International Journal of Research in Medical Sciences
*Shah NS et al. Int J Res Med Sci. 2019 Dec;7(12):4578-4584*
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012

DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20195522

**Original Research Article**

# Prevalence of mental nerve injury in facial fractures: a 3 year retrospective study

**Navin S. Shah, Karan V. Panchal*, Pratik Agrawal**

Department of Oral and Maxillofacial Surgery, K.M. Shah Dental College, Pipariya, Vadodara, Gujarat, India

**Received:** 11 October 2019
**Revised:** 05 November 2019
**Accepted:** 13 November 2019

***Correspondence:**
Dr. Karan V. Panchal,
E-mail: panchalkv@gmail.com



## ABSTRACT

**Background:** Mandibular fracture is the most common facial bone fracture. Fractures occurring at the Para symphysis region frequently results in mental nerve injury, due to which anaesthesia or paraesthesia of the skin and mucous membrane within the distribution of mental nerve may be observed and may cause reduced quality of life for patients. Aim of this study was to retrospectively analyse and evaluate the prevalence rate of mental nerve injury in patients that reported to the department of oral and maxillofacial surgery, managed conservatively or open reduction and internal fixation method during the last 3 years
**Methods:** Patients with neurosensory deficit following para symphysis fracture were recorded, statistically analyzed and results and observation were prepared from it.
**Results:** The patients with age group 21-30 diagnosed with para symphysis fracture constituted 25% of all operated case and were found to be more associated with midface and angle fracture. Etiology behind the trauma was mostly as a result of RTA. Neurosensory disturbances as a result of mental nerve injury were found to be associated in 20.89% case, out of which in most of the cases, it gradually recovered within a duration of 7-15 days.
**Conclusions:** RTA's have been a prime cause for para symphysis fracture, which may at times accompany neurosensory deficit following trauma or may occur post-surgery, has been found to cause troublesome sequelae and reduced quality of life. Moreover, further research study needs to be carried out over a larger time span having a larger group of patients.

**Keywords:** Mandibular fracture, Mental nerve, Paraesthesia, Trauma

## INTRODUCTION

Facial injuries constitute about 3.2% - 8% of all injuries.[1] Mandibular fracture is the first or second most common facial bone fracture, occurring twice as frequently as fractures of the midface bones probably due to its prominent and exposed position; other authors reported that the frequency of mandibular fractures is second to that of fractures of nasal bones in adults.[2-5] The incidence is approximately 38% of all facial bone fractures. Mandibular fractures constitute the bulk of the trauma treated by oral and maxillofacial services.[6,7]

Around the world, different places show different patterns of facial trauma, and accordingly treatment also differs. These differences can be explained by varying economic and social conditions, local behaviour and law. Comparing data from different countries can increase understanding of the facial trauma situation in different regions, allowing treatments to be optimized and improvements in the patient's quality of life.[8,9]

Mandibular fractures can be classified according to the type of fracture, cause of fracture, or the site of the fracture.[2,10] Mandibular fractures which occurs at the parasymphysis region frequently results in mental nerve injury. As a consequence of nerve injury, an altered neurosensory function in the form of anaesthesia or paraesthesia of the skin and mucous membrane within the distribution of mental nerve on the side of fracture may be observed, though usually such condition gradually improves with time.[2-5] Etiology of IAN injury may include indirect traumatic injury of nerve bundle, compression by soft tissue oedema, or direct nerve involvement within fracture rimes with consequent dislocation, traction, or compression.[7]

This altered sensation may be due to primary injury when the mental nerve lies in the fracture line or a secondary insult due to manipulation and fixation of the fracture. As a consequence of mental nerve injury, patients experience subjective disturbances of various intensities, but clinical experience shows that this condition gradually recovers after a certain period of time. Though the primary goal of trauma management is restoration of anatomic form and function, neurosensory deficits cannot be neglected in maxillofacial trauma. For example, teeth positioned anterior to a line of fracture can demonstrate disturbed sensitivity. Moreover, Post-traumatic disorders of mental nerve and IAN are troublesome sequelae of facial trauma, often determining a reduced quality of life for patients.[7]

The incidence and long-term outcomes of mental nerve neurosensory deficits associated with mandibular fractures are insufficiently documented in the literature. Reports reveal that the prevalence of post-trauma IAN deficit ranges from 5.7% to 58.5%.[11] The prevalence of IAN neurosensory deficit after fracture treatment ranges from 0.4% to 91.3%.[11] Permanent IAN neurosensory deficits after mandibular fracture range from 0.9% to 66.7%.[11]

Parasymphysis fracture of mandible is also challenge at times for osteosynthesis as a result of positioning of mental nerve, due to which placement of 3D mini-plates for fixation of fracture becomes difficult, in such situations two plating system are used to contradict the tensional as well as compressive forces.

Post-traumatic disorders of IAN and mental nerve injury are troublesome sequelae of facial trauma, often determining a reduced quality of life for patients. Nevertheless, the incidence and patterns of post-traumatic mental nerve sensory disturbances have been scarcely documented in the maxillofacial trauma literature.[12] The occurance of maxillofacial fractures varies with geographic region, socioeconomic status, culture, religion and era.

Considering all the above factors in mind the present study aims in retrospectively analysing the incidence of injury or any kind of neurosensory damage to the mental nerve in facial fractures in the past 3 years.

## METHODS

### *Inclusion criteria*

- Patients who are diagnosed with parasymphysis mandibular fracture in Department of oral and Maxillofacial Surgery, K. M. Shah Dental College Vadodara during the period of January 2016 to December 2018.
- All the cases irrespective of age and gender will be included in the study.
- All the cases reported with medico-legal and non-medico legal reporting will be included in the study.
- Records of patient with sufficient data as per required will be included in the study.

### *Exclusion criteria*

Records of cases with insufficient data will be excluded from the study.

It is a retrospective study, carried out with the duration of 3 months. Data analysis was done using t-test and Chi-square test

For all the patients included in the study, neurosensory examination of the mental nerve was carried out by sharp/blunt differentiation using the sharp point of a dental probe and a cotton roll on the lower lip of the injured side and was compared with the corresponding area of the non-injured side. Patients who reported to have anaesthesia or hypoesthesia (numbness) of the lower lip region on the affected side were considered to have mental nerve injury.

Approval to conduct the study will be sought from the Sumandeep Vidyapeeth Institutional Ethics Committee (SVIEC). After the permission is granted from the committee, data will be gathered from the record room of Dhiraj General Hospital and OPD record. The data obtained will be statistically analysed after thorough preliminary inspection and content analysis and results and observation will be drawn from it.

## RESULTS

In the present study prevalence of parasymphysis fractures in both male and female during a period of 3 years from Jan'16 to Dec'18 (Figure1) was evaluated and was found that prevalence of parasymphysis fracture was comparatively more in male than in females.

Prevalence of site of associated fracture present along with the parasymphysis fracture was evaluated and was found that in males parasymphysis fractures were found more associated with midface and angle fracture.

Whereas in females, it was found to be more associated with angle fracture (Figure 2).

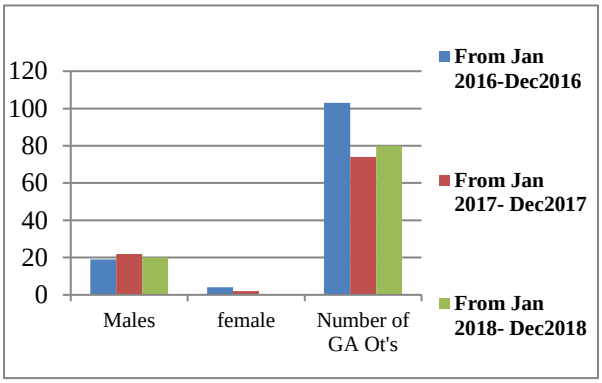


**Figure 1: Total number of patients diagnosed with parasymphysis fracture.**

In this study, prevalence of parasymphysis fractures among various age groups was evaluated and was found that age group of 21-30 were first highest to have parasymphysis fractures whereas age group 31-40 were second highest to have parasymphysis fracture in both males and females (Figure 3).

Number of patients based on various etiological factors was evaluated and was found that RTA's were the common cause for the parasymphysis fracture in both males and females (Figure 4).

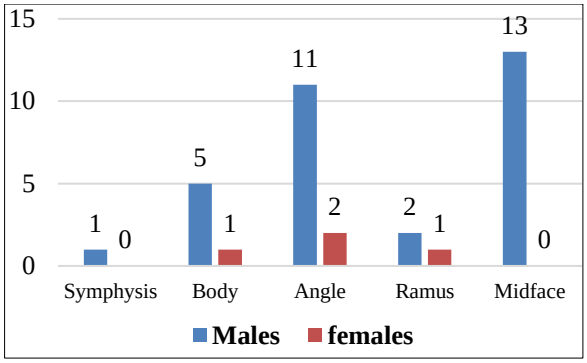


**Figure 2: Associated fracture with parasymphysis fracture.**

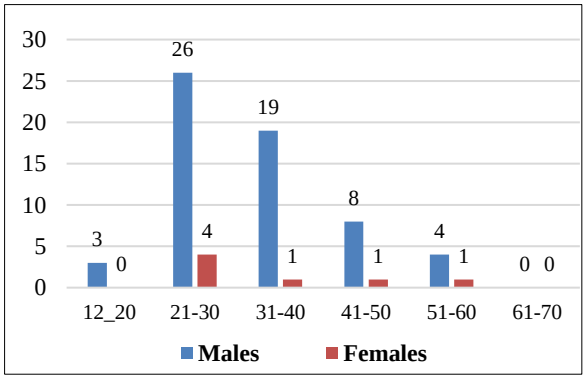


**Figure 3: Age range of the patient at the time of injury (in years).**

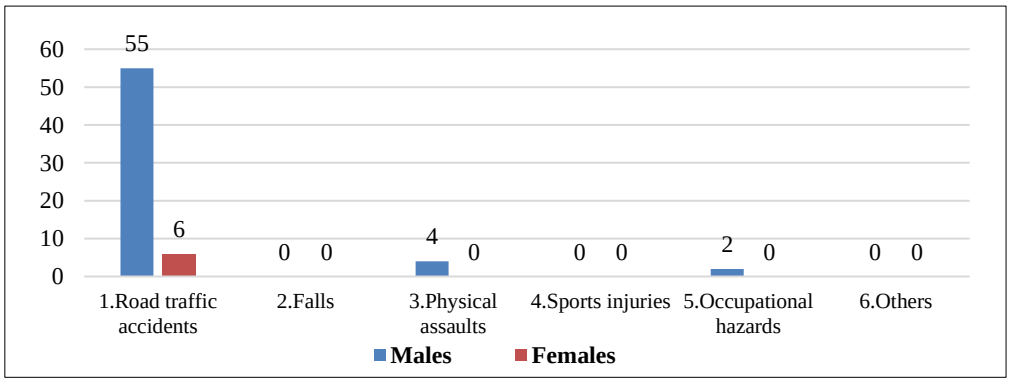


**Figure 4: Etiology of injury.**

Number of patients having neurosensory disturbances over a period of 3 years was evaluated and was found that 7 male and 1 female patient were diagnosed with neurosensory disturbance such as paresthesia whereas 3 male patients had dysesthesia (Figure 6).

In this study, prevalence of patients diagnosed with mental nerve injury was calculated and was found that year 2017 had 5 male patients diagnosed with mental nerve injury followed by 3 male and 1 female patient in year 2016 and 5 male patients in year 2018 (Figure 5).

In this study, number of patients having neurosensory disturbances postoperatively over a period of 3 years was evaluated and was found that 3 male patients were diagnosed with paresthesia (Figure 7).

In this study, number of patients recovered from neurosensory disturbances post operatively was evaluated and was found that 4 male and 1 female patient having paraesthesia and 3 male patients having dysesthesia recovered during the duration of 1 week whereas 4 male patients having paresthesia recovered within 15 days whereas the other 2 males recovered in 1 month (Figure 8).

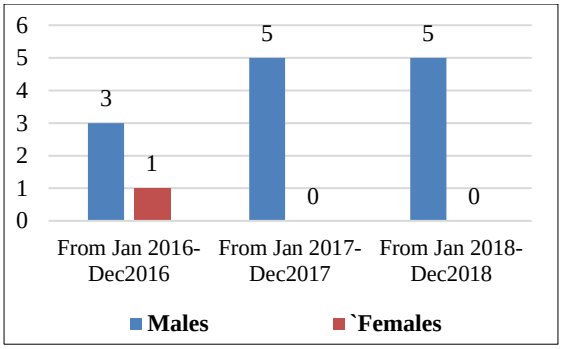


**Figure 5: Total Number of Patients diagnosed with mental nerve injury.**

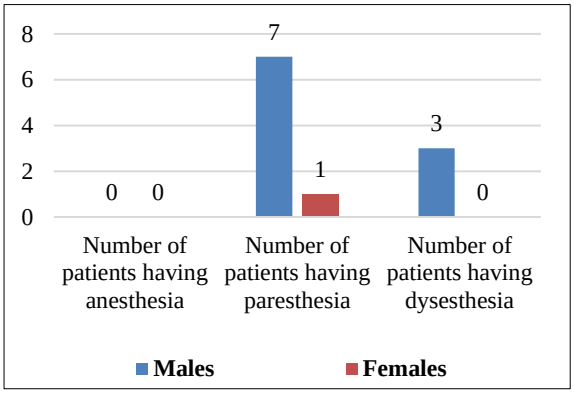


**Figure 6: Number of patients having neurosensory disturbances pre-operatively.**

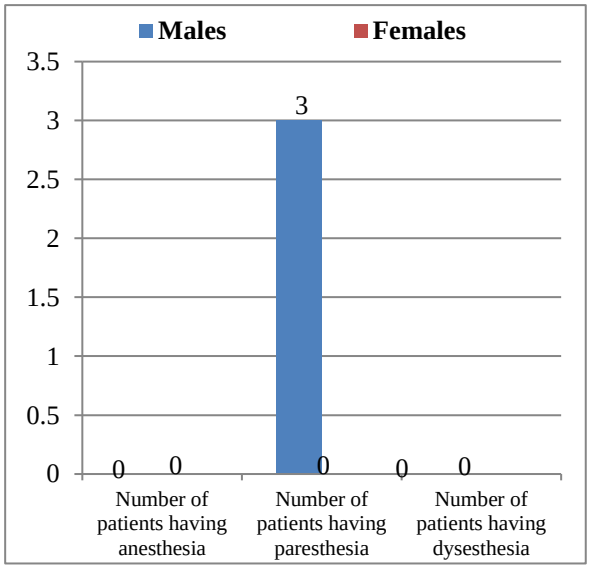


**Figure 7: Number of patients who had developed neurosensory disturbances only during post-operative phase**

## DISCUSSION

Facial injuries constitute about 3.2%-8% of all injuries.[1] Despite its rigidity, the mandible is reported to be the first or second most commonly fractured bone of the facial skeleton probably due to its prominent and exposed position occurring twice as frequently as fractures of the midface bones; other authors reported that the frequency of mandibular fractures is second to that of fractures of nasal bones in adults.[2-6] The incidence is about 38% of all facial bone fractures. Mandibular fractures constitute the bulk of the trauma treated by oral and maxillofacial services.

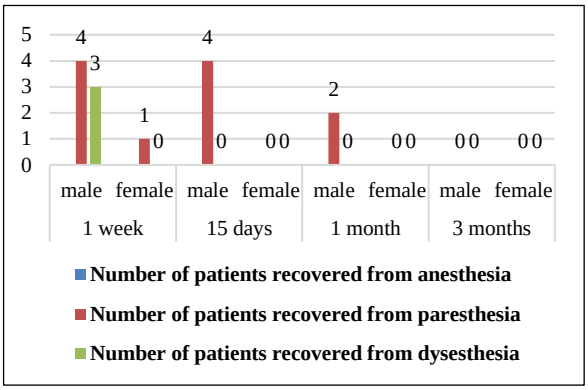


**Figure 8: Number of patients recovered from neurosensory disturbances post-operatively.**

Around the world, different societies show different patterns of facial trauma, and treatment also differs. These differences can be explained by varying economic and social conditions, local behaviour and law. Comparing data from different countries can increase understanding of the facial trauma situation in different regions, allowing treatments to be optimized and improvements in the patients' quality of life.[2,7]

Mandibular fractures can be classified according to the type of fracture, cause of fracture, or the site of the fracture.[2,8] Damage to the inferior alveolar or the mental nerve are the common complication of fractured mandible especially in the parasymphysis, angle and body regions.

In literature, the prevalence of postinjury/pre-treatment IAN deficit has been reported to range from 5.7 to 58.5%.[3,8,10] Mandibular fractures that occurs at the parasymphysis region frequently result in mental nerve injury, which produces anesthesia, paresthesia or dysesthesia of the skin and mucous membrane within the distribution of mental nerve on the side of the fracture may be observed, though usually such condition gradually improves with time.[2-5] In literature incidence of post-traumatic mental nerve injury has been found to be 22.23%.[13]

Etiology of IAN or mental nerve injury may include indirect traumatic injury of nerve bundle, compression by soft tissue edema, or direct nerve involvement within fracture rimes with consequent dislocation, traction, or compression, this nerve injury results in altered neurosensory function.[7]

This altered sensation may be due to primary injury when the mental nerve lies in the fracture line or a secondary insult due to manipulation and fixation of the fracture. As a consequence of mental nerve injury, patients experience subjective disturbances of various intensities, but clinical experience shows that this condition gradually recovers after a certain period of time. Though the primary goal of trauma management is restoration of anatomic form and function, neurosensory deficits cannot be neglected in maxillofacial trauma. For example, teeth anterior to a fracture line can demonstrate disturbed sensitivity. Moreover, Post-traumatic disorders of mental nerve and IAN are troublesome sequelae of facial trauma, often determining a reduced quality of life for patients.[7]

Common complications after ORIF of mandibular fractures include nerve trauma, disturbed wound-healing, infection, malocclusion and non-union. One of the most common postoperative complications after ORIF of mandibular fractures is mental nerve hypoesthesia, which can be of transient or permanent nature. The inferior alveolar nerve (IAN) and the mental nerve is at high risk in these fractures due to the exposition to bony fragments, which can cause compression, straining or tearing of the nerve. Therefore, the continuity of the nerve may be partially or fully injured. Risk factors for posttraumatic mental nerve dysfunction are highly displaced fractures, such as comminuted fractures, and fractures with close proximity to the mental nerve at the parasymphysis region of mandible.

Sixty-seven patients associated with parasymphysis mandibular fracture or along associated with other region fractures operated during the period of Jan'16 to Dec'18 were included in the retrospective study.

In the present study, with respect to number of total number of patients diagnosed with parasymphysis fracture during the period of Janaury'16 to December'18 author found that parasymphysis fracture diagnosed were about approx. one fourth of all the cases operated each year. Author also found that male dominance to be more when compared to female patients. Out of 67 patients diagnosed with parasymphysis fracture, 61 patients were male while the rest 6 patients were female. Average male to female patient ratio were found to be 10:1. Similar scenarios of maximum male patients were recorded every year from Jan'16 to Dec'18, this probably would be as a result of maximum males riding the vehicle.

Results obtained by Schön et al, in their study also observed similar results, where the high incidence of facial trauma in young patients and the male : female ratio of 4 : 1.[15] Similarly results were in accordance with the study by Paolo Boffano et al, where male-to-female ratio of 3.6:1 were recorded and with Bormann et al, where male: female ratio of 2.9:1 was recorded.[16,17]

With regards to number of associated fractures with parasymphysis fracture, it was found that parasymphysis fracture were found to be more associated with other fractures in order of midface>angle>body> and ramus fractures. Schön et al, in their study observed that mandibular angle was the most common site of the fracture in 66% patients.[14] Bormann et al, in their study found that another common fracture site was the combined angle and horizontal ramus, and the angle and parasymphysal region, a typical cause by fist fighting.[16] They also found that, 43% of the fractures were at the mandibular angle. The results of Ellis et al, indicated that condylar fractures were much more common than in angle fractures.[3]

In the present study, age range of patients at the time of injury diagnosed with parasymphysis fracture was evaluated and was found that 21-30 year age group were the first most commonly found followed by 31-40 age group. Riders with young age group were the primary cause for the age group found to be on the lower side. Dainius Razukevicius et al, in their study also found 74.5% patients with mandibular fracture cases age grouped from 11-44.[3] Results obtained by R. Schön et al, was also in accordance with the present study where in 49% of the patients diagnosed with mandibular fracture were age grouped from 20-29 and rest secondly 26% of the patient were age grouped from 30-39.[14]

On retrospectively analysing the present study, etiology in 82% cases of parasymphysis fracture were maximum found out to be road traffic accidents followed by 5.9% case with physical assault and 2.9% cases with occupational hazards. Reason behind majority of RTA cases is solely that the health care service easily accessible and located near to the national highway. R. Schön et al, in their study found that out of 114 cases, 89 case diagnosed with mandibular fracture had history of assault as the prime etiology for the trauma that accounted for 83% of all the fracture.[14] Bede et al, in their study found that out of 52 patients, the injuries were caused by assaults in 16 patients (30.7%), missile injuries in 14 patients (26.9%), and road traffic accidents (RTA) in 12 patients (23%).[17] Whereas Bormann et al, in their study found 32% cases of mandibular fracture were caused as a result of RTA followed by fights in 28% cases, falls in 26% cases.[16]

In the present study, patients diagnosed with mental nerve hypoesthesia or sensory deficit were found out to be 14 (20.8%) out of 67 patients. Etiology of mental nerve injury may include indirect traumatic injury of nerve bundle, compression by soft tissue oedema, or direct nerve involvement within fracture rimes with consequent dislocation, traction, or compression.[7] Posttraumatic disorders of mental nerve are troublesome sequelae of facial trauma. Mental nerve sensory disturbances were defined when a loss or abnormal sensation over its distribution could be found by two-point discrimination test. The non-injured side served as an internal control in two-point discrimination.[10] Patients who reported to have anaesthesia or hypoesthesia

(numbness) of the lower lip region on the affected side were considered to have mental nerve injury.[1] Boffano et al, in their study found that IAN injury, a sensory disturbance of the lower lip was evident in 79 patients (24.3%): 68 males and 11 females.[15] Fifty-one patients had single fractures in the angle region and 28 in the body region.

Bede et al, in their study found that out of 52 patients, IAN injury was evident in 22 patients (42.3%): 17 males and 5 females.[17] de Matos et al, in their retrospective study observed that Sensorial mental nerve dysfunction was the most common transient complication, affecting 28 patients (23%), of whom 11(9%) had this complication on the right side, 11 had it on the left side (9%), and 6 patients (5%) were affected on both sides.[18]

In the present study, number of patients having neurosensory disturbances pre-operatively were evaluated and was found that there were total 8 patients (11.9%) -7 males and 1 female patient had paraesthesia whereas total 3 male patients (4.4%) had dysesthesia thereby making 11 patients (16.4%) who had neurosensory disturbances pre-operatively. Whereas number of patients who had no neurosensory disturbances pre-operatively but had developed during post-operative phase were 3(4.4%).

Number of patients recovered from neurosensory disturbances post-operatively were analysed retrospectively in the present study where out of 14 patients (20.8%) who were diagnosed with neurosensory disturbances, with time 4 males and 1 female patient who had hypoesthesia preoperatively recovered from paraesthesia within a period of 1 week; 3 patients recovered within 15 days, whereas 1 patients who developed paraesthesia post operatively recovered within duration of 15 days and similarly 2 patients recovered within duration of 1 month. Rest 3 male patients who had dysesthesia preoperatively recovered in a period of 1 week. Bede et al in their study found that recovery period for the IAN was within 10 days post-injury in 12 patients (54.4%), 45-50 days postinjury in 4 patients (18%), 70 days in 1 patient (4.5%).[17]

## CONCLUSION

Mandibular fracture is the first or second most common facial bone fracture, occurring twice as frequently as fractures of the midface bones probably due to its prominent and exposed position. The incidence has been found to be about 38% of all facial bone fractures.

Mandibular fractures which occurs at the parasymphysis region frequently results in mental nerve injury. As a consequence of nerve injury, an altered neurosensory function in the form of anesthesia or paresthesia of the skin and mucous membrane within the distribution of mental nerve on the side of fracture may be observed, though usually such condition gradually improves with time.

Etiology of IAN injury may include indirect traumatic injury of nerve bundle, compression by soft tissue oedema, or direct nerve involvement within fracture rimes with consequent dislocation, traction, or compression. Post-traumatic disorders of mental nerve are troublesome sequelae of facial trauma, at times determining a reduced quality of life for patients.

The results obtained in the present study showed that patients with age group 21-30 diagnosed with parasymphysis fracture constituted 25% of all operated case and were found to be more associated with midface and angle fracture. Etiology behind the trauma was mostly as a result of RTA. Neurosensory disturbances as a result of mental nerve injury were found to be associated in 20.89% case, out of which in most of the cases, it gradually recovered within a duration of 7-15 days.

Moreover, further research is still required, to be carried out over a bigger group of patients over a larger time span.

## ACKNOWLEDGEMENTS

Author would like to thank Mrs. Geetha and Mr. Kiran for providing general support by arranging dental chair and trolley for the procedure.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. Ellis E, Moos KF, El-Attar A. Ten years of mandibular fractures: an analysis of 2,137 cases. Oral Surg, Oral Med, Oral Pathol Oral Radiol. 1985;59(2):120-9.
2. Oikarinen VJ, Lindqvist C. The frequency of facial bone fractures in patients with multiple injuries sustained in traffic accidents. Proceedings of the Finn Dent Soci. Suomen Hammaslaakariseuran toimituksia. 1975;71(2):53-7.
3. Razukevicius D. Damage of inferior alveolar nerve in mandible fracture cases. Stomatologija. 2004;6(4):122-25.
4. Dolynchuk KN. Fractures of the Facial Skeleton. Can J Surg. 2001 Aug;44(4):304.
5. hacon GE, Larsen PE. Principles of management of mandibular fractures. In: Miloro M, Ghali GE, Larsen PE, Waite PD, editors. Peterson's Principles of Oral and Maxillofacial Surgery. 2nd ed. Hamilton, Ontario: BC Decker Inc; 2004:401-433.
6. Kelly DE, Harrigan WF. A survey of facial fractures: Bellevue Hospital, 1948-1974. J Oral Surg (Am Dent Assoc: 1965). 1975;33(2):146.
7. Patrocinio LG, Patrocinio JA, Borba BHC, Bonatti BS, Pinto LF, Vieira V, et al. Mandibular fracture:

analysis of 293 patients treated in the hospital of clinics, Federal University of Uberlandia. Rev Bras Otorrinolaringol. 2005: 71:560-65.
8. Brasileiro BF, Passeri LA. Epidemiological analysis of maxillofacial fractures in Brazil: a 5-year prospective study. Oral Surg, Oral Med, Oral Pathol, Oral Radiol, Endodontol. 2006;102(1):28-34.
9. Horibe EK, Pereira MD, Ferreira LM, Andrade Filho EF, Nogueira A. Perfil epidemiológico de fraturas mandibulares tratadas na Universidade Federal de São Paulo-Escola Paulista Medicina. Rev Assoc Med Bras. 2004;50(4):417-21.
10. Naude GP, Bongard FS, Demetriades D. Trauma Secrets. 1st ed. Philadelphia: Hanley and Belfus; 1999:53-59.
11. Thurmuller P. Nerve injuries associated with facial trauma: natural history, management, and outcomes of repair. Oral Maxillofacial Surg Clini North Am. 2001;13:287-93.
12. Marchena JM, Padwa BL, Kaban LB. Sensory abnormalities associated with mandibular fractures: incidence and natural history. J Oral Maxillofacial Surg. 1998;56(7):822-5.
13. Basra BK, Goyal R, Sachde JP, Amin H, Prajapati C, Agrawal A, et al. Study of mental nerve injury in cases of fractured mandible. J Maxillofacial Trauma 2014;3(3):53-9.
14. Schön R, Roveda SI, Carter B. Mandibular fractures in Townsville, Australia: incidence, aetiology andtreatment using the 2.0 AO/ASIF miniplate system. British J Oral Maxillofacial Surg. 2001;39(2):145-8.
15. 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. Craniomaxillofac Trauma Reconstr. 2014;7(04):280-3.
16. Bormann KH, Wild S, Gellrich NC, Kokemüller H, Stühmer C, Schmelzeisen R, Schön R. Five-year retrospective study of mandibular fractures in Freiburg, Germany: incidence, etiology, treatment, and complications. J Oral Maxillofac Surg. 2009;67(6):1251-5.
17. Bede SY, Ismael WK, Al-Assaf DA, Omer SS. Inferior alveolar nerve injuries associated with mandibular fractures. J Craniofac Surg. 2012;23(6):1776-8.
18. De Matos FP, Arnez MF, Sverzut CE, Trivellato AE. A retrospective study of mandibular fracture in a 40-month period. Intern J Oral Maxillofac Surg. 2010;39(1):10-5.

**Cite this article as:** Shah NS, Panchal KV, Agrawal P. Prevalence of mental nerve injury in facial fractures: a 3 year retrospective study. Int J Res Med Sci 2019;7:4578-84.