FREQUENCY OF MAXILLOFACIAL TRAUMA IN PATIENTS REPORTING TO ORAL AND MAXILLOFACIAL SURGERY UNIT, LADY READING HOSPITAL, PESHAWAR

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ABSTRACT

OBJECTIVES

This study aimed to determine the epidemiology and primary etiology of maxillofacial fractures and to correlate these factors to identify the main patient categories affected by various traumatic etiologies.

METHODOLOGY

This cross-sectional study was conducted at the Department of Oral and Maxillofacial Surgery, Lady Reading Hospital, Peshawar, Pakistan, from 21 July 2023 to 30 April 2024. Ethical approval was obtained from the Institutional Review Board, and informed consent was acquired from all participants. Patients of all ages and sexes who presented with maxillofacial trauma were included. The data were collected using a structured questionnaire and clinical examination, and the analyses were performed using R statistical software.

RESULTS

A total of 137 patients were included, with a greater prevalence of maxillofacial fractures among males (68.61%) and individuals aged 18-30 (67.88%). Road traffic accidents were the most common cause of injury (35.04%). Females were more likely to be involved in assaults ($\chi^2 = 18.614$, $p = 0.00033$). The chi-square tests and one-way ANOVA showed no significant differences in BMI, duration of complaints, or age based on the laceration site or mechanism of injury.

CONCLUSION

This study highlights the high incidence of maxillofacial fractures among young adults, primarily due to road traffic accidents and interpersonal violence. The findings underscore the need for preventive strategies, better traffic regulations, and targeted education to reduce the incidence of these injuries.

KEYWORDS: *Facial Fractures, Epidemiology, Interpersonal Violence, Maxillofacial Trauma, Road Traffic Accidents*

INTRODUCTION

Facial trauma is becoming increasingly prevalent globally, representing the most common pathology diagnosed and treated in oral and maxillofacial surgery departments.[1] Trauma is the primary cause of maxillofacial injuries and affects skeletal components, dentition, and soft tissues of the face due to impacts on the maxillofacial region.[2] The frequency and severity of maxillofacial injuries are increasing due to the heavy reliance on road transportation and the growing socioeconomic activities of populations.[3] Over the past three decades, the etiology of maxillofacial trauma has evolved continuously, varying by socioeconomic status, cultural characteristics, geographical location, and age group.[4] Maxillofacial trauma has a multifactorial etiology, including road traffic accidents (RTAs), accidental falls, assaults, industrial mishaps, sports injuries, and firearm injuries (FAIs).[5] The severity and pattern of maxillofacial trauma depend on the anatomical site of injury, the force magnitude, and the direction of the impact.[6] Historically, the pattern of maxillofacial trauma was more straightforward. Facial trauma, based on the etiology and injury mechanism, can range from superficial lacerations and abrasions to facial bone fractures and may occur alongside systemic injuries such as in the head, cervical spine, chest, abdomen, and extremities, necessitating a multidisciplinary approach for management.[7] Injuries can occur in isolation or as part of polytrauma, coexisting with intracranial, cerebral, ocular, spinal, thoracic, or abdominal injuries, significantly increasing case complexity and morbidity.[8] Alterations to facial features can result in functional, psychological, social, and professional consequences that are difficult to reverse over time. Consequently, managing maxillofacial fractures is complex, often requiring a multidisciplinary approach and incurring high costs.[9] Prevention of maxillofacial fractures directly enhances public oral health, given the associated challenges such

as infections or osteitis from fracture site exposure and dento-periodontal trauma necessitating costly secondary oral rehabilitation. Current studies in the local population predominantly focus on bony fractures, with limited data on the patterns and etiology of maxillofacial trauma, including soft tissue injuries and nerve injuries, which are often overlooked. This study aimed to determine the epidemiology and primary etiology of maxillofacial fractures, correlate these factors to identify the main patient categories affected by various traumatic etiologies and examine the frequency and predictors of soft tissue and brutal tissue injuries.

METHODOLOGY

This cross-sectional study was conducted at the Department of Oral and Maxillofacial Surgery, Lady Reading Hospital, Peshawar, Pakistan. The study spanned ten months from 21 July 2023 to 30 April 2024. Patients with ages from 18 to 40 years were included in the study, who presented with maxillofacial trauma involving skeletal components, dentition, and/or soft tissues of the maxillofacial region were included in the study. Patients with isolated dental injuries without associated maxillofacial trauma and those who refused to provide informed consent were excluded. The sample size was determined based on the prevalence of maxillofacial trauma patients who presented to the department during the study period. One hundred thirty-seven patients who met the inclusion criteria were enrolled in the study. Patients who presented with maxillofacial trauma were evaluated and managed according to the department's standard clinical protocols. The data were collected systematically using a structured questionnaire and clinical examination. The demographic information collected included age, sex, and residential status (urban/rural). The injury characteristics recorded included the mechanism of injury (road traffic accident, fall, assault, other), time of injury, location of injury occurrence (home, workplace, public place, different), presence of polytrauma (yes/no), and duration of complaints (hours from injury to presentation). Clinical findings included the type of injury, specific injury site, presence of peripheral nerve involvement (yes/no), and initial management and treatment provided. Informed consent was obtained from all participants or their legal guardians (for minors) before inclusion in the study. Participants were informed about the study's purpose, procedures, potential risks, and benefits. Confidentiality and anonymity were ensured throughout the study. All patients underwent a thorough clinical examination by experienced oral and maxillofacial surgeons. The examination included inspection and palpation of the maxillofacial region to identify fractures, lacerations, and other injuries; a neurological examination to assess peripheral nerve involvement; and a radiographic evaluation using X-rays, CT scans, or MRI as indicated to confirm and detail the extent of skeletal injuries. The data were entered into a computerised database and analysed using R statistical software. Descriptive statistics were used to summarise demographic information and injury characteristics. Continuous variables are presented as the mean ± standard deviation (SD), and categorical variables are presented as frequencies and percentages. Inferential statistics included a chi-square test to assess the association between categorical variables (e.g., sex and mechanism of injury, age group, and laceration site) and logistic regression analysis to identify predictors of specific types of injuries, adjusting for potential confounders. Independent t-tests were used to compare continuous variables (e.g., BMI, duration of complaints) between different groups (e.g., males vs. females, age groups). A p-value less than 0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Review Board (IRB) of Lady Reading Hospital, Medical Teaching Hospital (Approval No. [239/LRH/MTI]). Informed consent was obtained from all participants before their inclusion in the study, ensuring adherence to the ethical guidelines stipulated by the Declaration of Helsinki.

RESULTS

Most participants were male (68.61%) and lived in urban areas (55.47%). Most participants were between 18 and 30 years old (67.88%). The most common type of injury reported was road traffic accidents (35.04%). Peripheral nerve involvement was absent in 67.88% of patients, and 45.99% had no laceration. The average age of the participants was 27.91 years, with an SD of 5.95. The mean BMI was 26.52, with an SD of 3.01.

Table 1: Chi-Square Test of Independence for Gender and Various Factors

Variable	Detail	Male	Female	P Value
Site of Laceration	Cheek	05	12	(χ^2): 0.614 P= 0.961
	Forehead	07	13	
	Infraorbital Region	04	10	
	Lower Lip and Chin	06	17	
	No Laceration	42	21	
Mechanism of Injury	Assault	01	16	(χ^2): 18.614 P= 0.00033
	Fall	07	02	
	Other	08	09	
	Road Traffic Accident	06	25	
Peripheral Nerve Injury	Yes	34	10	(χ^2): 1.704 P value: 0.192
	No	60	33	

Table 2: Association between Age Group and Various Factors

Variable	Detail	18-30 Years	31-40 Years	P-Value
Site of Laceration	Cheek	13	04	(χ^2): 3.155
	Forehead	39	24	P= 0.532
	Infraorbital Region	12	08	
	Lower Lip and Chin	09	05	
	No Laceration	19	04	
Mechanism of Injury	Assault	21	09	(χ^2): 2.174
	Fall	11	07	P= 0.537
	Other	19	12	
	Road Traffic Accident	32	16	
Peripheral Nerve Injury	Yes	30	14	(χ^2): 0.409
	No	63	29	P value: 0.523

Table 3: Chi-Square Test of Independence for Residential Status and Various Factors

Variable	Detail	Rural	Urban	P-Value
Site of Laceration	Cheek	09	12	(χ^2): 7.942
	Forehead	28	35	P= 0.094
	Infraorbital Region	07	14	
	Lower Lip and Chin	08	05	
	No Laceration	08	15	
Mechanism of Injury	Assault	13	17	(χ^2): 3.727
	Fall	13	05	P= 0.292
	Other	13	28	
	Road Traffic Accident	22	26	
Peripheral Nerve Injury	Yes	20	24	(χ^2): 0.000
	No	41	52	P value: 1.000

Table 4: ANOVA Analysis of Periodontal Parameters and Microbiological Profile

	Source	SS	df	MS	F	P
Site of Laceration & Duration of Complaints	Site of Laceration	37.59	04	9.40	0.51	0.73
	Residual	2452.81	132	18.58		
Site of Laceration and BMI	Site of Laceration	52.68	04	13.17	1.47	0.21
	Residual	1179.08	132	8.93		
Site of Laceration and Age	Site of Laceration	37.04	04	9.26	0.26	0.91
	Residual	4775.91	132	36.19		
Mechanism of Injury & Duration of Complaints	Mechanism of Injury	40.59	03	13.53	0.73	0.53
	Residual	2449.81	133	18.42		
Mechanism of Injury & BMI	Mechanism of Injury	36.20	03	12.07	1.34	0.26
	Residual	1195.56	133	8.99		
Mechanism of Injury & Age	Mechanism of Injury	113.06	03	37.69	1.07	0.37
	Residual	4699.89	133	35.34		

SS (Sum of Squares): Represents the variability, df (Degrees of Freedom): Number of levels in the factor, MS (Mean Square): SS divided by df, F: Test statistic., p: Significance level.

Table 5: Tukey's HSD Post Hoc Test for Mechanism of Injury and Site of Laceration on Various Factors

	Group 1	Group 2	Mean Diff	P-adj	Lower	Upper
Mechanism of Injury and BMI	Assault	Fall	-0.63	0.7279	-2.03	0.77
	Assault	Other	0.02	0.9998	-0.90	0.94
	Assault	Road traffic accidents	0.29	0.8991	-0.58	1.17
	Fall	Other	0.65	0.7166	-0.72	2.01
	Fall	Road traffic accidents	0.92	0.5055	-0.32	2.16
	Other	Road traffic accidents	0.27	0.9047	-0.57	1.11
Mechanisms of Injury and Duration of Complaints	Assault	Fall	-1.27	0.7486	-6.34	3.79
	Assault	Other	-0.91	0.8267	-4.18	2.37
	Assault	Road traffic accidents	-1.89	0.3999	-4.98	1.19
	Fall	Other	0.36	0.9872	-4.47	5.20
	Fall	Road traffic accidents	-0.62	0.9471	-5.36	4.12
	Other	Road traffic accidents	-0.99	0.7808	-4.18	2.20
Mechanism of Injury and Age	Assault	Fall	3.67	0.6182	-3.32	10.66
	Assault	Other	1.21	0.8793	-3.87	6.29
	Assault	Road traffic accidents	2.06	0.8052	-2.39	6.51
	Fall	Other	-2.45	0.8131	-9.59	4.69
	Fall	Road traffic accidents	-1.61	0.9152	-8.53	5.32
	Other	Road traffic accidents	0.84	0.9648	-3.30	5.09
Site of Laceration and BMI	Cheek	Forehead	-0.51	0.8957	-2.27	1.25
	Cheek	Infraorbital region	-0.56	0.8877	-2.46	1.33
	Cheek	Lower lip & chin	-0.47	0.9362	-2.55	1.61
	Cheek	No laceration	-0.73	0.7813	-2.25	0.80
	Forehead	Infraorbital region	-0.05	0.9999	-1.59	1.49
	Forehead	Lower lip & chin	0.04	1.0	-1.79	1.88
	Forehead	No laceration	-0.22	0.9891	-1.40	0.97
	Infraorbital region	Lower lip & chin	0.09	0.9998	-1.75	1.92
	Infraorbital region	No laceration	-0.17	0.9950	-1.60	1.26
	Lower lip & chin	No laceration	-0.26	0.9831	-1.83	1.30
Site of Laceration and Duration of Complaints	Cheek	Forehead	0.22	0.9999	-8.10	8.54
	Cheek	Infraorbital region	-1.83	0.9760	-11.20	7.54
	Cheek	Lower lip & chin	-2.17	0.9582	-12.64	8.31

	Cheek	No laceration	-0.63	0.9999	-8.02	6.76
	Forehead	Infraorbital region	-2.04	0.9682	-11.56	7.48
	Forehead	Lower lip & chin	-2.39	0.9482	-13.00	8.22
	Forehead	No laceration	-0.85	0.9998	-8.21	6.51
	Infraorbital region	Lower lip & chin	-0.35	0.9999	-11.68	10.97
	Infraorbital region	No laceration	1.19	0.9974	-7.57	9.94
	Lower lip & chin	No laceration	1.54	0.9931	-7.98	11.06
Site of Laceration and Age	Cheek	Forehead	-1.51	0.9347	-8.28	5.26
	Cheek	Infraorbital region	0.15	1.0	-7.30	7.60
	Cheek	Lower lip & chin	-1.14	0.9791	-8.77	6.48
	Cheek	No laceration	0.37	0.9999	-5.37	6.10
	Forehead	Infraorbital region	1.66	0.9178	-6.42	9.74
	Forehead	Lower lip & chin	0.37	0.9999	-8.70	9.44
	Forehead	No laceration	1.88	0.8643	-4.12	7.88
	Infraorbital region	Lower lip & chin	-1.28	0.9636	-8.95	6.38
	Infraorbital region	No laceration	0.22	1.0	-6.15	6.58
	Lower lip & chin	No laceration	1.51	0.9347	-5.42	8.44

Table 6: Independent T-Tests for Gender and Age Group on BMI and Duration of Complaints

	Gender	Mean BMI	SD BMI	t	df	p
Gender and BMI	Male	22.98	2.34	-1.47	135	0.145
	Female	23.58	2.69			
Gender and Duration of Complaints	Male	55.95	4.25	0.05	135	0.960
	Female	55.91	4.40			
Age group and BMI	18 to 30 years	26.35	3.09	-0.98	135	0.327
	31 to 40 years	26.89	2.84			
Age Group and Duration of Complaints	18 to 30 years	55.31	4.10	-2.52	135	0.013
	31 to 40 years	57.25	4.40			

SE: Standard Error, t: t value (Test Statistic), p: p-value

DISCUSSION

This research revealed a high incidence of maxillofacial fractures among individuals aged 18-30, which aligns with previous findings. Our data show that 67.88% of participants were within the 18-30 age range, with road traffic accidents being the most common cause of injury (35.04%). This age group is notably more socially, professionally, and physically active, making them more prone to trauma.[10] Increased participation in social events, often involving alcohol or recreational drug use, heightens the risk of interpersonal conflicts leading to physical aggression.[11] Additionally, inexperience, noncompliance with traffic rules, and high-speed driving further contribute to this demographic's elevated risk of road traffic accidents.[12] In contrast to our findings, other studies have reported a greater incidence of maxillofacial fractures in the 30- to 39-year-old age group, possibly due to global population aging.[13] Our study demonstrated a greater prevalence of maxillofacial fractures among males (68.61%), consistent with the literature. Behavioural tendencies in males to engage in interpersonal conflicts and their frequent involvement in physical labour and extreme sports account for the greater fracture risk in males than in females.[14] In urban areas, where 55.47% of our participants reside, high population density, social class disparities, and easy access to alcohol and narcotics increase the risk of interpersonal conflicts and road traffic accidents.[15] However, some studies suggest a greater frequency of fractures in rural areas, attributable to regional differences in healthcare institutions.[16] This study also revealed a unique pattern of increased interpersonal violence across both urban and rural areas, a finding that is relatively uncommon in the literature.[17] Our findings indicate that 67.88% of the most affected patients had no peripheral nerve involvement, and 45.99% had no laceration. Lower social status and limited access to healthcare can lead to frustration, depression, and increased vulnerability to interpersonal violence.[18] Interpersonal violence was the predominant cause of maxillofacial fractures, consistent with studies from various regions, including Germany, Brazil, the USA, Italy, Australia, Norway, and Sweden.[19] Developed countries have seen a rise in interpersonal violence as the primary etiological factor, overshadowing road traffic accidents and sports injuries. This trend is linked to the cultural and social dynamics in urban environments and the interplay between alcohol consumption and violence.[20] In contrast, regions such as Nigeria, Uganda, India, Egypt, Saudi Arabia, China, South Korea, Malaysia, and Iran have reported higher incidences of fractures due to road traffic accidents, which are driven by inadequate traffic regulations and infrastructure.[11] Effective traffic rules and stringent penalties have contributed to a reduction in traffic-related fractures in our country. Other studies have highlighted falls as a primary cause of fractures, particularly in regions with effective violence and accident prevention measures and among elderly people, who are more prone to fall-induced facial trauma.[21] Work-related, domestic, and animal attack-induced maxillofacial fractures were less common and more prevalent in rural areas, consistent with the literature.[22] The mandible is the most frequently

fractured bone, owing to its prominence and vulnerability to trauma.[23] Discrepancies in the reported locations of mandibular fractures reflect the variability in trauma mechanisms and conditions at the time of impact. The zygomatic bone is the most fractured in the midface due to its structural and biomechanical properties.[24,25] This study provides vital insights into the etiology and epidemiology of maxillofacial fractures, guiding resource allocation in healthcare, training for medical personnel, and implementing preventive measures. However, the retrospective nature of this study poses limitations, such as potential inaccuracies in patient records and intentional misreporting of causes of trauma, particularly in cases of interpersonal aggression. Future randomised controlled trials are recommended to address these shortcomings.

LIMITATIONS

The study contributes much to the current literature but has a limited sample size and is single-centered.

CONCLUSIONS

This study highlights the significant incidence of maxillofacial fractures, particularly among young adults aged 18-30 years, which are primarily caused by road traffic accidents and interpersonal violence. Education is a crucial preventive measure, with higher educational levels correlating with fewer trauma incidents.

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