Etiologic Factors Influencing the Pattern of Mandibular Fractures – A Retrospective Study

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Abstract

Objectives: Fractures involving the face, especially the mandible causes aesthetic disfigurement and hamper masticatory function. Ever changing economic and population trends have caused a shift in the etiologic factors responsible for mandibular fracture. This study records the epidemiology of the mandibular fractures in Bhubaneshwar region of Odisha and to appreciate the importance of demographics and contribution of individual etiological factors towards such injuries.

Methods: A retrospective study was conducted during between September 2013 to March 2017, in the department of Oral and Maxillofacial Surgery, Institute of Dental Science. Patients admitted in the facility for the treatment of mandibular fractures were included in the study. The data was collected from patient records.

Results: Out of a total of 197 patients, 90% affected were males, with 42.6% aged between 20-29 years. The most common cause was Road Traffic Accidents (RTAs)with 83% and para-symphysis fractures was seen in 42.7%. Etiology was found to be influenced by gender using Chi-square ($p < 0.05$) and site of injury was found to highly significant with respect to age.

Conclusion: Mandibular fractures were found to be associated with younger aged males and road traffic accidents. This could be prevented with stringent and safer traffic regulations.

Key words: *Mandibular fractures, etiology, retrospective study*

Introduction

The face is a significant part of the human body, necessary for many vital functions such as speech, sight, smell and most importantly in establishing the identity of an individual. The shape of face is determined by the bone structure of the skull, and each individual is unique through the anatomical variations present in the bones that make up the viscero-cranium. The shape of the facial structure can be attributed mainly to the maxilla, mandible, nasal bone and zygomatic bone.

Of these, the mandible is the only movable bone of the skull. It houses the lower teeth and is formed from the fusion of the right and left processes. One fifth of all facial injuries involve the mandible. Mandible has been found to be the second most affected site in facial injuries[1–4]. The injury to the mandible is given special consideration as, apart from the aesthetic disfigurement, the presence of teeth adds a concern regarding functionality of mastication. The mandible includes areas of weakness such as the areas adjacent to the mental protuberance, mental foramen, mandibular

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angle and the condylar neck. The bone tends to fracture at these areas of tensile strain.[5] But the condylar neck because of the thickening on its inner surface transmits pressure to the TMJ and base of skull, increasing the fatality of mandibular fractures[1].

The etiology and pattern of mandibular fractures vary from geographic regions based on its economic and population growth trends. In India, an alarming increase in vehicular ownership combined with expansion of road network has caused as change in the trends of facial fractures[6]. There is also a change in the age groups involved in the road traffic accidents with an increase in the younger adults being more affected[4]. Hence, even though there is no lack of literature elucidating the factors associated with mandibular factures, there is a need to re-evaluate these factors given the change in the economic, cultural and social environment of the recent times.

This study intends to record the epidemiology of the mandibular fractures in Bhubaneshwar region of Odisha and also to appreciate the importance of demographics and contribution of individual aetiological factors towards such injuries.

Material and Methods

A retrospective study was conducted in the department of Oral and Maxillofacial Surgery, Institute of Dental Science. Patients admitted in the facility for the treatment of mandibular fractures during the time period of September 2013 to March 2017 were included in the study. The data was collected from patient records. The search criteria included all mandibular fractures including condylar fracture, para-symphysis fracture, symphysis fracture, mandibular body fracture.

Eligibility Criteria:

1. Patients with fractures in the mandible.
2. Patients reporting to the OPD during the time period of the study.
3. Patients who consented to be a part of the study.

The patient records with incomplete information were not included in the study.The data was entered into a digital proforma designed to record the necessary variables required for the study. A tabular form was prepared for all the cases in Microsoft excel including the name of the patient, age, sex, site of fracture and mode of injury. The site of fracture classified into symphysis, parasymphysis, mandibular body, mandibular angle, condyle, coronoid and ramus fractures. Mode of injury for all the cases fell under three categories - Road traffic accidents, Fall and Assault. Ethical Clearance was obtained from the Institutional Review Board for conducting the study. The data was analysed for descriptive statistics and Chi-square was used to associate sex and age with type and region of fracture. The p value was set at >0.05.

Results

A total of 197 patients with mandibular fractures were included in the study. Of these 19 (10%) were females and 178 (90%) were males. (Graph 1). The M/F ratio was 9.3. Majority of the study sample (42.6%) belonged to 20-29 years, with the Mean ± SD found to be 30.9 years ±11.1.(Graph 2). It was observed that the most common etiologic was road traffic accidents contributing to 83% of the mandibular fractures (Graph 3). Aetiology was found to be influenced by gender using Chi-square at p value of 0.004. But however, it was evident that age of the study sample did not play a role. (p = 0.660) (Table 1 and 2). With 42.7% subjects reporting with para-symphysal fractures, making it the most frequently involved site in mandibular fractures. (Graph 4) The next common site of injury was condyle (n=80). This was found to highly significant with respect to age but not gender. (Table 3 and 4)

Table 1: Influence of gender on etiology of fractures:

Gender	Etiology			Chi-square value	p-value
	Fall	Accidental fall	Road traffic accidents		
Males	18 (10.1%)	8 (4.5%)	152 (85.4%)	11.257	0.004*
Females	7 (36.8%)	1 (5.3%)	11 (57.9%)		

Table 2: Influence of age on etiology of fractures:

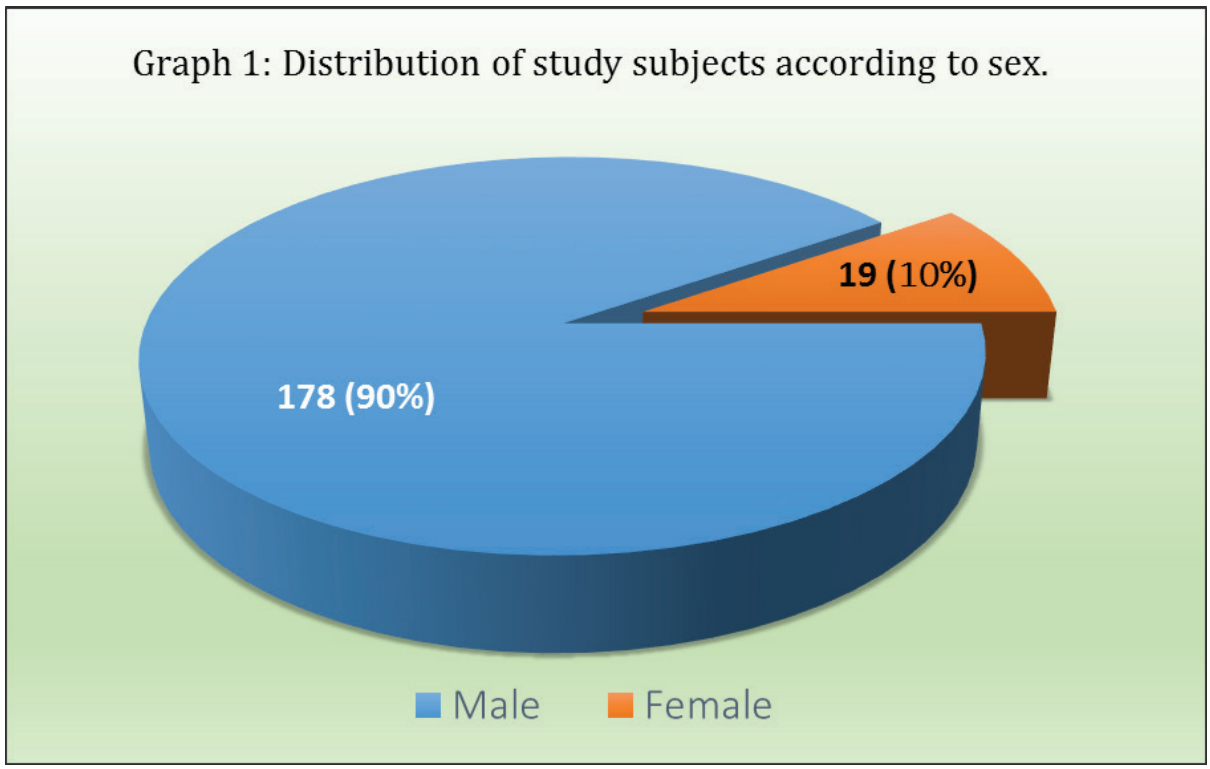
Age group	Etiology			Chi-square value	p-value
	Fall	Accidental fall	Road traffic accidents		
Under 9 years	0 (0%)	0 (0%)	1 (100%)	9.498	0.660
10-19 years	3 (16.7%)	1 (5.6%)	14 (77.7%)		
20-29 years	5 (6%)	5 (6%)	74 (88%)		
30-39 years	11 (19.3%)	2 (3.5%)	44 (77.2%)		
40-49 years	4 (20%)	1 (5%)	15 (75%)		
50-59 years	2 (18.2%)	0 (0%)	9 (81.8%)		
60 years and above	0 (0%)	0 (0%)	6 (100%)		

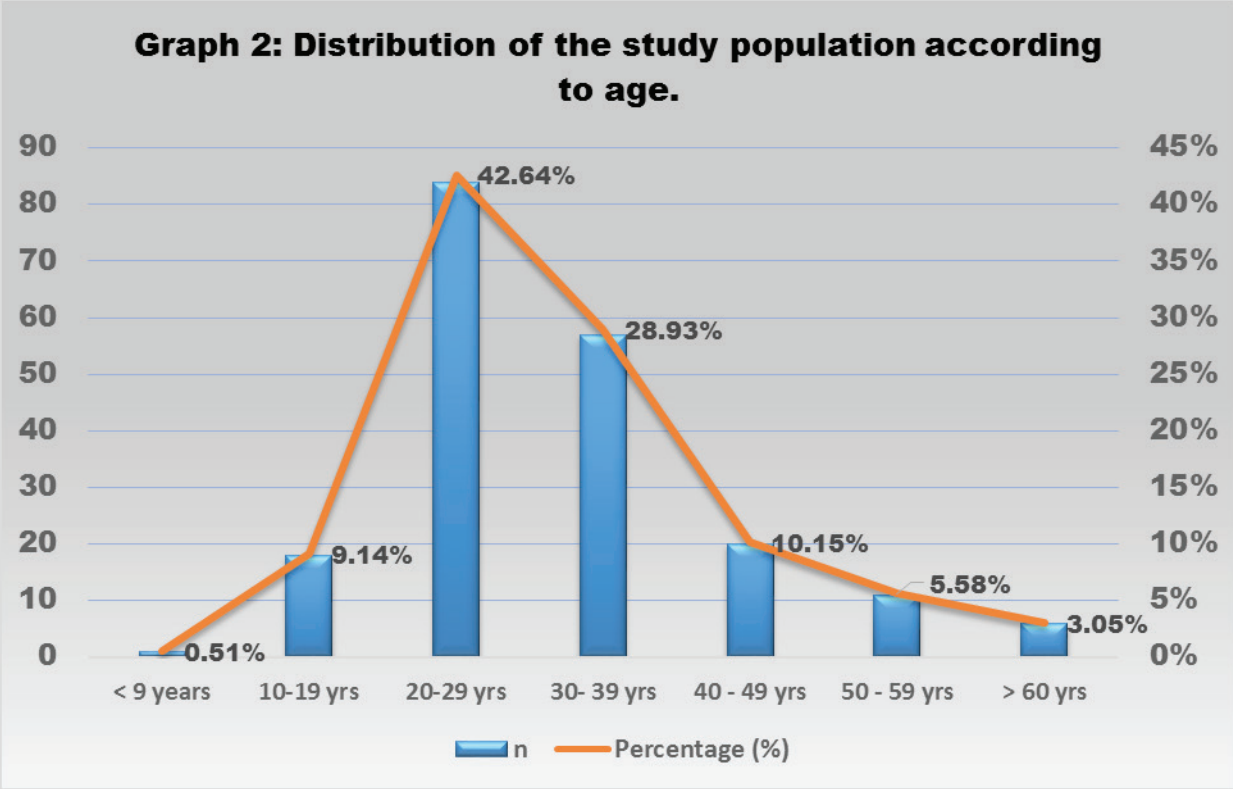
Table 3: Influence of gender on site of fractures:

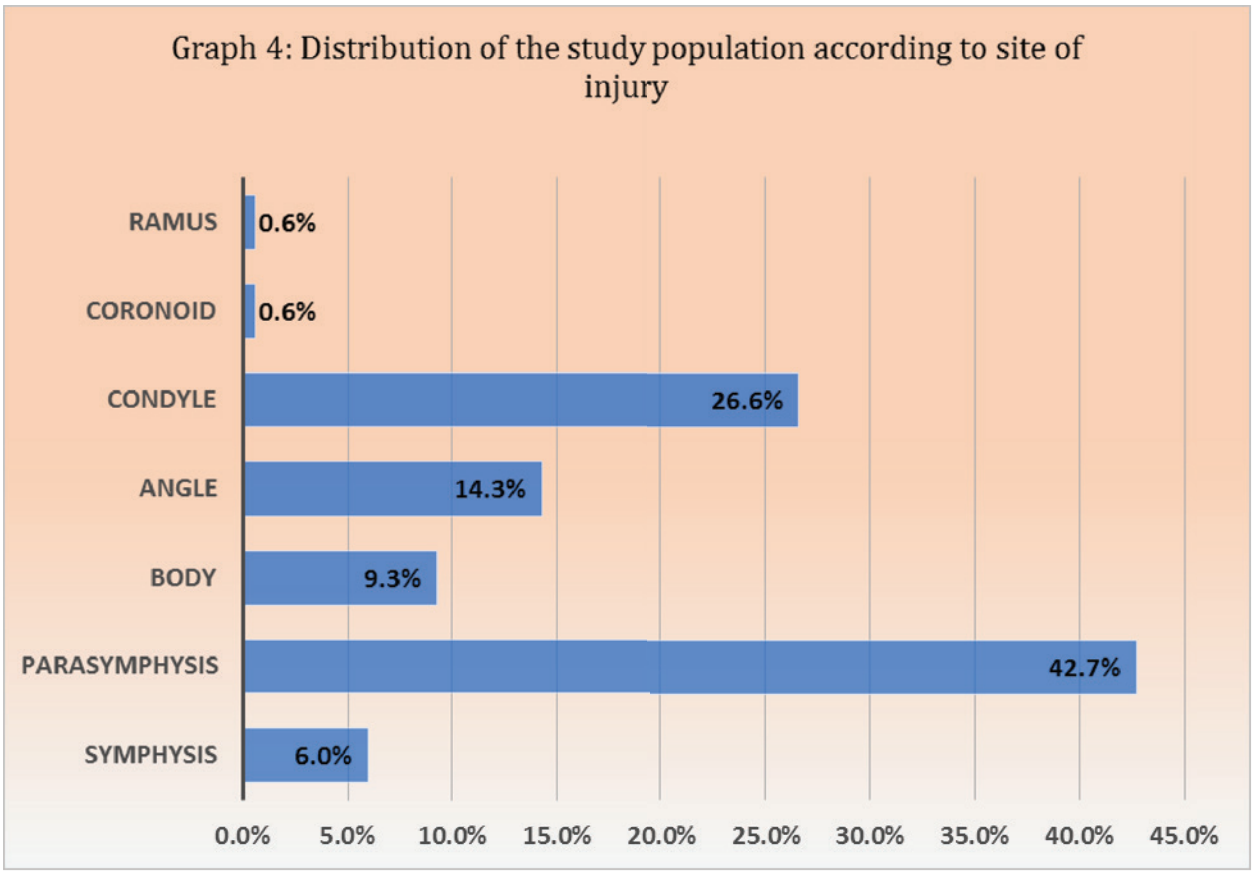
Gender	Site of fracture							Chi-square value	p-value
	Symphysis	Parasymphysis	Body	Angle	Condyle	Ramus	Multiple fractures		
Males	8 (4.5%)	56 (31.5%)	11 (6.2%)	22 (12.4%)	9 (5.1%)	1 (0.6%)	71 (39.7%)	4.933	0.552
Females	0 (0%)	5 (26.4%)	2 (10.5%)	2 (10.5%)	3 (15.8%)	0 (0%)	7 (36.8%)		

Table 4: Influence of age on site of fractures:

Age group	Site of fracture							Chi-square value	p-value
	Symphysis	Parasymphysis	Body	Angle	Condyle	Ramus	Multiple fractures		
Under 9 years	1 (100%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	80.194	0.000*
10-19 years	0 (0%)	5 (27.8%)	2 (11.1%)	3 (16.7%)	4 (22.2%)	0 (0%)	4 (22.2%)		
20-29 years	2 (2.4%)	27 (32.1%)	4 (4.8%)	11 (13.1%)	3 (3.6%)	0 (0%)	37 (44%)		
30-39 years	2 (3.5%)	17 (29.8%)	5 (8.8%)	5 (8.8%)	5 (8.8%)	0 (0%)	23 (40.4%)		
40-49 years	1 (5%)	7 (35%)	2 (10%)	4 (20%)	0 (0%)	0 (0%)	6 (30%)		
50-59 years	1 (9.1%)	3 (27.3%)	0 (0%)	1 (9.1%)	0 (0%)	0 (0%)	6 (54.5%)		
60 years and above	1 (16.7%)	2 (33.3%)	0 (0%)	0 (0%)	0 (0%)	1 (16.7%)	2 (33.3%)		




Graph 2: Distribution of the study population according to age.
90
80
70
60
50
40
30
20
10
0
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
42.64%
28.93%
10.15%
9.14%
5.58%
3.05%
0.51%
< 9 years
10-19 yrs
20-29 yrs
30- 39 yrs
40 - 49 yrs
50 - 59 yrs
> 60 yrs
n
Percentage (%)


Graph 4: Distribution of the study population according to site of injury
RAMUS
0.6%
CORONOID
0.6%
CONDYLE
26.6%
ANGLE
14.3%
BODY
9.3%
PARASYMPHYSIS
42.7%
SYMPHYSIS
6.0%
0.0%
5.0%
10.0%
15.0%
20.0%
25.0%
30.0%
35.0%
40.0%
45.0%

Discussion

Maxillofacial trauma involving fractures of the mandible have been on a steady rise. In the present study young adults (20-29 yrs) were found to be more prone to mandibular injuries. The changing socio-economic scenario makes possession of vehicles more easy and affordable but the younger drivers are usually found over-speeding and violating traffic rules, thus predisposing them to facial traumas. This is accordance with the findings of various other studies [1–3,5,7–14]. But studies by Ogundare et al(2003)[15] and E.T Adebayo et al (2003)[16] found higher prevalence of mandibular fractures in patients aged >30yrs, in Columbia (USA) and Nigeria respectively.

Mandibular fractures had a strong gender predilection with 178 males being affected out of 197 subjects. This is supported by outcomes of most of the studies[2,5,8,11,12,16–19]. Presently in this region, ownership of vehicles is largely skewed with males predominating, thus explaining the observation. Also lady drivers could be deemed as being more cautious and adhering to vehicular rules and regulations in general, thereby reducing the chances of Road Traffic Accidents. Chi square confirmed this difference and it's association with Road Traffic Accidents. But the attention should be drawn to the fact that only few of these studies[1,10,13,15,20] had a difference between the sexes by such a large margin as is seen in our study.

Road traffic accidents were found to be the leading cause of mandibular fractures followed by fall and sports injuries. This was similar to other studies[1–3,5,9,12,21] conducted in the India. These conclusions also matched with studies in Nigeria by E.T. Adebayo et al[16], in Saudi Arabia by Mahmood Samman et al[18], in Bangladesh by F Sultana et al[8], H. E. Al Ahmed et al[10] in UAE, in Iran by Mohammad Hoesin Kalantar Motamedi[13] and Fu-Yu Lin et al[7] in Taiwan probably because these countries also reflect similar socio-economic circumstances. However findings of the studies conducted by Jung Hoon Lee et al[14] in Korea, Ogundare et al[15] in United States, Ricardas K and Tadas Keizeris[20] in Lithuania, Cihan Bereket et al[19] in Turkey, Petrus Pereira et al[11] in Brazil, and Edwards et al[17] in United Kingdom were in clear contrast where, assaults or inter-personal trauma was the leading cause.

The most common site for the mandibular fracture was para-symphysis, followed by condyle. The least involved sites were coronoid and ramus. Studies by Fu-Yu Lin et al[7], Sultana et al[8], Sobodh Natu et al[5], Barade et al[2], Kamath et al[1], Kar et al[3], Vyas et al[21], Subhashraj et al[9] were also in concurrence with this finding. The para-symphysis is anatomically weak due to comparatively longer roots of canines, making them an easy site fractures in RTAs. However, Garkoti et al[12], Mahmood Samman et al[18], Cihan Bereket et al[19], Lee et al[14], Ahmed et al[10] and Motamedi[13] found condyle to be most frequently involved. Ricardas Kubillus and Tadas Keizeris[20] and Ogundare et al[15] found the angle of the mandible to involved while Adebayo et al[16] concluded that commonest site to be body of the mandible.

Conclusion

Road traffic accidents involving the highly impressionable younger age groups were found to be the leading cause of mandibular fractures. Most of which are preventable with stringent traffic regulations and safer traffic measures. A slight oversight in our study was that we did not differentiate if the traffic accidents involved four wheelers or two wheelers and driving while under the influence of alcohol. This, if done would have guided a clearer path in targeting the susceptible group.

Conflicts of Interests: The authors declare, they do not have any conflicts of interests

Funding: None

Ethical Issues: None

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