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FREQUENCY OF ISOLATED NASO-ORBITO ETHMOID FRACTURE IN MAXILLOFACIAL TRAUMA PATIENTS PRESENTING TO TERTIARY CARE HOSPITAL

Original Research

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ABSTRACT

Objective: This study aimed to evaluate the frequency of isolated naso-orbito-ethmoid (NOE) fractures in maxillofacial trauma patients presenting to a tertiary care hospital.

Methodology: A sample size of 65 patients was selected for this study. Patients aged 18–60 years with maxillofacial trauma within two weeks of the trauma were included, while those with significant morbidity or delayed presentations beyond two weeks were excluded. Diagnosis was confirmed through computed tomography (CT) scans, and clinical features such as tele canthus, epiphora, and diplopia were assessed.

Results: Patient's mean age was 30.98 ± 10.631 years. The study found that isolated NOE fractures accounted for 7.7% of maxillofacial trauma cases. Type 2 fractures were 60% while type 1 and 3 were 20% each.

Conclusion: Isolated NOE fractures are relatively rare but significant injuries, with Type 2 fractures being the most prevalent. Early diagnosis and prompt surgical intervention are crucial to prevent long-term complications such as telecanthus and epiphora. Increased awareness and preventive measures to reduce road traffic accidents are recommended to mitigate the incidence of such injuries.

Keywords: Epiphora, Diplopia, Maxillofacial Trauma, Naso-Orbito-Ethmoid Fractures, Telecanthus, Road Traffic Accidents.

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INTRODUCTION

Trauma represents the predominant etiology for maxillofacial injuries.[1, 2] Trauma to the maxillofacial region results in injuries for skeletal components, dentition, as well as soft tissues of the face. Maxillofacial injuries are becoming more prevalent and severe. [3] The cause of maxillofacial trauma has evolved consistently and continues to change.[4]

Fractures of the Naso-Orbito-Ethmoid (NOE) complex encompass the bones constituting the NOE confluence, which includes the anterior cranial fossa, frontal bone, ethmoid as well as frontal sinus bones, nasal bones, as well as orbits. These injuries frequently occur alongside injuries to other facial and bodily regions, although they may also manifest in isolation. Road traffic accidents as well as interpersonal violence represent the primary causes of these injuries; however, this trend is evolving because of advancements in vehicle and road safety.[5, 6]

Understanding regional anatomy is essential for the assessment and treatment of NOE fractures. The management of patients with these injuries initiates with advanced trauma life-sustaining algorithm. Patients may sustain injuries to vital structures, including the airway, brain, and cervical spine. Subsequent evaluation depends on a comprehensive clinical evaluation supported by radiological imaging. Operative intervention is contingent upon the classification of NOE complex fracture, determined by the condition of the medial canthal tendon.[7] Primary surgical correction must be performed with precision to accomplish aesthetic restoration of facial features and to prevent future complications. [8] The surgical technique and exposure should achieve a balance between fixing deformities and minimizing additional cosmetic disruption. NOE fractures constitute 5% of the total facial fractures within adults, predominantly affecting young males.[9, 10] A study indicated that isolated NOE fractures occur in 4.36% of patients, with a male to female ratio of 9:1.The average age was 28 years, road traffic accidents constitute 69%, followed by falls at 17% and assaults at 10%. [11]

The rationale of this study is to evaluate the frequency of isolated NOE fracture in RTA patients. The results of my study will create local evidence as there is scarcity of local data about the topic. This data will help the policy makers in making policies for prevention of such trauma and its management accordingly. This study may help to establish new protocols for the prevention of such fractures in future.

METHODOLOGY:

The study was conducted at the Department of Oral and Maxillofacial Surgery at Mardan Medical Complex. A cross-sectional study design was employed, and the duration of the study spanned [04-07-2024—04-01-2025]. The sample size was determined to be 65, calculated using the WHO software with the formula for estimating a proportion with specified absolute precision. The assumptions for this calculation included a 95% confidence interval, an anticipated frequency of naso-orbito-ethmoid (NOE) fractures at 4.36%[11], and an absolute precision of 5%. Non-probability consecutive sampling was used to select participants.

The inclusion criteria for the study encompassed all patients presenting with maxillofacial trauma, aged between 18 and 60 years, and of any gender. Patients with significant morbidity, previous surgical cases and those presenting with midface fractures of more than two weeks post-trauma were not included. Data collection began after obtaining approval from the ethical committee of Mardan Medical Complex. Informed consent was secured from all participants, ensuring confidentiality and transparency regarding the study's objectives. A detailed history and thorough clinical examination were conducted for each patient, accompanied by routine investigations such as hemoglobin levels, bleeding time (BT), clotting time (CT), chest X-rays, and electrocardiograms (ECG). The diagnosis of isolated NOE fractures was confirmed through computed tomography (CT) scans. A structured questionnaire was developed to capture variables of interest, including telecanthus, epiphora, and diplopia. Telecanthus was clinically evaluated by measuring the intercanthal distance, while epiphora was assessed using dye disappearance, Jones 1, and Jones 2 tests. Diplopia was evaluated through force duction tests and radiographic imaging.

All data were recorded on a standardized proforma for each patient. Data was analyzed using SPSS 24. Quantitative variables, such as age, were expressed as mean and standard deviation. For non-normal data, the Kolmogorov-Smirnov or Shapiro-Wilk tests were applied. Qualitative variables, such as gender, presence of NOE fractures, clinical pattern and type of NOE fractures were presented as frequencies and percentages. Effect modifiers, including age and gender were stratified with presence of NOE fractures using chi-square/Fisher's exact test p-value ≤ 0.05 considered as statistically significant. The results were presented in the form of tables and

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charts, and the study objectives were achieved by determining the frequency of isolated NOE fractures diagnosed through CT scans based on nasal and ethmoid bone fractures.

RESULTS:

Among the 65 patients we examined, the average age was 30.98 years, with a spread of ±10.631 years, reflecting a fairly young group of individuals. When it came to gender, we found that 42 (64.6%) patients were male, while 23 (35.4%) were female which suggests a noticeable male predominance in this trauma population (Figure 1).

Looking at the presence of isolated NOE fractures, our findings revealed that only 5 (7.7%) patients had this specific injury (Table 1). Among those 5 patients with confirmed isolated NOE fractures, we further investigated the clinical features. Telecanthus was observed in 3 (60.0%) of this subgroup. Epiphora was present in 2 (40.0%) patients. Diplopia appeared in just 1 (20%) patient (Table 2).

We also categorized the type of NOE fracture according to the Markowitz and Manson classification among these 5 patients. Our results showed that Type 2 fractures were the most common occurring in 3 (60.0%) patients. Type 1 fractures and Type 3 fractures, each occurred in 1 patient, both representing 20.0% of the NOE fractures (Table 3).

Regarding the stratification of demographics with the presence of NOE fractures, we found that age was notably associated with NOE fractures, we found that the younger and middle-aged patients had higher frequency of NOE fractures (Table 4).

Overall, our study paints a picture of isolated NOE fractures as a rare entity within maxillofacial trauma at our tertiary care hospital, with Type 2 fractures emerging as the most frequent subtype among those affected. Clinical features like telecanthus and epiphora appeared more often than diplopia, and while gender showed no significant link, age played a notable role in the occurrence of these injuries. These findings offer a glimpse into the local patterns of NOE fractures and set the stage for deeper exploration into their causes and implications.

Gender distribution of patients

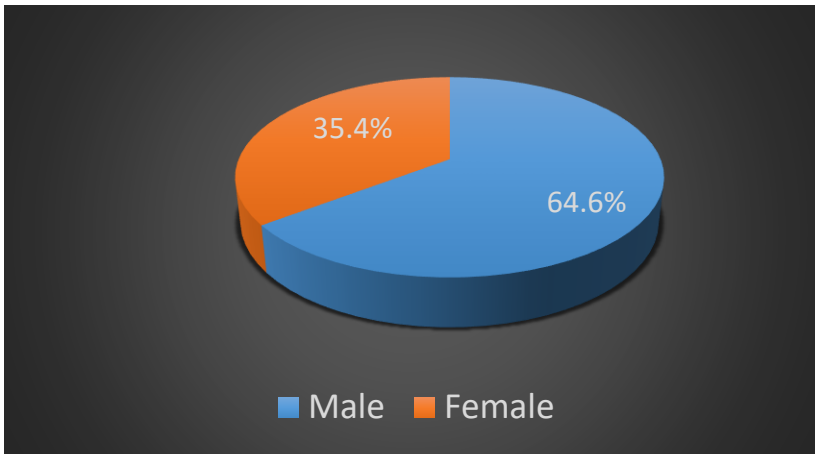

Figure 1 Gender distribution of patients

Table 1: Presence of isolated NOE fracture

Presence of isolated NOE fracture	Frequency	Percent
Yes	5	7.7
No	60	92.3
Total	65	100.0

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Table 2: Clinical features of NOE fractures

Clinical Features in Isolated NOE Fractures		N	%
Telecanthus	Yes	3	60.0%
	No	2	40.0%
Epiphora	Yes	2	40.0%
	No	3	60.0%
Diplopia	Yes	1	20.0%
	No	4	80.0%

Table 3: Type of NOE fracture (Markowitz and Manson classification)

Type of NOE fracture	N	%
Type 1	1	20.0%
Type 2	3	60.0%
Type 3	1	20.0%

Table 4: Stratification of presence of isolated NOE fracture with demographics

Demographics		Presence of isolated NOE fracture				P value
		Yes		No		
		N	%	N	%	
Gender	Male	4	80.0%	38	63.3%	0.45
	Female	1	20.0%	22	36.7%	
Age distribution (Years)	18t o 35	2	40.0%	51	85.0%	0.01
	36 to 50	2	40.0%	3	5.0%	
	51 to 60	1	20.0%	6	10.0%	

DISCUSSION:

The findings of our study reveal that isolated NOE fractures are relatively rare, accounting for only 7.7% of the cases, which aligns with the literature suggesting that NOE fractures constitute a small percentage of facial fractures, typically ranging from 5% to 15% in adults.[11,12] The study also highlights a male predominance in the trauma population, with males making up 64.6% of the sample. This is consistent with Pati et al. and Buchanan et al., which also reported a higher incidence of facial fractures in males.[11,13]

The average age of patients in the study was 30.98 years, which is similar to Pati et al., who reporting an average age of 29.63 years in their study on NOE fractures in eastern India.[11] This age group is typically more active and involved in activities that predispose them to trauma, such as driving and sports. The study also found that younger and middle-aged patients had a higher frequency of NOE fractures, which is consistent with the demographic trends observed by Kelley et al.[9]

In terms of clinical features, the study observed that telecanthus was present in 60% of patients with isolated NOE fractures, while epiphora was present in 40%. These findings are somewhat lower than those reported by Pati et al., who found telecanthus in 100% of their NOE fracture cases and epiphora in 9.61%. The difference in the prevalence of epiphora could be attributed to the fact that some cases of epiphora may resolve spontaneously over time.[11] Diplopia, on the other hand, was the least frequent clinical sign, appearing in only 20% of the cases, which is consistent with the findings of Etemadi Sh et al., who noted that diplopia is a less common complication of NOE fractures.[12]

The classification of NOE fractures according to the Markowitz and Manson system revealed that Type 2 fractures were the most common, occurring in 60% of the cases. This is consistent with the findings of Markowitz et al., who also reported that Type 2 fractures, characterized by comminuted fragments with the medial canthal tendon still attached, are the most frequent.[7] Type 1 and Type 3 fractures were less common, each representing 20% of the cases. This distribution is similar to that reported by Pati et al., who found that 67.30% of their cases were Type 2 fractures, while Type 1 and Type 3 fractures accounted for 30.76% and 1.92%, respectively.[11]

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In our study all the patients presenting with maxillofacial trauma suffered from road traffic accidents, which is consistent with the findings of Pati et al. and Buchanan et al., RTAs, particularly those involving motorcycles, are a significant cause of facial trauma in many regions, especially where helmet use is not strictly enforced.[11,13]

We suggest on the management of NOE fractures that open reduction and internal fixation (ORIF) is the preferred treatment modality, particularly for displaced and unstable fractures. These are also the recommendations of Etemadi Sh et al., who emphasized the importance of prompt surgical intervention to avoid secondary deformities.[12]

Our study provides valuable insights into epidemiology, clinical features, and types of NOE fractures in a tertiary care hospital. Future studies should focus on developing cost-effective treatment strategies and improving access to healthcare resources for patients with NOE fractures.

CONCLUSION:

The study revealed that isolated naso-orbito-ethmoid (NOE) fractures accounted for 7.7% of maxillofacial trauma cases, with Type 2 fractures being the most common. To improve outcomes, early diagnosis and prompt surgical intervention are recommended.

AUTHOR CONTRIBUTION

Author	Contribution
Hina Khan*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Ahmad Khan	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published

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