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The “European Mandibular Angle” research project: the epidemiological results from a multicenter European collaboration.

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TITLE: The “European Mandibular Angle” research project: the epidemiological results from a multicenter European collaboration.

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Introduction: The aim of this study was to analyze the demographics, causes and characteristics of mandibular angle fractures managed at several European departments of maxillofacial surgery.

Methods: This study is based on a multicenter systematic database that allowed the recording of all patients with mandibular angle fractures between 1st January 2013 and 31st December 2017. The following data were recorded: gender, age, etiology, side of angle fracture, associated mandibular fractures, presence of third molar, intermaxillary fixation, osteosynthesis.

Results: 1162 patients (1045 males, 117 females) were included in the study. A significant association was found between the presence of a third molar and the diagnosis of an isolated angle fracture ($p < .0000005$). Furthermore, assaults were associated with the presence of voluptuary habits ($p < .00005$), a younger mean age ($p < .00000005$), male gender ($p < .00000005$), and left angle fractures ($p < .00000005$).

Conclusions: Assaults and falls actually represent the most frequent causes of angle fractures. The presence of third molars may let the force completely disperse during the determination of the angle fracture, finding a point of weakness.

Keywords: angle fracture; mandible; mandibular fracture; treatment; epidemiology.

INTRODUCTION

Mandibular angle is particularly susceptible for injury because of its experience of a complex convergence of torsional and shear force, and its direct proximity to the third molar tooth adding another risk when tooth impaction occurs.¹⁻³¹

In fact, about 12–30% of all mandibular fractures are fractures of the mandibular angle, that are some of the most frequently involved site of the mandible.²⁻⁶

Although there is widespread agreement regarding the need for surgical reduction and fixation of a mandibular angle fracture, several different treatment options have been described, ranging from the Champy technique to 3D strut plates.⁶⁻⁷

As aforementioned, an important role seems to be played by third molars because the mandibular angle forms the transition between the mandibular body and the ascending ramus, where unerupted or partially erupted third molars are usually nested. Such teeth affect the local distribution of traumatic forces, which might render the region more susceptible to fractures. It has been reported that the presence of a lower third molar makes the mandibular angle 2 to 3 times more likely to fracture.⁶⁻⁷

Therefore, several European centres that had already shown research experience in maxillofacial trauma decided to collaborate on a research project about mandibular angle fracture epidemiology in Europe.⁸⁻²⁶

The aim of this study was to analyze the demographics, causes and characteristics of mandibular angle fractures managed at several European departments of oral and maxillofacial surgery. The results of this collaboration in a multicenter study on maxillofacial trauma epidemiology over a five-year period are presented here.

MATERIAL AND METHODS

The present study was conducted at several European departments of oral and maxillofacial

surgery: the Division of Maxillofacial Surgery at the University of Eastern Piedmont (Novara, Italy); the Department of Oral and Maxillofacial Surgery/Pathology at the VU University Medical Center and Academic Centre for Dentistry Amsterdam (Amsterdam, The Netherlands); the Department of Maxillofacial Surgery at the University Hospital Dubrava (Zagreb, Croatia); the Clinic of Maxillofacial Surgery of the School of Dentistry at the University of Belgrade (Belgrade, Serbia); the Department of Maxillofacial Surgery at the Medical University (Plovdiv, Bulgaria); the Department for Oral and Maxillofacial Surgery at the Bogomolets National Medical University (Kiev, Ukraine); and the Service de Stomatologie et Chirurgie Maxillo-faciale at the Chu de Nantes (Nantes, France). This study is based on a systematic computer-assisted database that allowed the recording of all patients hospitalized with mandibular angle fractures in the involved maxillofacial surgical units across Europe, between 1st January 2013 and 31st December 2017. Criteria of inclusion were the following: unilateral fracture of mandibular angle (alone or associated with other mandibular fractures), absence of further maxillofacial fractures, performance of hospital treatment. The following data were recorded for each patient: gender, age, personal medical history, etiology, side of angle fracture, associated mandibular fractures, presence of third molar (impacted or not impacted) in the angle fracture line, type of performed intermaxillary fixation (IMF screws, arch bars, other), type of osteosynthesis technique (Champy technique, 2 miniplates, superior lateral border, inferior border, reconstruction plate, Kirschner wire, other).

The following categories of cause of injury were considered: fall, motor vehicle accident (MVA), assault, sport injury, work injury, and other cause. Mandibular fractures were determined from computed tomography scans at admission to hospital and classified as fractures of the symphysis, parasymphysis, body, angle, ramus, coronoid, condyle. Patient characteristics were analysed using descriptive statistics. Statistical analysis was used to search for associations among multiple variables. Statistical significance was determined using the χ^2 or Fisher exact test, if the sample sizes were too small. Statistical significance was set at .05. We followed Helsinki Declaration guidelines, according to local laws. IRB exempt as a retrospective study according to local

institution.

RESULTS

On the whole, 1162 patients (1045 males, 117 females) met the inclusion criteria during the study period (2013-2017) and were included in the study. The 89.9% of patients were males, whereas the 10.1% were females, with a male to female ratio of 8.9:1. Mean age was 31.2 years (median, 28; standard deviation, 13.7; range, 4 – 95). Within the study sample, 678 left angle fractures and 484 right angle fractures were observed.

Most patients (705 patients, 60.7%) did not report any voluptuary habit, whereas the remaining 457 reported smoke, alcohol and/or drug use, as shown in Table 1 and Figure 1. A statistically significant association was found between male gender and voluptuary habits ($p < .05$; OR 1.67; IC 95% 1.10 – 2.54).

As for etiology, the most frequent cause of injury was assault with 706 patients, followed by falls (240 patients), MVAs (80 patients), sport accidents (78 patients), work accidents (7 patients), and other causes (51 patients) (Figure 2).

The most frequent associated mandibular fracture, in addition to angle fracture, was body fracture (347 patients), followed by parasymphyseal fracture (96 patients). In 489 patients, no associated mandibular fracture was present in addition to the angle fracture (Table 2).

Third molar was present in angle fracture line in 623 patients (53.6%) out of 1162. Table 3 shows the relationship between the presence of third molar in angle fracture line and the presence of an isolated or associated angle fracture. A statistically significant association was found between the presence of a third molar in angle fracture line and the diagnosis of an isolated angle fracture without any further associated injury ($p < .0000005$; OR 2.57; IC 95% 2.02 – 3.28). Instead, no statistically significant association was found between the presence of an impacted or a not impacted third molars and an isolated angle fracture (Table 4).

The most frequently adopted technique of intermaxillary fixation is arch bars (79% of cases)

(Figure 3).

As for surgical technique, the Champy technique was the most frequently chosen (44%), followed by 2 plates technique (32%), and by superior lateral border plating (15%) (Figure 4).

Table 5 resumes the relationships between etiology, voluptuary habits, age, gender, and side of fracture. Statistical analyses pointed out that assaults were associated with the presence of voluptuary habits ($p < .00005$), with a younger mean age ($p < .00000005$), with male gender ($p < .00000005$), and with left angle fractures ($p < .00000005$). Statistically significant associations were found between falls and higher mean age ($p < .00005$), and between falls and female gender ($p < .00000005$).

DISCUSSION

The main purpose of the treatment of mandibular fractures is the restoration of occlusion and the healing of the fractured segments. Rigid fixation can be used to meet these goals in the management of mandibular angle fractures, with a high success rate.¹⁻⁶ Therefore, a thorough knowledge of the epidemiology and characteristics of angle fractures is crucial and preparatory for an appropriate management of such challenging fractures.

As frequently shown in maxillofacial trauma research, males outnumbered females with a male to female ratio of 8.9:1. Mean age was 31.2 years and left-side angle fractures predominated, in agreement with previous articles.¹⁻³

Assaults confirmed to be the most frequent etiological factor for maxillofacial trauma all across Europe nowadays, followed by falls probably due to the ageing of European population. Rather predictably, patients who were victims of assaults often reported voluptuary habits such as alcohol consumption, with a statistically significant association.

Then a significant association was found between male gender and the etiological factors “assaults” and “falls”. Curiously, left angle fractures resulted to be associated with assaults: the only possible

hypothesis could be represented by the fact that most people are right-handed, so that most fists and aggression could come from right-handed people that hit the left side of the victims. Although this could just be a pure and mere speculation.

The most frequent associated mandibular fracture, in addition to angle fracture, was body fracture, followed by parasymphyseal fracture. Often, such fractures represent a further point of dispersion of the forces that were responsible for the angle fracture too.

Just about half of patients with angle fractures had a third molar in the angle fracture line. Of course, our data do not allow to draw any conclusion about the possible relationship about the presence of third molar and the incidence of angle or condyle fractures,^{7,8,28} because condylar fractures were not the object of our study. Nevertheless, a statistically significant association was found between the presence of a third molar in angle fracture lines and the diagnosis of an isolated angle fracture without any further associated fracture, whereas no statistically significant association was found between the presence of an impacted or a not impacted third molars and an isolated angle fracture. These results could help us to hypothesize that, when there is a third molar, the force can completely disperse during the determination of the angle fracture, finding a point of weakness, no matter if the involved tooth is impacted or not.

In fact, as the mandibular angle forms the transition between the mandibular body and the ascending ramus, a point of weakness in such resistance lines transition area could represent an important point of force dispersion. Consequently, the impact force might not have sufficient strength to determine further fractures.

As for treatment, the Champy technique was the most frequently chosen in almost half of cases, thus confirming the widespread diffusion of the validity of Champy theories, followed by 2 plates technique, and by superior lateral border plating. In the last years, a great debate is going on about the best internal fixation technique for angle fractures with several analyses and comparisons of complications, costs, and benefits of the different techniques. However, the focus of this first article of the “Mandibular Angle” research project is not centered on the analysis of complications of the

different techniques that would need a more homogeneous study population (for example involving just isolated angle fractures).

In conclusion, our study confirmed the epidemiological trends as for etiology, with assaults and falls representing the most frequent causes of angle fractures. The presence of third molars may let the force completely disperse during the determination of the angle fracture, finding a point of weakness, no matter if the involved tooth is impacted or not. Further multicenter studies are needed to deepen the knowledge of the epidemiology and mechanisms of angle fractures.

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REFERENCES:

1. El-Anwar MW, Sweed AH. Simple Percutaneous Transbuccal Approach for Management of Mandibular Angular Fracture. **J Craniofac Surg.** 2017 Jun;28(4):1035-1037.
2. Boffano P, Roccia F, Zavatiero E, Dediol E, Uglešić V, Kovačić Ž, Vesnaver A, Konstantinović VS, Petrović M, Stephens J, Kanzaria A, Bhatti N, Holmes S, Pechalova PF, Bakardjiev AG, Malanchuk VA, Kopchak AV, Galteland P, Mjøen E, Skjelbred P,

- Koudougou C, Mouallem G, Corre P, Løes S, Lekven N, Laverick S, Gordon P, Tamme T, Akermann S, Karagozoglou KH, Kommers SC, Forouzanfar T. European Maxillofacial Trauma (**EURMAT**) project: a multicentre and prospective study. **J Craniomaxillofac Surg**. 2015 Jan;43(1):62-70.
3. Amarista Rojas FJ, Bordoy Soto MA, Cachazo M, Dopazo JR, Vélez H. The epidemiology of mandibular fractures in Caracas, Venezuela: Incidence and its combination patterns. **Dent Traumatol**. 2017 Dec;33(6):427-432.
 4. Morris C, Bebeau NP, Brockhoff H, Tandon R, Tiwana P. **Mandibular fractures**: an analysis of the **epidemiology** and patterns of injury in 4,143 **fractures**. **J Oral Maxillofac Surg**. 2015 May;73(5):951.e1-951.e12.
 5. Afrooz PN, Bykowski MR, James IB, Daniali LN, Clavijo-Alvarez JA. The **Epidemiology** of **Mandibular Fractures** in the United States, Part 1: A Review of 13,142 Cases from the US National Trauma Data Bank. **J Oral Maxillofac Surg**. 2015 Dec;73(12):2361-6.
 6. Al-Moraissi EA, El-Sharkawy TM, El-Ghareeb TI, Chrcanovic BR. **Three-dimensional versus standard miniplate fixation** in the **management** of **mandibular angle fractures**: a **systematic review** and **meta-analysis**. **Int J Oral Maxillofac Surg**. 2014 Jun;43(6):708-16.
 7. Ruela WS, de Almeida VL, Lima-Rivera LM, Santos PL, Porporatti AL, de Freitas PHL, Paranhos LR. Does an **Association Exist** Between the **Presence of Lower Third Molar** and **Mandibular Angle Fractures?**: A **Meta-Analysis**. **J Oral Maxillofac Surg**. 2018 Jan;76(1):34-45.
 8. Bakardjiev A, Pechalova P. Maxillofacial fractures in Southern Bulgaria - a retrospective study of 1706 cases. **J Craniomaxillofac Surg**. 2007 Apr;35(3):147-50.
 9. Tabaković SZ, Konstantinović VS, Radosavljević R, Movrin D, Hadžistević M, Hatab N. Application of Computer-Aided Designing and Rapid Prototyping Technologies in

- Reconstruction of Blowout Fractures of the Orbital Floor. **J Craniofac Surg.** 2015 Jul;26(5):1558-63.
10. Kokemueller H, Konstantinovic VS, Barth EL, Goldhahn S, von See C, Tavassol F, Essig H, Gellrich NC. Endoscope-assisted transoral reduction and internal fixation versus closed treatment of mandibular condylar process fractures--a prospective double-center study. **J Oral Maxillofac Surg.** 2012 Feb;70(2):384-95
11. Konstantinović VS, Puzović D, Anićić B, Jelovac DB. Epidemiological, clinical, and forensic aspects of chainsaw, circular saw, and grinding saw injuries in the maxillofacial region. **J Craniofac Surg.** 2010 Jul;21(4):1029-32.
12. Merlet FL, Grimaud F, Pace R, Mercier JM, Poisson M, Pare A, Corre P. Outcomes of functional treatment versus open reduction and internal fixation of condylar mandibular fracture with articular impact: A retrospective study of 83 adults. **J Stomatol Oral Maxillofac Surg.** 2018 Feb;119(1):8-15.
13. Boffano P, Corre P, Righi S. The Role of Intra-articular Surgery in the Management of Mandibular Condylar Head Fractures. **Atlas Oral Maxillofac Surg Clin North Am.** 2017 Mar;25(1):25-34.
14. Corre P, Arzul L, Khonsari RH, Mercier J. Facial trauma and multiple trauma. **Soins.** 2013 Sep;(778):43-5.
15. Malanchuk VO, Kopchak AV. Risk factors for development of infection in patients with mandibular fractures located in the tooth-bearing area. **J Craniomaxillofac Surg.** 2007 Jan;35(1):57-62.
16. Dediol E. The role of three-dimensional computed tomography in evaluating facial trauma. **Plast Reconstr Surg.** 2012 Feb;129(2):354e-355e
17. Bins A, Oomens MA, Boffano P, Forouzanfar T. Is There Enough Evidence to Regularly Apply Bone Screws for Intermaxillary Fixation in Mandibular Fractures? **J Oral Maxillofac Surg.** 2015 Oct;73(10):1963-9.

18. Salentijn EG, Peerdeman SM, Boffano P, van den Bergh B, Forouzanfar T. A ten-year analysis of the traumatic maxillofacial and brain injury patient in Amsterdam: incidence and aetiology. **J Craniomaxillofac Surg.** 2014 Sep;42(6):705-10.
19. Salentijn EG, Collin JD, Boffano P, Forouzanfar T. A ten year analysis of the traumatic maxillofacial and brain injury patient in Amsterdam: complications and treatment. **J Craniomaxillofac Surg.** 2014 Dec;42(8):1717-22.
20. Brucoli M, Boccafoschi F, Boffano P, Broccardo E, Benech A. The Anatomage Table and the placement of titanium mesh for the management of orbital floor fractures. **Oral Surg Oral Med Oral Pathol Oral Radiol.** 2018 May 2. pii: S2212-4403(18)30923-4. doi: 10.1016/j.oooo.2018.04.006. [Epub ahead of print]
21. Brucoli M, Boffano P, Magnano M, Mistretta R, Benech R, Benech A. The management of a high-risk patient with edentulous mandibular fractures. *Otorinolaringologia.* Accepted, in Press. DOI: 10.23736/S0392-6621.18.02174-4
22. Brucoli M, Nestola DF, Baragiotta N, Boffano P, Benech A. Maxillofacial fractures: epidemiological analysis of a single centre experience. *Otorinolaringologia.* Accepted, in Press. DOI: 10.23736/S0392-6621.18.02185-9
23. Arcuri F, Brucoli M, Grivetto F, Benech A. Mandibular symphyseal fracture simulated by a foreign body in the chin. **J Craniofac Surg.** 2012 Mar;23(2):e91-3.
24. Brucoli M, Stecco A, Iaquina C, Carriero A, Benech A. Diagnosis and treatment of orbit posttraumatic subperiosteal hemorrhage in a child, associated with a subdural intracranial hemorrhage. **J Craniofac Surg.** 2005 May;16(3):407-10.
25. Saponaro A, Stecco A, Brucoli M, Armienti F, Stellin L, Favano F, Benech A, Carriero A. Magnetic resonance imaging in the postsurgical evaluation of patients with mandibular condyle fractures treated using the transparotid approach: our experience. **J Oral Maxillofac Surg.** 2009 Sep;67(9):1815-20.

26. Ruslin M, Boffano P, ten Brincke YJ, Forouzanfar T, Brand HS. Sport-Related Maxillo-Facial Fractures. *J Craniofac Surg.* 2016 Jan;27(1):e91-4.
27. Kommers SC, Boffano P, Forouzanfar T. Consensus or controversy? The classification and treatment decision-making by 491 maxillofacial surgeons from around the world in three cases of a unilateral mandibular condyle fracture. *J Craniomaxillofac Surg.* 2015 Dec;43(10):1952-60.
28. Bins A, Oomens MA, Boffano P, Forouzanfar T. Is There Enough Evidence to Regularly Apply Bone Screws for Intermaxillary Fixation in Mandibular Fractures? *J Oral Maxillofac Surg.* 2015 Oct;73(10):1963-9.
29. Ruslin M, Wolff J, Boffano P, Brand HS, Forouzanfar T. Dental trauma in association with maxillofacial fractures: an epidemiological study. *Dent Traumatol.* 2015 Aug;31(4):318-23
30. Elsayed SA, Mohamed FI, Khalifa GA. Clinical outcomes of three different types of hardware for the treatment of mandibular angle fractures: a comparative retrospective study. *Int J Oral Maxillofac Surg.* 2015 Oct;44(10):1260-7.
31. Duarte BG, Assis D, Ribeiro-Júnior P, Gonçalves ES. Does the Relationship between Retained Mandibular Third Molar and Mandibular Angle Fracture Exist? An Assessment of Three Possible Causes. ***Craniomaxillofac Trauma Reconstr.*** 2012 Sep;5(3):127-36.

LEGENDS:

Figure 1: Voluptuary habits within the study population (pink, females; blue, males)

Figure 2: Aetiological factors within the study population.

Figure 3: Percentages of maxillomandibular fixation adopted techniques.

Figure 4: Percentages of plating adopted techniques.

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Table 1: Voluptuary habits within the study population

	Population	Males	Females	M:F ratio
smoke	228	210	18	11,7:1
alcohol	119	110	9	12,2:1
drug	6	6	0	
alcohol + smoke	91	84	7	12:1
alcohol + drug	3	3	0	
alcohol + smoke + drug	10	10	0	
no voluptuary habit	705	622	83	7,5:1
Total	1162	1045	117	

Table 2: Presence of associated mandibular fractures in addition to angle fracture

Associated mandibular fracture	N
body	347
parasymphysis	96
condyle	72
symphysis	67
ramus	16
combination of multiple mandibular sites	75
no associated fractures	489
Total	1162

Table 3: Relationship between the presence of third molar in angle fracture line and the presence of an isolated or associated angle fracture

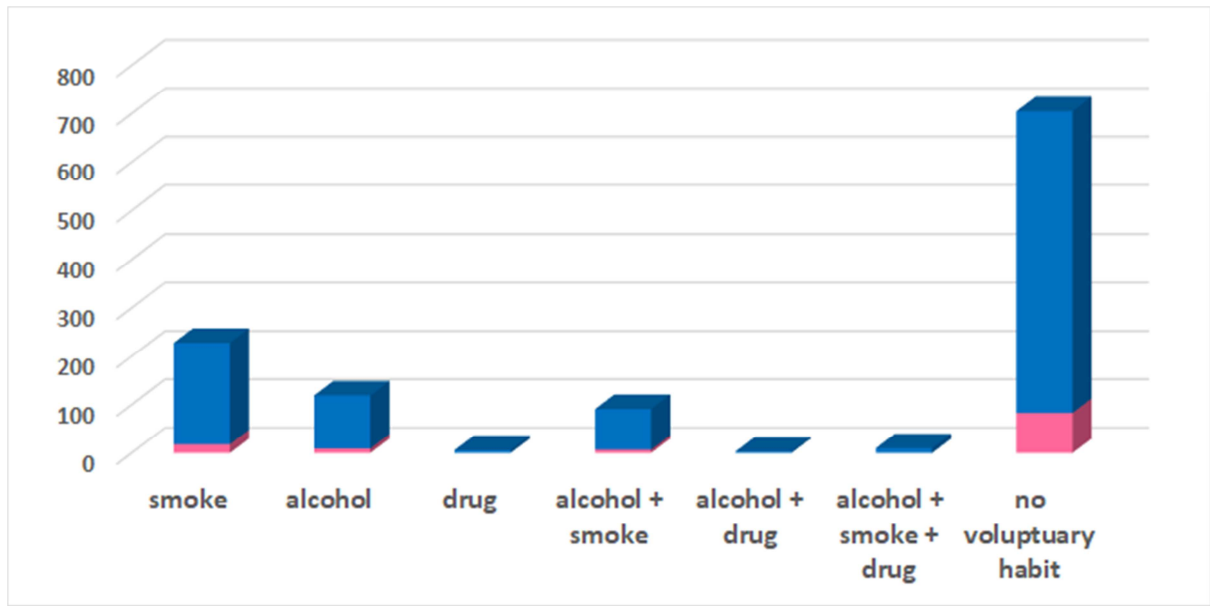
	Presence of associated mandibular fracture/s	Isolated angle fracture	Total
Third molar Present	296	327	623
Absent	377	162	539

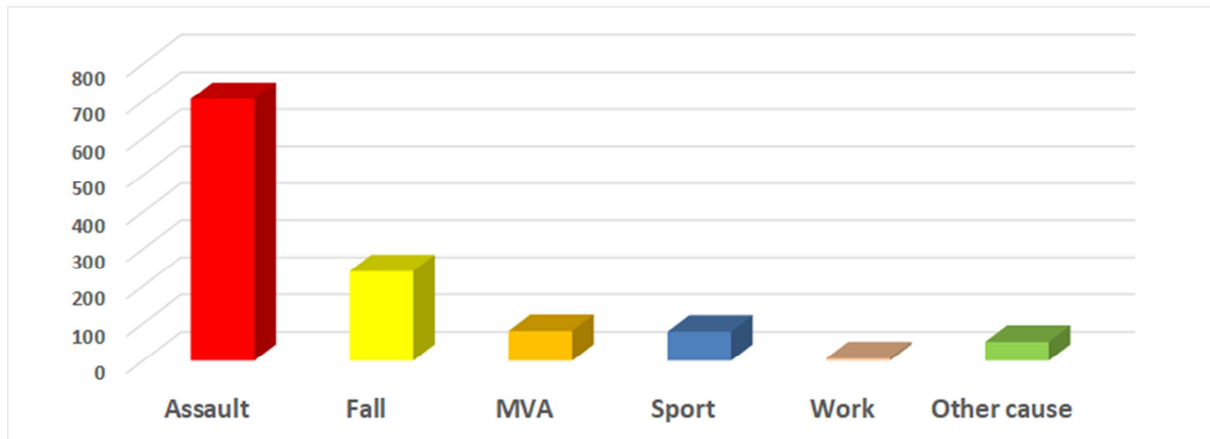
Table 4: Relationship between the presence of an impacted or a not impacted third molars and an isolated angle fracture

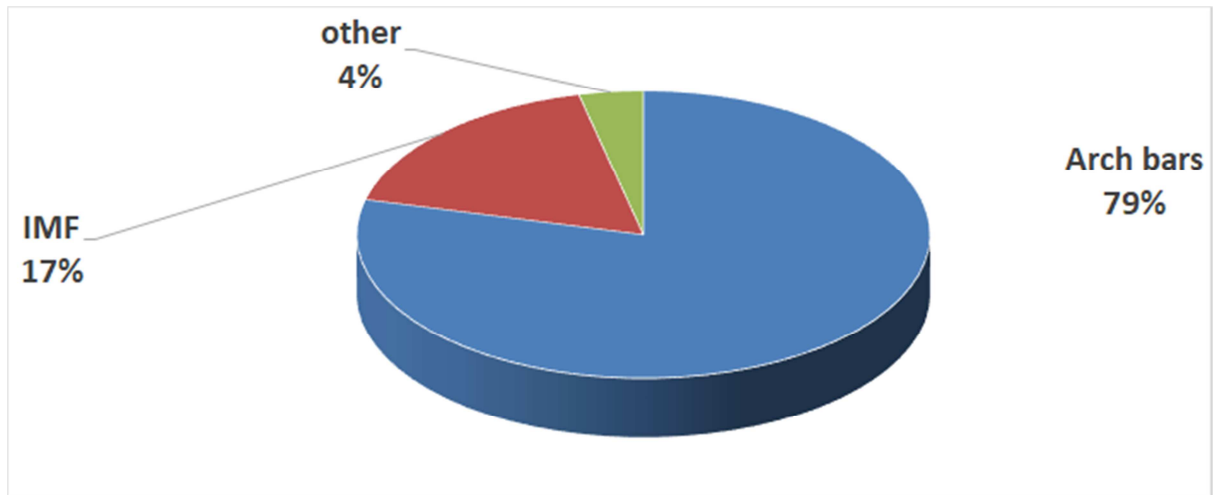
	Presence of associated mandibular fracture/s	Isolated angle fracture	Total
impacted	118	145	263
Not impacted	178	182	360

Table 5: Relationships between etiology, voluptuary habits, age, gender, and side of fracture within the study population

Etiology		Voluptuary habits	No voluptuary habits		Mean age		Males	Females	
Assault	706	314	392	p < .00005	29,1	p < .00000005	665	41	p < .0000
Fall	240	89	151	p > .05	36,7	p < .00005	184	56	p < .0000
MVA	80	29	51	p > .05	32,5	p > .05	70	10	∩∩
Sport	78	8	70	p > .05	24,8	p > .05	75	3	∩∩
Work	7	1	6	p > .05	49,2	∩∩	7	0	∩∩
Other cause	51	17	34	p > .05	39,5	∩∩	44	7	∩∩







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