

# Patterns of Facial Fractures Associated with Socio-demographic and Causative Factors: A Multi-Center Analysis from Karachi



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**OBJECTIVE:** To assess the association of age, gender, and mechanism of injuries in patients presenting at tertiary care facilities of Karachi, Pakistan.

**METHODOLOGY:** A retrospective analysis of 1038 patients visiting private and public tertiary care dental hospital was conducted. Data was collected by means of a comprehensive history, clinical examination and radiological investigation. Qualitative variables were calculated as frequencies and percentage whereas means and standard deviation of quantitative variables were analyzed. Association among dependent and independent variables were assessed by Chi square test.

**RESULTS:** A total of 1038 patients reported, which included 85 % males and 15 % females. Road traffic accidents accounted for 43% of injuries in males and 12% in females and were followed by falls in 15% males and 8% females. Body of mandible was the most frequently affected bone accounting for 32%, while condyle was next commonly involved. Left side of mandible was noted to be more frequently affected. Only 6% of fractures involved the zygomatic region.

**CONCLUSION:** In this study RTA's were the most common cause of injuries among males and females in the second and third decades of life while in young children falls predominated. The mandibular body was the most frequently involved site followed by the condyle.

**KEY WORDS:** Maxillofacial injuries, Road traffic accidents, falls, body of mandible, trauma

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## INTRODUCTION

Trauma to the maxillofacial region can cause injuries affecting the craniofacial skin, bones and neurovascular-sensory organs. These occur as consequences of falls, interpersonal violence, accidents or other associated etiological factors.<sup>1</sup> The mandible is most commonly affected because of its prominent position on the face.<sup>2</sup> Studies have concluded that within the mandible, 36% of fractures involve the condyle and 21% affect the mandibular body. The angle is involved in 20% of cases while parasymphiseal fractures account for 14% and the symphysis, coronoid, ramus and alveolar areas all account for up to 3% each. Within the maxillary bone, Le Fort II fractures were

the commonest followed by Le Fort I and Le Fort III.<sup>3</sup>

The factors associated with maxillofacial traumatic injuries vary considerably from one geographical region to the other. Statistics from developed countries show that physical assault is the most common cause of trauma whereas among developing countries road traffic accidents (RTA) are the leading factor.<sup>4,5,6</sup> The WHO has documented that nearly one-third of traumatic injuries reported in developing countries are due to road traffic accidents (RTA) which significantly contribute towards increased mortality rates.<sup>7,8</sup>

The purpose of the current study was to assess the association of age, gender, and mechanism of injuries in patients presenting at tertiary care facilities of Karachi, Pakistan. Locally reported data have shown that males are more prone to facial injuries during their 2nd and 3rd decades of life with the most common etiologic factor being road traffic accidents (RTA).<sup>6,9</sup> Moreover, studies conducted in past focused more upon the relation between different etiological factors and gender; therefore the association between facial injuries with gender, age and mode of injury

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needs to be addressed. Hence the objective of the current study is to assess the association of age and gender with mode of injury, as well as to analyze the site of injury with respect to age.

## METHODOLOGY

This analytical cross sectional study was carried out in tertiary trauma care centers, based on primary data collected by a single examiner over a period of five years. A total of (n=1038) cases were recorded; data collection was based on detailed history, thorough clinical examination as well as radiographic evaluation. Radiographs commonly used were: Orthopantomogram (OPG), Postero-anterior (PA) view of face, lateral view and lateral oblique view for mandibular injuries, with Occipito- Mental (OM /PNS) view used for mid face injuries. Computed Tomography (CT scans) tended to be used for complex and pan facial fractures usually associated with head injuries.

For evaluating dento-alveolar injuries intra oral radiographs were additionally used including periapical and occlusal views, as necessary.

Data was collated regarding age, gender, mode of injury, anatomical location of fracture in mandibular and maxillary bones based on R. Dingman and P. Natvig's classification<sup>10</sup> as well as side of face affected: right, left or bilateral involvement.

Data analysis was performed using SPSS version 21 (Statistical Package of Social Sciences). Qualitative variables were calculated as frequencies and percentage whereas means and standard deviation of quantitative variables were analyzed. Association among dependent and independent variables were assessed by chi square test. Level of significance was kept  $p < 0.05$ .

## RESULTS

A total of n=1038 patients were reported, out of which 85.5% (n=887) were males and 14.5% (n=151) were females. Ages ranged from 02 years to 80 years, with the mean age of  $24.65 \pm 13.76$  years. In eighteen percent (n=189) of cases, the ages ranged from 0-10 years; the peak incidence was in patients with age range of 11 to 30 years that accounted for fifty seven percent (n=593) of cases. However, twenty one percent (n=216) of cases were from age range of 31-50 years, three percent (n=33) from 51 to 70 years and less than one percent (n=07) were of 71 and above.

From the reported etiology of injury fifty six percent (n=582) were road traffic accidents, twenty two percent (n=224) claimed to have accidental falls, twelve percent (n=122) were victims of assault, four percent of cases (n=38)

presented with sports related injuries and three percent (n=34) had industrial traumatic injuries while four percent (n=38) of cases presented with other mode of injury.

Regarding the location of fracture in mandible; the mandibular body was most frequently involved at 32% (n=327) followed by condylar process of mandible at 29% (n=299). The chin region and angle of the mandible were reported to be 18.4% (n=191) and 17% (n=178) respectively while the least involved parts were alveolus 2.6% (n=27) and Pterygoid body 0.1% (01). The left side of the mandible was found to be most frequently involved at thirty eight percent (n=395) while thirty six percent (n=368) and twenty three percent (n=239) of the cases reported with right side and bilateral involvement, respectively.

Only seventeen percent (n=174) maxillary fractures were

reported, among which the most common site was the Zygomatic/orbit region 5.8% (n=60) followed by the maxilla body at five percent (n=52). In maxillary fractures 9.5% (n=99) patients were reported with bilateral involvement, 5.6% (n=58) and 5.1% (n=53) with right and left side, respectively. (Table 1)

Statistically significant difference was found between gender and cause of injury ( $p < 0.003$ ), with males injured more through road traffic accidents (n=513) followed by accidental falls (n=174). Whereas, females also encountered RTA more frequently. (Table 2)

Statistically significant difference was found among gender and location of the fracture in

Variables	Frequencies (n=1038)	Percentages %
<b>Gender</b>		
Male	887	85.5
Female	151	14.5
<b>Age groups</b>		
0 -10 years	189	18.2
11-30 years	593	57.1
31-50 years	216	20.8
51-70 years	33	3.2
71- onwards	07	0.7
<b>Mode of injury</b>		
Assault	122	11.8
Industrial	34	3.3
Fall	224	21.6
RTA	582	56.1
Sports	38	3.7
Others	38	3.7
<b>Location of fracture in Mandible</b>		
Angle	178	17.1
Chin	191	18.4
Body	327	31.5
Coronoid	02	0.2
Pterygoid body	01	0.1
Alveolus	27	2.6
Condyle	299	28.8
others	13	1.3
<b>Sites in Mandible</b>		
Bilateral	239	23
Right	368	35.5
Left	395	38.1
Others	36	3.5
<b>Location of fracture in Maxillae</b>		
Zygoma/orbit	60	5.8
Orbit only	13	1.3
Palate	02	0.2
Alveolus	14	1.3
Frontal	15	1.4
Nasal	18	1.7
Maxilla	52	05
Others	864	83.2
<b>Sites in Maxillae</b>		
Bilateral	99	9.5
Right	58	5.6
Left	53	5.1
others	828	79.8

**Table 1:** Descriptive analysis of the demographic variables, etiology and location of Mandibular & Maxillary fractures along their sites

**Table 2:** Association of gender and mode of injury

Variable	Mode of injury %(n)						Chi square value	P-value
	Assault	Industrial	Fall	RTA	Sports	Others		
Gender								
Male	8.7(104)	2.7(32)	14.6(174)	43.1(513)	2.9(34)	2.5(30)	23.56	0.000
Female	3(36)	0.3(04)	8.4(100)	11.6(138)	0.7(42)	1.3(46)		

Chi square test, \* statistically significant

**Table 3:** Association of gender and mandibular fractures

Variable	Location of fracture in mandibular bone %(n)								Chi square value	P-value
	Angle	Chin	Body	Coronoid	Posterior body	Alveolus	Condyle	others		
Gender										
Male	12.8(152)	14.2(169)	23.5(280)	0.1(1)	0(0)	1.5(18)	21.4(255)	1(11)	23.56	0.001*
Female	4.4(52)	3.7(44)	7.9(94)	0.2(2)	0.2(2)	1.5(18)	7.4(88)	0.2(2)		

Chi square test, \* statistically significant

**Table 4:** Association of age and mode of injury

Variable	Mode of injury %(n)						Chi square value	P-value
	Assault	Industrial	Fall	RTA	Sports	Others		
Age								
0-10 years	2.1(04)	0.5(01)	56.6(107)	34.9(66)	3.2(06)	2.6(05)	2.09	0.000
11-30 years	12.8(76)	03(18)	15.5(92)	61.6(365)	4.4(26)	2.7(16)		
31-50 years	16.2(35)	06(13)	9.3(20)	59.7(129)	1.9(04)	6.9(15)		
51-70 years	18.2(06)	6.1(02)	12.1(04)	57.6(19)	0(0)	6.1(02)		
71 and onwards	14.3(01)	0(0)	14.3(01)	42.9(03)	28.6(02)	0(0)		

Chi square test, \* statistically significant

mandibular bone ( $p \leq 0.000$ ), among males, mandibular body ( $n=280$ ) followed by condylar process ( $n=255$ ) were the most frequent reported sites. (Table 3)

Statistically significant difference was noted among the age ranges of the study subjects and the cause of the injury ( $p \leq 0.000$ ). In the age range of 11 to 30 years road traffic accidents ( $n=365$ ) were more frequently reported. However, histories of accidental fall ( $n=107$ ) were more common in the age range of ten years and below. (Table 4)

## DISCUSSION

The majority of the samples in the current study were adult males, in the second and third decade of life and this was statistically significant. Road traffic accidents are a major cause of injury followed by accidental falls. The latter mode of injury was found to be more common amongst children in the first decade of life. Being most prone to injury the body of mandible was the most commonly affected site, followed by the condyle itself. Zygomatic region was noted to be more likely to be injured followed by trauma to maxillary bone among fractures associated with the mid face.

In the current study, the majority of injuries involved the males; these findings concur with previous studies.<sup>11,12,13</sup>

The overall male to female ratio was 4:1 which was similar to the findings of other studies.<sup>14,15</sup> Furthermore, males in the second and third decades of life were most commonly involved; these findings also were similar to other regionally reported local studies.<sup>16,17,18</sup> This may be because men are more freely mobile and involved in outdoor activities as compared to women, particularly in our socio-economic setting, often relying on unsafe modes of transport such as motorcycles, hanging on to buses or jaywalking. Furthermore, in the current study, young children in the one to ten years age group were more prone to injuries caused by accidental falls, and these findings are consistent with other studies.<sup>19,20,21</sup> Children of that reported age group are growing up fast and are more liable to injuries while playing; occasionally they fall from beds or slip from parents hands due to inadequate safety measures and carelessness.

In the current study road traffic accidents were found to be a major cause of injury, approximately half of the sample however differs from other studies.<sup>22,23</sup> Moreover, statistics from western world have demonstrated physical assault as an important cause of maxillofacial injury.<sup>24</sup> RTA's are more common due to failure to follow safety measures while driving; such as the use of seat belts or wearing of helmets and weaving through traffic by bikers, and also due to poor maintenance of roads. In industrialized countries these basic rules of the road are strictly applied and followed. Injuries due to accidental falls were the next most common cause of injury; this is consistent with the study conducted in India and with previously reported studies.<sup>25,26</sup> While child abuse must always be considered in cases of trauma especially those that do not fit described histories and patterns, or when issues of possible negligence of parents and caretakers is involved, the active nature of growing children does tend to make them more accident prone.<sup>27</sup>

The most common mandibular site of fracture observed in the current study was of the body of mandible followed by the condylar part. Similar finding were reported by previously conducted studies.<sup>28,29</sup> Apart from road traffic accidents being more common in our part of the world, high mobility and relative lack of surrounding bony support of the mandibular bone as compared to other facial bones is a contributing factor. However these finding were divergent from the statistics reported from developed countries.<sup>30,31,32</sup> In the west, assault was a major risk factor which has been attributed to stressful everyday routines and interpersonal differences along with higher usage of drugs and alcohol in those societies. Strict laws regarding drinking and driving and casual alcohol breath testing by police make RTA's on this account relatively less common.

In the current study, statistically significant association

has been found between gender and mode of injury. Males predominate, due to their aggressive nature as well as more involvement in outdoor activities and freedom of movement, as compared to females in our eastern society. Current study demonstrated RTA as major cause of trauma among males, which can be attributed to improper implementation of traffic rules and regulations, among other reasons. Females reportedly suffered more from falls, some of which could be due to domestic violence which is reportedly more common yet unrecognized within developing countries.<sup>33</sup> Location of fracture within the mandible also demonstrates considerable relation with gender. It is seen that body of mandible is the most commonly involved site followed by condyle, due to road traffic accidents and falls, commonly affecting males belonging to second and third decades of life.

Among the maxillary fractures noted in the current study, zygomatic region was the commonest site to be involved and affected by trauma; similar findings were stated by previous studies.<sup>34</sup> The subsequent frequently affected sites were the maxillary bone region which coincides with study conducted by previous researchers.<sup>35,36,37</sup> Zygomatic bone is a prominent bone of the face and during interpersonal assault is frequently subjected to trauma. The basic protective tendency in the midface area is to turn the face downwards and to the side in order to protect the thinner central naso-orbital structures.<sup>38</sup>

### CONCLUSION

RTA's are the most common cause of injuries in males and females between the second to third decade with the body of mandible being most frequently involved followed by the condyle. Falls among young children was the primary cause of injury followed by RTA.

### RECOMMENDATIONS

It is strongly recommended that road infrastructure needs urgent maintenance to reduce the tendency of sudden braking and evasive driving. Equally, the driving rules and regulations, especially those related to the age of drivers, speed control and the wearing of seat belts and helmets needs to be strongly followed and strict actions needs to be taken against violators. Thirdly, public awareness programs regarding safely measures and precautions needed while driving; and relating to issues of child safety and negligence / abuse precautions must be widely publicized via the media.

### CONFLICT OF INTEREST

None declared

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