractures, of which 112 patients with 181 mandibular fractures were analyzed. The age range of 4-66 years (mean age, 26.06 years), and the most common was for the patients aged between 21 and 30 years old 43(38.4%). The incidence of mandibular fracture was higher in male patients 90(80.36%) than in females 22(19.64%) (Male: female ratio was 4:1). Road traffic accident (RTA) was the most common cause of mandibular fractures 74(66.07%), followed by violence in male patients was only 13(11.6%) and the fall was in both sexes 13(11.6%). The most common anatomical site of fracture was the angle 42 (23.2%) followed by parasymphysis 41(22.7%) (Table 1).

The most common type of fracture was simple fractures 122(67.3%) followed by comminuted 43(23.9%) and the most common type of injury was multiple fractures 122(67.3%). In the type of injury single fracture, the most common site was parasymphysis 14(7.7%) followed by angle 13(7.2%), while multiple fractures, the most common was angle 29(16%) followed by parasymphysis 27(14.9%). In the simple type of

fracture, the most common site was angle 30(16.5%) fractures, while comminuted fractures were parasymphysis 10(5.5%) (Table 2).

The most common combination pattern of fractures was parasymphysis with angle 12(25%) followed by parasymphysis with unilateral condylar fractures 6(12.6%) (Table 3).

Open reduction and internal fixation (ORIF) were the predominant treatment modality in 93(83.0%) patients, followed by closed reduction and arch bar (IMF) was performed in 12(10.7%) (Table 4).

DISCUSSION

The patterns of maxillofacial fractures had differences in the etiology and incidence and vary according to age and sex with differences in geographical region, and socioeconomic position, culture, religion, environmental and era from country to country. The majority of patients in the present study belonged to age group 21 to 30 years in both males and females; similar finding was noted in another study [10].

In most studies, males are affected more commonly than females, in the present study, the incidence of mandibular fracture was higher in male patients with a male: female ratio of 4:1 and this can be expected, since men are more involved in outdoor activities and are also exposed to violent interactions as compared to females. This finding was consistent with the studies conducted by other studies [11]. Due to the increasing role of women in Jordanian society, they are more likely to sustain a facial bone fracture than other females in other countries.

There is a striking contrast in the etiology of mandibular fractures in developed and developing countries [12,13]. This might be due to rash driving, speeding, subpar roads, unwillingness to follow road safety measures such as seatbelts, poor maintenance of vehicles [12,14]. The most common etiologic factor of mandibular fractures in this study was road traffic accident, followed by violence in males and falls in both sexes, which is in accordance with other study [15].

In the current study, the most common anatomical site of mandibular fracture was the angle which accounted for a total of 42 fractures and parasymphysis accounted for a total of 41 fractures, this finding is similar to previous study [15-18] which have shown mandibular angle to be the most common site of fracture. Mandibular fractures can involve any of the anatomic sub-sites with simultaneous multiple site involvement [19]. Literature was insufficient regarding multiple site fractures in the mandible; this could be explained by the presence of permanent tooth buds and canine root weakening the structure. In most studies, the coronoid process of the mandible is the least affected site of mandibular fracture [14,16,20]. Only one case of coronoid process fracture from the present study was reported.

Special patterns of mandibular fractures, which have not been frequently discussed in the literature, were reported in this

Table 1: Distribution of Sex according to Age group and Etiology

Age	Sex		Total	%
	Male	Female		
<10	7	2	9	8.0
11-20	24	4	28	25.0
21-30	31	12	43	38.4
31-40	18	2	20	17.9
41-50	4	1	5	4.5
>50	6	1	7	6.3
Total	90	22	112	100
Etiology				
Road traffic accident	56	18	74	66.0
Violence	13	0	13	11.6
Fall	9	4	13	11.6
Sport	5	0	5	4.5
Industrial	4	0	4	3.6
Gunshot	3	0	3	2.7
Total	90	22	112	100

Table 2: Distribution of Anatomical site according to type of injury and type of fractures

Fracture site	n	%	Type of injury					Type of Fracture						
			Multiple		Single		P	Comminuted		Compund		Simple		P
			n	%	n	%		n	%	n	%	n	%	
Symphysis	18	9.9	13	7.2	5	2.7	.729	3	1.8	2	1.0	13	7.2	.564
Parasymphysis	41	22.7	27	14.9	14	7.7	.615	10	5.5	0	0	31	17.1	.027
Dentoalveolar	20	11	10	5.5	10	5.5	.046	4	2.3	2	1.0	14	7.7	.751
Body	32	17.7	22	12.2	10	5.5	1.000	8	4.4	5	2.7	19	10.5	.291
Angle	42	23.2	29	16	13	7.2	.958	8	4.4	4	2.3	30	16.5	.357
Ramus	8	4.5	5	2.7	3	1.8	.692	4	2.3	0	0	4	2.3	.250
Condyle	19	10.5	15	8.3	4	2.3	.293	5	2.7	3	1.8	11	6.0	.508
Coronoid Process	1	0.5	1	0.5	0	0	.498	1	0.5	0	0	0	0	.252
Total	181	100	122	67.3	59	32.7		43	23.9	16	8.8	122	67.3	

Table 3: Combinations of site of fracture in relationship to sex and age group

Mandibular fracture site combinations	n	Sex		Age group						Total	%
		M	F	0-10	11-20	21-30	31-40	41-50	>50		
Dentoalveolar+Symphysis	2	2	0	0	0	0	1	0	1	2	4.166
Dentoalveolar+Symphysis+ Parasymphysis	1	0	1	0	0	0	0	1	0	1	2.08
Dentoalveolar+Angle	2	2	0	0	1	1	0	0	0	2	4.166
Dentoalveolar+ Parasymphysis+Angle	1	1	0	0	1		0	0	0	1	2.08
Dentoalveolar+Body+ Unicondyle	1	1	0	0	0	1	0	0	0	1	2.08
Dentoalveolar+Symphysis+ Body+Angle+Bicondyle	1	1	0	0	0	1	0	0	0	1	2.08
Symphysis+Angle	1	1	0	0	0	0	1	0	0	1	2.08
Symphysis+Unicondyle	2	1	1	0	0	0	0	1	1	2	4.166
Symphysis+bicondyle	3	3	0	0	0	2	1	0	0	3	6.26
Parasymphysis+Body	4	2	2	1	1	1	0	1	0	4	8.34
Parasymphysis+Angle	12	10	2	1	2	6	1	1	1	12	25.0
Parasymphysis+Ramus	2	0	2	0	0	2	0	0	0	2	4.166
Parasymphysis+Unicondyle	6	5	1	0	3	1	1	0	1	6	12.6
Parasymphysis+Symphysis+ Angle	1	1	0	0	0	0	0	0	1	1	2.08
Parasymphysis+Body+Angle	2	1	1	0	0	0	1	1	0	2	4.166
Body+Angle	2	2	0	0	0	1	0	1	0	2	4.166
Body+Ramus	2	2	0	0	1	0	0	0	1	2	4.166
Body+Unicondyle	2	2	0	0	0	2	0	0	0	2	4.166
Body+Angle+Ramus	1	1	0	0	0	0	0	0	1	1	2.08
Total	48	38	10	2	9	19	6	5	7	48	100

Table 4: Treatment modalities

Mode of treatment	n	(%)
Closed reduction and arch bar (IMF)	12	10.7
Open reduction and internal fixation (ORIF)	93	83.0
Conservative	7	6.3
Total	112	100.0

study. The most common type of fracture was simple fractures 122(67.3%) followed by comminuted 43(23.9%) and the most common type of injury was multiple fractures 122(67.3%). In the type of injury single fracture, the most common site was parasymphysis 14(7.7%) followed by angle 13(7.2%). Insufficient literature regarding multiple site fractures in the mandible can even could occur commonly because of the unique anatomy of the mandible [16]. The most common fracture in this study was angle 29(16%) followed by parasymphysis 27(14.9%). In the simple type of fracture, the most common site was angle 30(16.5%) fractures, while comminuted fractures were parasymphysis 10(5.5%). Anatomical distribution of mandible

fractures was studied and has different results. Brasileiro and Passeri [21] reported the mandibular condyle as the most common site of fracture. Dongas and Hall [17] and Morris et al. [18], have shown mandibular angle to be the most common site of fracture, while Adi et al. [22] have shown the mandibular body as the most common site of fracture. Mandibular fractures can involve any of the anatomic sites with simultaneous multiple site involvement [19].

The most common combination fracture found in the study was angle with parasymphysis (26/146, 17.8%), which is similar to information reported in other studies [17,23-26]. However, additional studies reported parasymphysis with condyle [14,23,27] and body with angle as the most common combinations [18,28].

The most common combination pattern of fractures was parasymphysis with angle 12(25%) followed by parasymphysis with unilateral condylar fractures 6(12.6%).

Treatments generally vary according to fracture type, number and location, surgeon performance, and patient age. The various treatment options available are intermaxillary fixation, open reduction and internal fixation, closed treatment with external fixation, and treatment with Kirschner wire [20]. In the present study, open reduction and internal fixation (ORIF) were the predominant treatment modality in 93(83.0%) patients, followed by closed reduction and arch bar (IMF) was performed in 12(10.7%). It is important to manage mandibular fractures to establish a stable occlusion, preserve normal mandibular arch form, restore mandibular functions, retain the symmetry of the face, and avoid advancement of developmental disorders.

CONCLUSION

Mandibular fractures are predominant and are the most common of all maxillofacial fractures. Mostly, a common combination fractures and involves any of the anatomic sites with simultaneous multiple site involvement. Still, the RTA is the most common cause of maxillofacial fractures in developing countries. Treatments generally vary according to fracture type, number and location, surgeon performance, and patient age.

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Ethics approval and consent to participate

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