

# Frequency of Inferior Alveolar Nerve Injury During Third Molar Extraction

Sehrish Maqbool<sup>1</sup>, Najia Sajjad Khan<sup>2</sup>, Iram Abbas<sup>1</sup> and Alamgir Khan<sup>1</sup>

<sup>1</sup>Department of Oral and Maxillofacial Surgery, Ayub Medical College, Abbottabad, Pakistan

<sup>2</sup>Department of Community Dentistry, Ayub Medical College, Abbottabad, Pakistan

## ABSTRACT

**Objective:** To determine the frequency of inferior alveolar nerve injury during third molar extraction and the associated factors.

**Study Design:** Descriptive study.

**Place and Duration of the Study:** Department of Oral and Maxillofacial Surgery, Ayub Teaching Hospital, Abbottabad, Pakistan, from July to December 2021.

**Methodology:** A total of 163 patients with third molar surgery were included. Patients were followed up after one week, one month, and three months of duration. The frequency of inferior alveolar nerve injury was determined as well as its relationship with other surgical variables like age, gender, type of impaction, buccal flap retraction, bone cutting, tooth splitting, and duration of surgery via Chi-square test.

**Results:** The frequency of inferior alveolar nerve injury was found to be 1.2% (n = 02). None of the surgical variables had a statistically significant association with it ( $p > 0.05$ ).

**Conclusion:** The frequency of nerve injury of the inferior alveolar nerve during extraction of the third molar was 1.2%. Proper treatment planning, using advanced radiography, experienced surgeon, and proper technique can help in lowering nerve injury risk.

**Key Words:** Inferior alveolar nerve injuries, Molar, Tooth extraction, Paraesthesia.

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## INTRODUCTION

Inferior alveolar nerve (IAN) is the largest terminal branch of mandibular division of trigeminal nerve. Injury to this nerve can cause loss of sensations in the lip, cheek, and gingiva.<sup>1</sup> The occurrence of each of these symptoms depends upon where the site of the nerve injury happened. Most of the times, injury of IAN is temporary in nature and recovers within 4-8 weeks. Permanent nerve injury of more than six months duration occurs very rarely which is associated with hypoesthesia, dysesthesia, and hyperesthesia of lip, chin, and buccal mucosa of the same side.<sup>2</sup> Sensory disturbance affects chewing and speaking abilities of patients. It also causes involuntary biting of lip and tongue and adversely affects the psychological conditions and social lives of the affected patients.<sup>3</sup> The presence of an experienced surgeon, proper technique, and planning on radiographs and using advanced radiographic techniques like cone-beam computed tomography (CBCT) and three-dimensional computed tomography (CT) can greatly minimise IAN damage by locating the position of the nerve.<sup>4</sup>

One of the common causes of nerve damage to IAN occurs during the mandibular third molar (M3M) extraction. If a M3M is impacted, then its proximity is nearer to the root of the IAN, thereby increasing the chances of nerve injury.<sup>5</sup> The prevalence of impacted third molar has been reported to be in the range of 20 to 30%.<sup>6</sup> The causes of M3M impaction include genetic predisposition, inadequate retromolar space, unfavourable tooth eruption path, and malposition of tooth germ.<sup>7</sup> Third molar extraction is a common procedure that dentists and oral and maxillofacial surgeons encounter in their routine practice. The complications that often follow this procedure are pain, paraesthesia, trismus, swelling, bleeding, and infection.<sup>8</sup>

There are several risk factors reported for IAN injuries during M3M surgery. These include increased age,<sup>2</sup> female gender,<sup>3</sup> systemic disease, surgeon with less experience,<sup>2</sup> buccal flap retraction,<sup>9</sup> type of impaction especially deep, distal and horizontal impaction,<sup>2,10</sup> bone cutting,<sup>11</sup> tooth splitting,<sup>4</sup> and duration of surgery.<sup>11</sup>

Temporary injury to IAN has been reported in different studies from 0.26 to 20%.<sup>4,12</sup> Permanent injury to IAN has been reported in different studies from 1 to 20%.<sup>4,13,14</sup>

Different studies from Pakistan reported prevalence of IAN during M3M extraction as 3.3% in Multan,<sup>2</sup> 0.53% and 8.2% from two studies in Islamabad,<sup>3,13</sup> 3.3% in Karachi,<sup>5</sup> 6% in Jamshoro,<sup>10</sup> and 6.5% and 0.9% from two studies in Lahore.<sup>15,16</sup>

Correspondence to: Dr. Najia Sajjad Khan, Department of Community Dentistry, Ayub Medical College, Abbottabad, Pakistan

E-mail: najiasajjadkhan@gmail.com

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To the authors' knowledge, no such study which found out the frequency of IAN injury during and after M3M extraction as well as its relationship with its risk factors has been conducted in Khyber Pakhtunkhwa or more specifically in the region of Abbottabad. The study will be beneficial to dentists and oral and maxillofacial surgeons, so that they can properly plan beforehand, and understand the risks while performing M3M extraction and minimise the risk of damage to IAN among patients. The objective of the study was to determine the frequency of IAN injury during M3M extraction and its association with demographics, type of impaction, and surgical variables.

## METHODOLOGY

This descriptive study was conducted in the Department of Oral and Maxillofacial Surgery, Ayub Teaching Hospital, Abbottabad, from July to December 2021. Patients of either gender below 30 years of age, who consented for the procedure and follow-up, were included. Medically compromised patients like those suffering from diabetes mellitus, liver diseases and/or blood disorders were excluded. The sample size calculated was 163 patients with World Health Organisation (WHO) sample size calculator by using confidence level of 95%, anticipated frequency of IAN injury during extraction of the M3M of 20%<sup>12</sup> and absolute precision of 3.5%. The sampling technique was non-probability convenience sampling.

Ethical approval was obtained from the Ethical Committee of Ayub Teaching Hospital, Abbottabad. Informed written consent was taken from the patients. Data were collected on a proforma via interview. The proforma comprised of demographical data and other relevant variables. The content validity of the proforma was checked and verified by an oral and maxillofacial surgeon. Third molar surgery was performed by well-experienced surgeons who were either postgraduate residents or consultants of oral and maxillofacial surgery. A peri-apical x-ray and orthopantomogram were taken prior to starting the procedure. The type of impaction according to Winter's classification was assessed. Local anaesthesia using the long buccal nerve and inferior alveolar block (1.8 ml of 2% lignocaine and 1:200000 adrenaline) was given. A full-thickness mucoperiosteal flap was raised with straight elevator. If tooth could be extracted by closed extraction technique, it was removed with forceps. If surgical extraction was required, buccal flap retraction was done, and bone cutting was performed with a diamond bur using simultaneous irrigation. Tooth splitting was then done and tooth was extracted. The wound was closed with a 3'0 silk suture. The duration of surgery was timed with a stopwatch. Patients were called for follow-up after one week, one month, and three months for assessing nerve injury by light touch recognition test with a small cotton swab and a probe to cause a pinprick sensation, stroke direction, two-point discrimination, and thermal sensation. The patient was also asked about lip numbness.

Statistical analysis was performed by using statistical package for the Social Sciences (SPSS) version 21.0. Categorical nominal variables of inferior alveolar nerve injury, age, gender,

type of impaction, buccal flap retraction, bone cutting, tooth splitting, and duration of surgery were described as frequencies and percentages. The relationship between IAN injury and the other study variables were assessed via Chi-square test at 95% confidence level, with statistical significance below a value of  $p < 0.05$ .

## RESULTS

The study showed that the frequency and percentage of IAN injury was 2 (1.2%, Table I). Two patients with temporary IAN injury were noted after one week. Paraesthesia was reduced after 1-month follow-up visit with the touch recognition test and other tests, and patient gave history of tingling sensation. At 3-month's visit, paraesthesia was completely recovered. So, no permanent injury of IAN was observed. One of these cases occurred during the extraction of disto-angular impacted tooth and the other case occurred during the extraction of horizontal impacted tooth according to the Winter's classification. The frequencies and percentages of the other variables are shown in Table I.

With regards to the relationship of variables with IAN injury during M3M extraction, all the variables of age, gender, type of impaction, buccal flap retraction, bone cutting, tooth splitting, and duration of surgery had statistically insignificant associations with it ( $p \geq 0.05$ , Table II).

**Table I: Study variables.**

Variables	Groups	Frequency (n)	Percentage (%)
Age (years)	<28	104	63.8
	>28	59	36.2
Gender	Male	81	49.7
	Female	82	50.3
Type of impaction	Mesioangular	58	35.6
	Horizontal	33	20.2
	Disto-angular	28	17.2
	Vertical	44	27.0
Buccal flap retraction	Yes	63	38.7
	No	100	61.3
Bone cutting	Yes	53	32.5
	No	110	67.5
Tooth splitting	Yes	40	24.5
	No	123	75.5
Duration of surgery (minutes)	<30	139	85.3
	>30	24	14.7
Frequency of inferior alveolar nerve injury	Present	2	1.2
	Absent	161	98.8

**Table II: Association of inferior alveolar nerve injury with demographical and surgical variables.**

Variables	p-value
Age	0.535
Gender	0.245
Type of impaction	0.300
Buccal flap retraction	0.148
Bone cutting	0.104
Tooth splitting	0.059
Duration of surgery	0.554

## DISCUSSION

In this study, the frequency of injury to IAN during the extraction of M3M and its association with other related variables was determined. The frequency of IAN injury was found to be 1.2%. It was temporary in nature and disappeared in three months, and none of the patients sustained permanent injury. This was similar to a study by Bashir *et al.*, which reported an incidence of 1% temporary IAN injury.<sup>4</sup> In a study by Shaukat *et al.*, two patients (3.3%) had temporary IAN injury.<sup>5</sup> The studies that had lesser incidence than this study were by Nguyen *et al.*, (0.68%, 0.44% temporary, and 0.24% permanent),<sup>17</sup> Bashir *et al.*, (1%),<sup>4</sup> and Kim *et al.*, (0.64%).<sup>18</sup> The studies which reported more nerve injury than this study were by Smith (3.9% temporary and 0.7% permanent),<sup>19</sup> Qi *et al.*, (7%),<sup>11</sup> Umar *et al.*, (12% all temporary),<sup>14</sup> Bhangwar *et al.*, (6% temporary nerve injury),<sup>15</sup> and Irfan *et al.*, (6.5% permanent nerve injury after one month).<sup>16</sup> A systematic review reported an incidence of 0.26-8.4%.<sup>12</sup> A study by Israr *et al.*, reported eight cases out of 1,487 cases (0.53%) of IAN temporary injury and 0% cases of permanent injury.<sup>3</sup> A study by Noaman *et al.* and Sajid *et al.* reported 19.8% temporary injury and 0.9% permanent injury.<sup>10</sup>

In this study, horizontal and vertical angulation were the most likely at risk of IAN injury but the IAN injury occurred with the disto-angular and horizontal impactions, respectively. The study by Smith *et al.* reported a greater association of IAN injury with the vertical and mesio-angular impaction and similar to this study it was statistically insignificant.<sup>19</sup> In a study by Nguyen *et al.*, mesio-angular and horizontal angulation were most common and similar to the findings of this study, it was statistically insignificant.<sup>17</sup> The studies by Qi *et al.*, and Irfan *et al.*, also showed a similar insignificant relation.<sup>11,16</sup>

In this study, female patients were more affected than males, which aligns with the study conducted by Smith *et al.*<sup>19</sup> In this study the relationship with the IAN injury was statistically insignificant similar to the studies by Israr *et al.*,<sup>3</sup> Nguyen *et al.*,<sup>17</sup> Hasegawa *et al.*,<sup>20</sup> Qi *et al.*,<sup>11</sup> Kang *et al.*,<sup>21</sup> and Cheung *et al.*<sup>22</sup>

Age did not influence the occurrence of IAN injury which contradicts the findings of the study by On *et al.*,<sup>23</sup> and consistent with the studies conducted by Israr *et al.*,<sup>3</sup> Nguyen *et al.*,<sup>17</sup> Hasegawa *et al.*,<sup>20</sup> Qi *et al.*,<sup>11</sup> and Cheung *et al.*<sup>22</sup> Tooth splitting had an insignificant association with the IAN injury. This was similar to the studies by Pippi *et al.*,<sup>24</sup> and Cheung *et al.*,<sup>22</sup> and contrary to the studies by Bashir *et al.*,<sup>4</sup> and Kang *et al.*<sup>21</sup> Duration of surgery had no significant association with IAN injury. This was similar to a study by Qi *et al.*<sup>11</sup> buccal flap retraction had an insignificant association with IAN injury. This was similar to the study by Hassan *et al.*,<sup>2</sup> but in contrary to the study by Absi *et al.*<sup>9</sup> Bone cutting had an insignificant association with the IAN injury. This was similar to the study by Absi *et al.*,<sup>9</sup> and in contrast to the study by Sayed *et al.*<sup>25</sup> The low frequency of the IAN injury and no permanent injury found in the present study could be due to dental surgeons following all the standard protocols of third molar extraction surgery.

There were some strengths of the study. The patients were informed about the risk factors and natural history. Detailed information was noted about the patient regarding the IAN injury, and many risk factors were taken into account. The limitations of this study were that there was no comparison group, so it was difficult to address aetiological questions, many surgeons performed the procedure and no CBCT could be advised beforehand. The sampling technique was non-random so the cases were not representative of the population. Additionally, the aspect of management after IAN injury was not covered in the study.

## CONCLUSION

The frequency of injury to IAN during the extraction of M3M was found to be 1.2% in this clinical setting and no significant risk factors were found. These are normally significant factors which if not taken care of, can result in an IAN injury. However, in this study, because of experienced operators and low incidence of injury (1.2%), they are not significantly associated. The careful surgical technique can minimise the incidence. So, the patient must be informed about the risk of injury to the IAN before the M3M extraction. Further studies regarding the association of the IAN during the M3M extraction with other variables with better study designs can be carried out.

### ETHICAL APPROVAL:

Ethical approval was obtained from the Ethical Committee of Ayub Teaching Hospital, Abbottabad, Pakistan (Approval no: DSG-2017-010-2215, Dated: 10-June-2021).

### PATIENTS' CONSENT:

Informed consent was obtained from the patients.

### COMPETING INTEREST:

The authors declared no conflict of interest.

### AUTHORS' CONTRIBUTION:

SM: Conception, acquisition of data, drafting the work, and proofreading.

NSK: Conception, acquisition, analysis and interpretation of data, drafting the work, and proofreading.

IA, AK: Conception and proofreading.

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