Król Mateusz, Sieradzki Paweł, Komisarek Oskar. Epidemiology of mandibular fractures - frequency and trauma pattern comparison in seventies of twentieth century with modern times (2002-2012). Journal of Education, Health and Sport. 2019;9(8):835-842. eISSN 2391-8306. DOI http://dx.doi.org/10.5281/zenodo.3408147
http://ojs.ukw.edu.pl/index.php/johs/article/view/7250

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 05.07.2019. Revised: 25.07.2019. Accepted: 18.08.2019.

Epidemiologia złamań żuchwy - Porównanie częstości występowania oraz modelu urazu w latach 70. XX wieku z czasami teraźniejszymi (2002-2012)

Epidemiology of mandibular fractures - frequency and trauma pattern comparison in seventies of twentieth century with modern times (2002-2012)

Mateusz Król[1], Paweł Sieradzki[1], Oskar Komisarek[2]

[1]Studenckie Koło Naukowe Chirurgii Szczękowo-Twarzowej i Ortognatycznej Uniwersytet Medyczny w Poznaniu
[1]Students Scientific Society Maxillofacial and Orthognathic Surgery, University of Medical Sciences, Poznań, Poland

[2]Katedra i Klinika Ortopedii Szczękowej i Ortodoncji Uniwersytetu Medycznego w Poznaniu
[2]Department of Maxillofacial Orthopaedics and Orthodontics, Poznan University of Medical Sciences

Contact: lek. dent. Oskar Komisarek Bukowska 70, Katedra i Klinika Ortopedii Szczękowej i Ortodoncji UMP, oskarkomisarek@ump.edu.pl, +48784762591

ABSTRAKT

Wstęp: Złamania żuchwy tworzą grupę jednych z najpowszechniejszych urazów z jakimi muszą mierzyć się chirurdzy szczękowo-twarzowi w praktyce klinicznej.
Cel: Niniejsza praca ma na celu analizę epidemiologii złamań żuchwy wśród pacjentów leczonych w Klinice Chirurgii Szczękowo-twarzowej UM w Poznaniu w latach 2002-2012 i porównanie wyników z danymi z lat 1961-1974.

Materiały i metody badań: Praca została oparta o dokumentację medyczną pacjentów leczonych w Klinice Chirurgii Szczękowo-twarzowej z urazami żuchwy w latach 2002-2012. Zgromadzone dane dotyczyły 1990 przypadków, lecz tylko 1701 posiadało dostatecznie wyczerpujący opis, aby wykorzystać je w opracowywaniu wyników. Populację pacjentów podzielono wg płci i wieku z granicą na 16 roku życia. Na podstawie tych danych obliczono ilość złamań pojedynczych, wieloodłamowych, rozkład procentowy urazów pomiędzy struktury anatomiczne żuchwy, częstotliwość występowania urazów w zależności od wieku pacjenta i pory roku. Uzyskane wyniki następnie porównano z publikacją dotyczącą pacjentów z lat 1961-1974.
Wyniki: Populację 1701 stanowiło 1426 mężczyzn, 235 kobiet, 40 dzieci do lat 16 (25 chłopców i 15 dziewcząt). Stosunek mężczyzn do kobiet wyniósł 6,13:1. Szczyt występowania urazów żuchwy przypadał na przedział o 20 do 30 roku życia, niezależnie od płci. Średnio rocznie w okresie 2002-2012 hospitalizowano 199 pacjentów (włącznie z przypadkami o niewystarczającym opisie). W okresie od kwietnia do września dochodziło do największej ilości hospitalizacji z powodu urazu żuchwy w latach 2002-2012. Od 2002 do 2012 doszło do 1864 złamań pojedynczych struktur anatomicznych żuchwy. Najczęściej urazowi ulegały: trzon żuchwy (783), lewy kąt żuchwy (274), kłykieć prawy (241), lewy (239) oraz prawy kąt żuchwy (195). 895 (52,62%) przypadków miało charakter złamania pojedynczego, a 806 (47,38%) wielokrotnego. Współcześnie w stosunku do lat 1961-1974 zauważono zwiększenie średniej rocznej liczby pacjentów z urazem żuchwy, zmniejszenie stosunku mężczyzn do kobiet, stosunek szans na złamanie pojedyncze do szans na złamanie wieloodłamowe jest bliski jedności, zaistnienie lewego kąta żuchwy w puli struktur z największym prawdopodobieństwem na złamanie.

Słowa kluczowe: złamania żuchwy, traumatologia twarzowo-szczękowa, epidemiologia urazów żuchwy

ABSTRACT

Introduction: Mandibular fractures are a group of most common trauma with which maxillofacial surgeons have to deal in their clinical practice.
Aim of the study: Analysis of mandibular fractures epidemiology in the group of patients treated in the Clinic of Maxillofacial Surgery at Poznan University of Medical Science between 2002 and 2012 and comparison of results with data from the period 1961-1974.
Material and methods: Material consisted of medical documentation of patients treated in the Clinic of Maxillofacial Surgery in Poznan due to mandibular fractures between 2002 and 2012. 1990 patients experienced mandibular trauma but only 1701 cases were described precisely enough to take part in the analysis. The population of patients were divided by sex and age (16th year of life was the border of the divide). Using this data, the amount of single and multi-fragmental fractures, percentage distribution of fractures among anatomical structures of the mandible, frequency of fractures in age groups and seasons of the year were calculated. Then, results were compared with a publication about the epidemiology of mandibular fractures between 1961-1974.
Results: The population of 1701 patients consisted of 1426 males, 235 females and 40 children up to 16 years old (25 boys and 15 girls). Male to female ratio was 6,13:1. Most fractures affected patients at an age between 20 and 30 years old, regardless of sex. On average, 199 hospitalization due to mandibular fractures a year had a place in a period of 2002-2012 (involving all cases). Most of the hospitalizations due to mandibular fractures occurred between April and September. From 2002 to 2012, 1864 anatomical structures were broken. Body (783), left angle (274), right condyle (241), left condyle (239) and right angle (195) were structures that were fractured most often. 895 (52,62%) cases were

single fractures , 806 (47,38%) were multi-fragmental fractures. The greater the average amount of patients a year, the reduction of male to female ratio, single fractures to multi-fragmental fractures ratio is about 1:1, left angle in the group of most frequently fractured structures are the main differences between period 1961-1974 and 2002-2012.
Conclusion: Analysis indicates that the epidemiology of mandibular fractures is a complex problem. Some elements are constant but other changes dynamically across time. In the opinion of abroad scientists, the development of technology, motorization, and changes in human behavior are the main reasons for such evolution.

Key words: mandibular fractures, maxillo-facial traumatology, epidemiology of mandibular trauma

INTRODUCTION

Mandibular fractures are the most common group of trauma being treated by maxillofacial surgeons in their clinical practice. Numerous researches show that mandible is the most frequently injured structure of viscerocranium. In some study groups, only zygomatic bone is fractured more often. [1][2][3]
Mandibular trauma is a serious medical problem - it may disrupt proper chewing, speaking, breathing, it may cause paraesthesia, infection, and changes in facial aesthetics.[4]
Epidemiological researches indicate on significant differentiation of the problem, depending on sex, age, trauma etiology, and fractured mandible area. Numerous researches show that a statistic patient is a young (18-39 years of life), male (male to the female ratio from 2:1 to 5:1). Mandibular fractures' anatomy is difficult to standardize- anatomy may differ in some study groups. Reasons for mandibular trauma are various across the world.[5][6][7][8]In Poland, physical violence and road accidents.[9]
Mandibular fractures are a severe medical problem, it is the reason why epidemiological researches should be carried out because they will help to estimate medical needs, provide appropriate access to treatment for patients and prepare prophylaxis for the future times (e.g. changes in legislation, implementation of safety measures, etc.)
The purpose of the publication is analysis of mandibular fractures epidemiology in the group of patients being treated in Maxillofacial Surgery Clinic of Poznań University of Medical Science and comparison of present and past data (period of 1961-1974).

MATERIALS AND METHODS

This scientific work is based on medical documentation analysis of PUMS Maxillofacial Surgery Clinics from the period 2002-2012. Then, present data (2002-2012) was compared to epidemiological data from the publication of PUMS Maxillofacial Surgery Clinic released in 1977.[10] Patients were divided into 4 groups by sex and age: adult female, adult male, boys under sixteen and girls under sixteen. For scientific purposes, we have created a medical database that is composed of 1990 medical histories. However, only 1701 medical histories were enough precise to be used as research material. Based on those medical histories, several single and multi-fragmental fractures, anatomical distribution of fractures and frequency of trauma in study groups and seasons were calculated.

RESULTS

Group of 1701 patients consists of 1426 male, 235 female, 25 boys and 15 girls under 16th year of life. Male to female ratio is 6,13:1. Using all 1990 medical histories, on average, Clinic has treated 199 patients with mandibular fractures a year. In gathered data, 1864 of individual mandible structures were fractured. In general, the most frequently fractured structures were: body (783), left angle (274), right condylar process (241), left condylar process (239) and right angle (195). 895 patients (52,62%) out of 1701 cases had a

single fracture, 806 patients (47,38%) out of 1701 cases had multi-fragmental fractures. [Table I, II].

In the male group, the average patient was 32 years old (± 13 years). 691 cases (42,08%) were diagnosed as multi-fragmental fractures. In the male group, 1642 is the number of individual mandibular fractures. The most frequently fractured locations were: body (648), left angle (251), right condylar process (190), left condylar process (183).

In the female group, the average age of the patient was 38 years (± 19 years). 255 is the number of individual fractured mandibular structures. 105 cases (41,18%) were described as multi-fragmental mandibular trauma. Among female patients, the most commonly fractured areas were: body (123), left condylar process (44), right condylar process (41) and left angle of the mandible.

In the group of male patients under sixteen, the average age of the patient was 12 years (± 3 years). In this group, 24 individual mandibular fractures were diagnosed. 5 cases (20,83%) were described as multi-fragmental fractures. Among male patients under sixteen, Most frequently structures affected by trauma were: left condylar process (6), body (5), right condylar process (3).

The average age, in a group of female patients under sixteen, was 8 years (± 4 years). In this group, there were 17 individual mandibular structures fractured. 5 cases (29,41%) were diagnosed as multi-fragmental trauma. Among female patients under sixteen, the most commonly fractured areas were: body (5), left condylar process (6) and right condylar process (5).

Regardless of patients' sex, distribution of cases has its peak between the twentieth and thirtieth year of life. [Graphs 1, 2]

The modern model patient is a male (6:1 male to female ratio), is an example of a single fracture case (1,21:1 single to multi-fragmental fractures ratio), with a fractured body, left angle or condylar process of the mandible.

The authors of researchers from the seventies came to the following conclusions. In the period from 1961 to 1974, Clinic had treated 2251 patients affected by mandibular fracture- on average 173 cases a year. 82% of this population were male, 8,3 % female, and 9,7% of children of both genders. Adult male to adult female patients ratio was 10,1:1. [10]

Comparing the period from 2002 to 2012 to period from 1961 to 1974, there are following changes: more hospitalizations due to mandibular fractures in modern period, decreasing of male to female ratio (from 10,1:1 in 1961-1974 to 6:1 in 2002-2012), single to multi-fragmental fractures ratio striving for (from 1,42:1 in 1961-1974 to 1,12:1 in 2002-2012), left angle of mandible became new mostly fractured structure.

The separate commentary is required on the distribution of cases by months. In the period from 2002 to 2012, most cases were hospitalized in the period from April to September. [Graph 3] It corresponds to the season of highest temperatures, increased tourist traffic and traffic in the roads in the year. Flieger and Barańczak have come to the same conclusions, they indicated the holiday period as the time of the highest incidence of maxillofacial fractures, including mandibular trauma. [10]

DISCUSSION

Drawn conclusions need to be rectified. In the period from 1961 to 1974, approximately 218 children were treated, while 2002-2012 only 40 children. It would indicate a decreasing number of fractures in the group of children but the reason for such change is nonmedical. Nowadays, PUMS Maxillofacial Surgery Clinic concentrates on adult patients treating, as a consequence, the number of pediatric patients has been decreased. To gain accurate information about mandibular fractures, the analysis of data from the pediatric

trauma surgery clinic must be done. Difficulties in comparing those two periods should be explained. Authors of publication from the 1970s used different methodology from ours (different fractures classification, way of dividing groups of patients). It forced us to manually recalculate data from the period from 1961 to 1974, to make that data usable for our comparison. The mathematical conversion of other scientist's data may be a source of potential mistakes. Such procedures must be done with extreme caution.

Global researches about mandibular fractures indicate a great differentiation of this problem. The main reasons for such variation are a place of research, socioeconomic status of the analyzed population, the culture of the region, legal system and season of the year. Not without significance are the development of technology and the automotive industry. Over the years, the velocity of vehicles and safety systems have been changing. [11-15]

In most regions of the world and Poland, traffic accidents and physical violence are the main etiological factors of maxillofacial traumas (including mandibular fractures) for many years. [10,16,17]

The mandible is one of the most frequently fractured bone, not only in Poland but in many other countries too. Our research indicates that the model of trauma in Poland is equal to the global model: young males are the most susceptible group to be affected by trauma. Among 1701 patients of the clinic, 1426 (83,3%) patients were male, the average age was 32 years (± 13 years). Male to female ratio was 6,13:1. Male dominance among mandibular fracture patients' populations is characteristic of all the publications we have studied. [11-17]

In our results, most of the cases were diagnosed as a single fracture (52,62%). Scientists from other countries demonstrate various results. Hai – HuaZhou [11] (66,2%), Hai Wong Jung [12] (52,2%) i Ashish Vyas [19] (51%) indicate multi-fragmental fractures but Felix J Amarista [14] (51,2%) and Subodh S. Natu [17] (56%) indicate single fractures as main type of trauma in their researches.

Most cases were hospitalized in the clinic between April and September.

According to Anwar Ramadhan [16] period from April to June is characterized by the highest number of fractures but Hai Wong Jung [12] indicates a period from September to October. The results of other authors are equal to ours.

The most commonly fractured structures in the above researches are the body (42%), both angles (25,1%), both condylar processes (25,7%). In other epidemiological researches about mandibular fractures, mandible symphysis, angles, condylar processes and body [12-19] are enumerated as most commonly injured structures, in various order. Medical records, being used in our research, have not taken into account symphysis. It means that our results are practically impossible to compare to other publications. Nevertheless, results about the rest of the structures are equal to worldwide results.

CONCLUSION

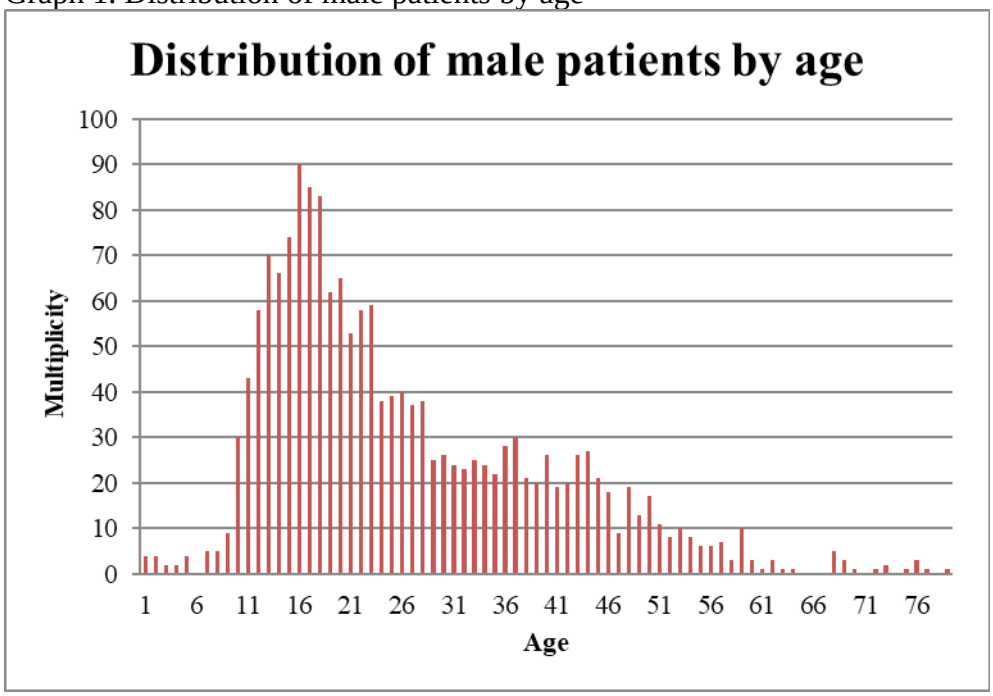
The following conclusions can be drawn from the above research. Independently on many factors, the group of young males is the most predisposed to mandibular trauma. However, it should be noted that, over the years, the percentage of women in the population of patients has increased. Such change is caused by the rising activity of women in social life, taking jobs non-typical for females, rising level of violence among women.

Comparison of modern and past data, undoubtedly, shows an increasing number of mandibular fractures overall, and a rising percentage of multi-fragmental fractures. The quoted researchers indicate the development of technology and the automotive industry as the main reasons for such changes. Increasing the engine power of motor vehicles means more traffic accidents at higher velocities of vehicles, which implies severer injuries among victims.

Comparison of the above results and publications of authors from all over the world has shown that mandibular fractures epidemiology in Poland does not deviate from epidemiology in other countries. Male to female ratio, distribution of patients by age, most frequently fractured structures, seasons of the year with the highest number of hospitalizations are equal to foreign elaborations.

GRAPHS AND TABLES

Graph 1. Distribution of male patients by age



Graph 2. Distribution of female patients by age

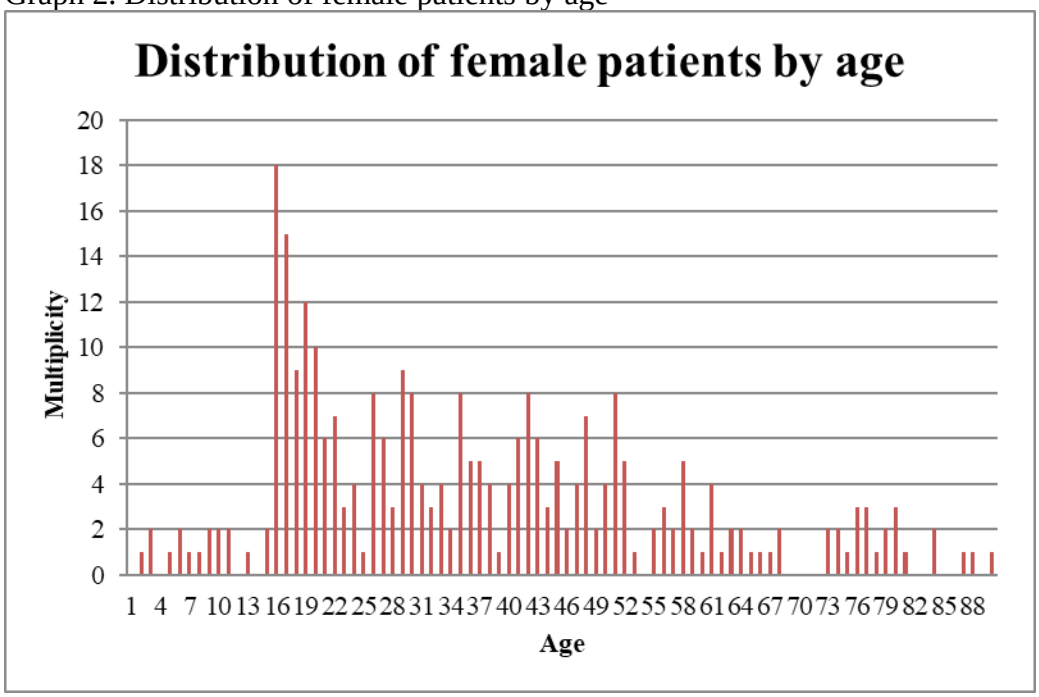


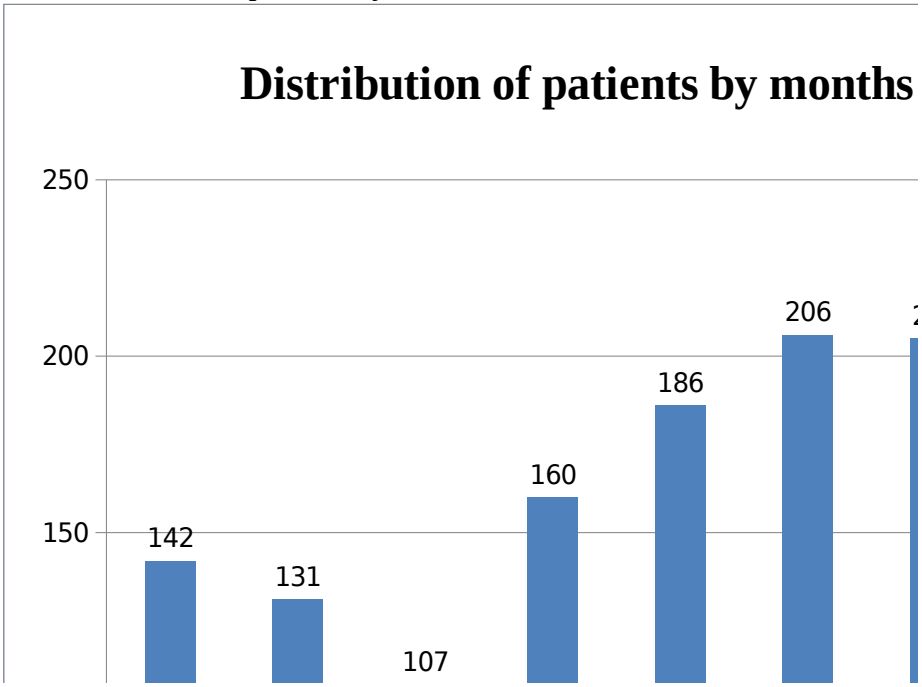
Table I. Numbers of fractured mandibular structures

Structures	Procent:	
Body of mandible	42,06%	
Right condylar process	12,93%	
Left condylar process	12,82%	
Right angle	10,46%	
Left angle	14,70%	
Alveolar part of body	0,64%	
Right coronoid process	1,50%	
Left coronoid process	3,00%	
Right ramus	0,86%	
Left ramus	0,86%	
Mental protuberance	0,16%	

Table II. Fractures division into single and multi-fragmental fractures.

Number of all fractures		
Single	52,62%	
Multi-fragmental	47,38%	

Graph 3. Distribution of patients by months



REFERENCES

1. Kelly DE, Harrigan WF. A survey of facial fractures: Bellevue Hospital 1948–1974. J Oral Surg 1975: 33: s.146–149. English

2. Patrocinio LG, Patrocinio JA, Borba BHC, Bonatti BS, Pinto LF, Vieira JV, Costa JM. Mandibular fracture: analysis of 293 patients treated in the hospital of clinics, Federal University of Uberlandia. Rev Bras Otorrinolaringol 2005: 71: 560–565. English

3. Ruslin M, Boffano P, ten Brincke YJ, Forouzanfar T, Brand HS. Sport-Related Maxillo-Facial Fractures. J CraniofacSurg. 2016 Jan;27(1):e91-94. English

4. Munante-Cardenas JL, Facchina Nunes PH, Passeri LA. Etiology, treatment, and complications of mandibular fractures. J CraniofacSurg. 2015 May;26(3):611-5. English
5. Bonavolontà P, Dell'aversana Orabona G, Abbate V, Vaira LA, Lo Faro C, Petrocelli M, Attanasi F, De Riu G, Iaconetta G, Califano L, The epidemiological analysis of maxillofacial fractures in Italy: The experience of a single tertiary center with 1720 patients, Journal of Cranio-Maxillofacial Surgery 2017 August;45, s.1319-1326. English
6. Arangio P, Vellone V, Torre U, Calafati V, Capriotti M, Cascone P. Maxillofacial fractures in the province of Latina, Lazio, Italy: review of 400 injuries and 83 cases. J CraniomaxillofacSurg. 2014 Jul;42(5):583-7. English
7. Christopher F. Viozzi, Maxillofacial and Mandibular Fractures in Sports, Clin Sports Med 36 (2017) 355–368. English
8. Pickrell BB, Serebrakian AT, Maricevich RS. Mandible Fractures. SeminPlast Surg. 2017 May;31(2):100-107 . English
9. Wojciechowicz J, Tomaszewski T, Dobiezyńska B, Rahnama M. "Mandibular fractures-retrospective study". Wiad Lek. 2004;57(1-2):37-43 x. Polski
10. Flieger S, Barańczak Z. Traumatologia Szczękowo-Twarzowa, AM Poznań, Poznań 1977 , Polski
11. Zhou HH, Ongodia D, Liu Q, Yang RT, Li ZB. Dental trauma in patients with single mandibular fractures. Dental Traumatology 2012 August; 29(4) 285-290. English
12. Jung HW, Lee BS, Kwon YD, Choi BJ, Lee JW, Lee HW, Moon CS, Ohe JY. Retrospective clinical study of mandible fractures. J Korean Assoc Oral Maxillofac Surg. 2014 Feb;40(1):21-6.. English
13. 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. English
14. Amarista Rojas FJ, Bordoy Soto MA, Cachazo M1, 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 . English
15. Sojot AJ, Meisami T, Sandor GK, Clokie CM. The Epidemiology of Mandibular FracturesTreated at the Toronto General Hospital: A Review of 246 Cases. J Can Dent Assoc 2001; 67(11):640-4. English
16. Ramadhan A, Gavelin P, Hirsch JM, Sand LP. A retrospective study of patients with mandibular fractures treated at a Swedish University Hospital 1999-2008. Ann Maxillofac Surg. 2014 Jul-Dec;4(2):178-81
17. Arangio P, Vellone V, Torre U, Calafati V, Capriotti M, Cascone P. Maxillofacial fractures in the province of Latina, Lazio, Italy: Review of 400 injuries and 83 cases. J Craniomaxillofac Surg. 2014 Jul;42(5):583-7
18. Natu SS, Pradhan H, Gupta H, Alam S, Gupta S, Pradhan R, Mohammad S, Kohli M, Sinha VP, Shankar R, Agarwal A.. An Epidemiological Study on Pattern and Incidence of Mandibular Fractures. Plast Surg Int. 2012;2012:834364 . English
19. Vyas A, Mazumdar U, Khan F, Mehra M, Parihar L, Purohit C. A study of mandibular fractures over a 5-year period of time: A retrospective study. Contemp Clin Dent. 2014 Oct;5(4):452-5