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ORIGINAL ARTICLE

Prevalence of inferior alveolar nerve injury in patients with mandibular angle fractures, presenting to Khyber College of Dentistry, Peshawar: A descriptive study

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ABSTRACT

Introduction: Sensation abnormalities arise at the innervation point of the inferior alveolar nerve, which is often affected when a mandibular fracture occurs at the angle area. Damage to the nerves causes abnormalities in the sensitivity of the teeth, mucous membranes, and skin. In the area of innervation, patients experience pain, paraesthesia, and discomfort. This illness lowers a person's working capacity and negatively affects their psycho-emotional state.

Objective: The objective of the study was to determine the overall frequency of inferior alveolar nerve injuries and its severity among patients with mandibular angle fractures.

Materials and Methods: In this descriptive cross-sectional study, total of 264 patients mandibular angle fracture from department of oral and maxillofacial surgery, Khyber college of dentistry were selected to asses inferior alveolar nerve injury. Orthopantomogram (OPG) was used to confirm angle fracture, while neurosensory testing was used to assess nerve injury.

Results: 264 patients with male predominance and having age ranges from 17 to years were studied. Results showed that 71% had inferior alveolar nerve injury with more common (42.4%) in age group of 21-30 years. Male patients had more (62.9%) inferior alveolar nerve injury then female patients (8.7%).

KEYWORDS

Inferior alveolar nerve injury; Mandibular angle fracture; Orthopantomogram; Neurosensory testing; Paraesthesia

ARTICLE HISTORY

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Introduction

Maxillofacial injuries are a significant public health concern worldwide, contributing to morbidity, functional impairment, and psychological distress. Among these, mandibular fractures represent the most common type of facial fracture, accounting for 70% to 80% of all maxillofacial injuries due to the mandible's prominent and vulnerable position in the facial skeleton [1]. The mandibular angle, an anatomically weak region due to the presence of the third molar and thinner cortical bone, is particularly predisposed to fractures, constituting 25% to 40% of mandibular fractures. A major consequence of mandibular angle fractures is injury to the inferior alveolar nerve (IAN), the terminal branch of the mandibular division of the trigeminal nerve, which provides sensory innervation to the lower lip, chin, and lower teeth [2].

Inferior alveolar nerve injury (IANI) resulting from mandibular angle fractures has been recognized as a significant complication, with wide-ranging clinical implications. The severity of the injury can range from transient paresthesia to permanent anesthesia or dysesthesia, causing loss of sensation, tingling, or pain in the areas innervated by the IAN [1,3]. Such sensory disturbances not only hinder the quality of life but also impair oral function, leading to difficulties in mastication, speech, and emotional well-being. Despite the known clinical significance of IANI, its prevalence and severity remain highly variable across different populations, geographic regions, and clinical settings, influenced by factors such as fracture displacement, trauma severity, and treatment protocols [4].

The prevalence of IAN injury associated with mandibular fractures has been reported to range from 5.7% to 66.7%, depending on the degree of fracture displacement and the diagnostic method employed. Studies indicate that displaced fractures are more likely to cause nerve compression or transection, while minimally displaced or non-displaced fractures have a lower risk [5]. However, variability exists in diagnostic approaches, with some studies relying solely on subjective patient-reported symptoms while others incorporate objective neurosensory testing. Moreover, age, gender, and trauma etiology play a significant role in the frequency and severity of IAN injuries. Young adults, particularly those aged 21 to 30 years, are most susceptible due to their active lifestyles and higher exposure to risk factors such as road traffic accidents (RTAs), interpersonal violence, and sports-related trauma [6].

Recent studies conducted in different populations have highlighted the epidemiology of mandibular fractures and associated IAN injuries. For example, a study by Boffano et al. reported an overall prevalence of IANI in 24.3% of patients with mandibular fractures [12]. Conversely, Yadav et al. documented a significantly higher prevalence of 86.7% in post-traumatic mandibular fractures among the Korean

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population [7]. In gender-based analyses, males are disproportionately affected, with studies consistently reporting a male-to-female ratio of 4:1. This disparity is attributed to cultural and socioeconomic factors, with males being more frequently involved in outdoor activities and high-risk behaviours [6,8].

In Pakistan, where road safety measures are inadequately enforced, RTAs remain the leading cause of maxillofacial trauma, contributing to the high burden of mandibular fractures and subsequent nerve injuries. Despite these findings, there is limited region-specific data on the frequency and severity of IAN injuries, particularly in relation to age and gender distributions [8].

While significant strides have been made in understanding IAN injuries, several limitations persist in the existing body of research. Firstly, many studies suffer from small sample sizes, single-center designs, and lack of standardized diagnostic protocols, leading to underreporting or misdiagnosis of nerve injuries. Secondly, the reliance on subjective symptoms for assessing IAN function introduces variability and reduces diagnostic accuracy. Furthermore, limited follow-up data on nerve recovery post-treatment prevents a comprehensive understanding of long-term outcomes. These shortcomings underscore the need for well-designed, large-scale studies employing standardized neurosensory testing protocols [9,10].

Despite the prevalence of mandibular angle fractures and their association with IAN injury, there remains a paucity of region-specific data, particularly in developing countries such as Pakistan. Most published studies have focused on Western and East Asian populations, with limited representation of South Asian demographics. Moreover, few studies have explored the age- and gender-based stratification of IAN injuries, which is crucial for targeted prevention and management strategies. Addressing these research gaps is essential to improve clinical outcomes, optimize treatment protocols, and inform public health interventions [11].

The objective of the present study is to determine the frequency of inferior alveolar nerve injuries in patients with mandibular angle fractures presenting to the Khyber College of Dentistry, Peshawar. The study aims to evaluate the distribution of IAN injuries across different age groups and genders, identify patterns of injury severity, and provide region-specific data to bridge existing knowledge gaps. By employing standardized diagnostic methods, including clinical neurosensory testing and radiographic evaluation, this study seeks to contribute to the growing body of evidence on IAN injuries and inform clinical practice and policymaking for improved patient care.

Material and Method

The Department of Oral and Maxillofacial Surgery at Khyber College of Dentistry in Peshawar conducted this prospective descriptive study. This study covered all patients, regardless of gender or age, who reported to the oral and maxillofacial department with a mandibular angle fracture.

Following the hospital's ethical review committee's permission, patients were informed of the study's goals and advantages, and their willingness to participate was obtained through informed consent. They received assurances that the information they provided, including personal information, would be kept private. Patient with suspected angle fractures were diagnosed clinically as presence of tenderness, step deformity, mobility of the segments and open bite on the fracture site and confirmation was done with the help of Orthopantomogram (OPG). Patients having iatrogenic nerve injury, communited angle fracture, avulsive bone injuries, patients with firearm injuries and displaced fractures of more than 9mm were excluded from study. Inferior alveolar nerve injury was assessed by lip numbness subjectively and measured clinically using neurosensory testing with help of cotton stick and sharp probe. The collected data was analyzed by SPSS version 22. Inferior alveolar nerve injury stratified among age, gender. Post-stratification chi-square test was applied keeping p-value < 0.05 as significant. All results were presented in the form of table.

Results

A total of 264 patients having mandibular angle fracture were included in the study having age ranged 17 to 50 years with a mean age was 29.06±7.7604 years. Out of 264, male patients were 222 while female patients were 42. Maximum patients (54.5%) were presented in the age group 21 to 30 years followed by 31 to 40 years (23.5%). Least number of patients (8%) were presented in age group 41 to 50 years (8%). The details of age distribution of patients were depicted in the Table 1.

Of total sample, 71% had inferior alveolar nerve injury. Male patients had more (62.9%) inferior alveolar nerve injury then female patients (8.7%). This difference among different degree of mandibular angle fracture displacement was highly statistically significant (P=0.008) using Chi square test. Inferior alveolar nerve injury was also stratified among various age groups. Inferior alveolar nerve injury was more common (42.4%) in age group of 21-30 years followed by 31-40 years. Least Inferior alveolar nerve injury (6.8%) was in age group 15-20 years. The difference of inferior alveolar injury among different age groups was highly statistically significant P=0.000 (Table 1).

Table 1. Demographic and clinical characteristics of the patients.

Variables Age group (years)	Frequency (n)	Percentage (%)	P value
15-20	37	14.0 %, 54.5%, 23.5%, 8.0%	
21-30	144		
31-40	62	0.716	
41-50	21		
Inferior alveolar nerve Injury	189		
		0.629	
IAN Injury among Gender		0.087	
Male Patients			
Female Patients			

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IAN Injury in Age Groups	166		
15-20	23		
21-30			
31-40		0.068	0.008 *
41-50		0.424	
		0.144	
		0.08	
	18		
	112		
	38		
	21		
			0.079**

*(Chi-square= 6.955; df=1; P-value =0.008)
**(Chi-square= 23.853; df=3; P-value = 0.079)

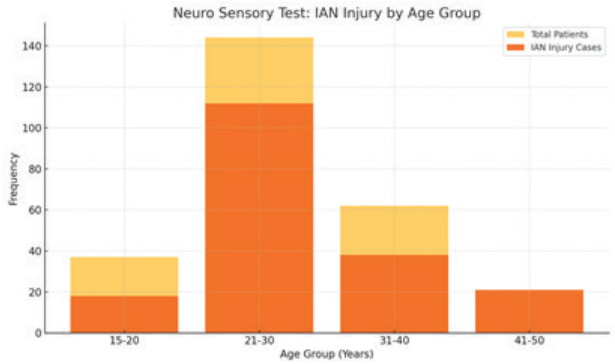

Figure 8. Distribution of Inferior Alveolar Nerve Injury Across Age Groups.

Discussion

An essential sensory nerve in the maxillofacial area is the inferior alveolar nerve (IAN). Sensation abnormalities arise at the innervation site of the inferior alveolar nerve, which is often affected in mandibular angle fractures [12]. If the pieces are minimally displaced or not moved, the damage is typically minimal; however, it increases as the segments become more dislocated [7,13]. The purpose of this study is to ascertain the prevalence of alveolar nerve injury in various age and gender categories.

In this study, nerve injury was assessed by lip numbness subjectively and measured clinically using neurosensory testing with the help of cotton sticks and a sharp probe. Mandibular angle fracture was evaluated from an orthopentomogram (OPG). Bede et al [8,14]. performed a similar study in Baghdad to assess the nerve injury in the maxillofacial region and used the same methods to confirm the presence of nerve injury. A similar study was performed by Prabhu et al. who used the same neurosensory testing to confirm nerve injury in the Indian population [9].

In this study, males were more than females. This may be due to the fact in our country males are outdoor working and more vulnerable to maxillofacial trauma. The second reason is the lack of compliance with driving rules which results in an increased rate of road traffic accidents. The literacy rate in our country is much lower in females as compared to males consequently most of them are housewives. The other reasons for fewer females in maxillofacial trauma are ethical, religious and cultural norms.

In our study, the age range was from 17 to 50 with a mean of 29.06 ±7.7604 years. Most individuals become mobile and outdoor workers after 15 years so the lower age in our study was 17 years. After fifty years the individuals acquired a more sedentary lifestyle and have fewer chances to be involved in maxillofacial trauma. Tay et al. conducted a study on Inferior alveolar nerve injury in trauma-induced mandible fractures in the Singapore population and reported a mean of 30 years [11]. These results are consistent with the current study. Although, their sample size was smaller than the current study.

In our study, 71% of mandibular angle fractures had inferior alveolar nerve damage. Inferior alveolar nerve damage linked to at-risk mandibular fractures was examined by Boffano et al. [12]. They found that 24.3% of mandibular fractures resulted in inferior alveolar nerve damage. The results of this study are different from the current study because they considered all mandibular fractures in their study while in the current study, only angle fractures were considered and nerve injury is more common in angle fractures [10,12]. Otherwise, their sample size was large(n=380). Yadav et al. conducted on post-traumatic and postoperative neurosensory deficits of the inferior alveolar nerve in the mandibular fracture in the Korean population. Their study showed that the overall prevalence of IAN injury was 86.7% [7]. The results of the Yadav et al. study is closer to the current study.

In the current study, inferior alveolar nerve injury was common in the young age group. Maximum nerve injury was in the age group of 21-30 years followed by 31-40 years. The reason for the nerve injury in the young age group is due to their active participation in life activities including increased mobility, careless use of automobiles, and involvement in sports. Therefore, they have more chances of maxillofacial injuries than the old age group and consequently, increased frequency of inferior alveolar nerve injury occurs [12-14]. Poorian et al. in their study on the Iranian population also showed that maximum inferior alveolar nerve injury in mandibular fractures was in the young age group (20-39 years) [13]. The results of this study are similar to the current study.
In conclusion, Patients having mandibular angle fractures had a prevalence of 71% of nerve injury, with males more frequently affected than females. Patients in the age group of 21-30 years are commonly affected due to active participation in life activities. Patients in the age group 15-20 years were least commonly affected due to elastic bone, and less vulnerable to neural injury. Therefore, nerve injury should be diagnosed and documented in maxillofacial injuries to provide early treatment. Moreover, better road safety laws need to be implemented to decrease road traffic accidents and the occurrence of such injuries.

Conclusion

The present study provides crucial insights into the prevalence

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and demographic distribution of inferior alveolar nerve injury (IANI) among patients with mandibular angle fractures. This descriptive study, conducted at the Department of Oral and Maxillofacial Surgery, Khyber College of Dentistry, highlights the significant burden of IANI associated with mandibular fractures, particularly in young, active individuals. The findings underscore that 71% of patients with mandibular angle fractures experienced IAN injury, with the majority of cases occurring in the 21 to 30 years age group. These results align with global trends, where young adults are more susceptible to maxillofacial trauma due to their increased participation in outdoor activities, sports, and exposure to road traffic accidents (RTAs). Gender-based analysis revealed a stark predominance of IAN injuries among males (62.9%) compared to females (8.7%). This disparity can be attributed to socio-cultural factors, including males' higher involvement in high-risk occupations and outdoor activities, as well as lower compliance with road safety regulations. Females, in contrast, are less exposed to such injuries due to societal norms and restricted mobility in some regions. These findings emphasize the need for gender-specific strategies in trauma prevention and management.

The study further demonstrated that the frequency of IAN injury was significantly associated with age, with the highest prevalence observed in the 21 to 30 years group, followed by the 31 to 40 years group. The least affected age group was 15 to 20 years, likely due to greater bone elasticity and reduced exposure to high-impact trauma. This age-related trend highlights the vulnerability of young adults to maxillofacial injuries and underscores the importance of targeted interventions, such as improved road safety measures, educational campaigns, and sports safety protocols, to mitigate the risk of mandibular fractures and subsequent nerve injuries.

Clinically, the study reinforces the importance of early and accurate diagnosis of IAN injury using standardized neurosensory testing and radiographic evaluation. The assessment of nerve function through subjective symptoms and objective clinical tests ensures timely identification and management of sensory deficits, thereby improving patient outcomes. Given the high prevalence of IANI in mandibular angle fractures, clinicians must prioritize thorough neurosensory evaluations during the initial assessment and follow-up of patients. Despite its strengths, this study has certain limitations, including its single-centre design, which may limit the generalizability of the findings. Additionally, the study did not assess the long-term recovery of nerve function or the impact of treatment modalities on IAN outcomes. Future multicenter studies with larger sample sizes and longitudinal follow-ups are recommended to address these gaps and provide a more comprehensive understanding of IAN injuries.

In conclusion, mandibular angle fractures are a significant cause of inferior alveolar nerve injuries, particularly in young males. The high prevalence of IANI observed in this study highlights the need for improved preventive measures, including stricter enforcement of road safety laws, enhanced public awareness regarding maxillofacial trauma, and the use of protective gear during high-risk activities. Early diagnosis and intervention remain pivotal in minimizing sensory deficits and improving patients' quality of life. Future research should focus on exploring treatment outcomes, nerve recovery rates, and preventive strategies to reduce the burden of IAN injuries in maxillofacial trauma patients.

Disclosure Statement

The author reported no potential conflict of interest.

References

1. Razukevicius D, Kubilius R, Sabalys G, Lukosiunas A, Grybauskas S. Inferior alveolar nerve sensitivity changes after mandibular trauma. Med Health Sci J. 2010;4:1-8.
2. Rajandram R, Nabil S, Shareif M, Ishak I, Marhazlinda J, Nordin R, et al. Mandibular third molar and angle of mandible fractures: an unsolved clinical dilemma. Sains Malaysiana. 2013;42(1):39-43. http://eprints.um.edu.my/id/eprint/7743
3. Chandel S, Agrawal A, Singh N, Singhal A. Angle Fractures and Third Molars. J Dent Sci Research. 2013;3(3):5-8.
4. Juan F, Azorín ML, Andrés GS, Rosa P, Muries CA, Panadero RA. Prevention and treatment of IAN injuries:A literature review. J Interdiscipl Med Dent Sci. ;2014 2(3):214- 221. http://dx.doi.org/10.4172/jimds.1000223
5. Scott R, Teo N, Perry M. Displacement of mandibular fractures: is there a correlation with sensory loss and recovery? Int j Oral Maxillofac surgery. 2014;43(5):555-558. https://doi.org/10.1016/j.ijom.2013.11.007
6. Brajdić D, Virag M, Uglešić V, Aljinović-Ratković N, Zajc I, Macan D. Evaluation of sensitivity of teeth after mandibular fractures. Int j Oral Maxillofac surgery. 2011;40(3):266-270. https://doi.org/10.1016/j.ijom.2010.11.016
7. Yadav S, Mittal HC, Malik S, Dhupar V, Sachdeva A, Malhotra V, et al. Post-traumatic and postoperative neurosensory deficits of the inferior alveolar nerve in mandibular fracture: a prospective study. J Korean Assoc Oral Maxillofac Surg. 2016;42(5):259-264. https://doi.org/10.5125/jkaoms.2016.42.5.259
8. Bede SYH, Ismael WK, Al-Assaf DA, Omer SS. Inferior alveolar nerve injuries associated with mandibular fractures. J Craniofacial Surgery. 2012;23(6):1776-1778. https://doi.org/10.1097/SCS.0b013e318266fda3
9. Prabhu RK, Sinha R, Chowdhury SK, Chattopadhyay PK. Evaluation of facial nerve function following surgical approaches for maxillofacial trauma. Ann Maxillofac Surg. 2012;2(1):36-40. https://doi.org/10.4103/2231-0746.95315
10. Poorian B, Bemanali M, Chavoshinejad M. Evaluation of Sensorimotor Nerve Damage in Patients with Maxillofacial Trauma; a Single Center Experience. Bull Emerg Trauma. 2016;4(2):88. https://pubmed.ncbi.nlm.nih.gov/27331065/
11. Tay ABG, Lai JB, Lye KW, Wong WY, Nadkarni NV, Li W, et al. Inferior alveolar nerve injury in trauma-induced mandible fractures. J Oral Maxillofac Surgery. 2015;73(7):1328-1340. https://doi.org/10.1016/j.joms.2015.02.003
12. Boffano P, Roccia F, Gallesio C, Karagozoglu K, Forouzanfar T. Inferior alveolar nerve injuries associated with mandibular fractures at risk: a two-center retrospective study. Craniomaxillofacial Trauma Reconstruction. 2014;7(04):280-283.
13. Poorian B, Bemanali M, Chavoshinejad M. Evaluation of Sensorimotor Nerve Damage in Patients with Maxillofacial Trauma; a Single Center Experience. Bulletin Emerg Trauma 2016;4(2):88.
14. Juodzbalys G, Wang HL, Sabalys G, Sidlauskas A, Galindo-Moreno P. Inferior alveolar nerve injury associated with implant surgery. Clin Oral Implants Res. 2013;24(2):183-190. https://doi.org/10.1111/j.1600-0501.2011.02314.x

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