

Original Article

Midfacial Fractures: A Retrospective Etiological Study over a 10-Year Period in Western Romanian Population

PA Tent, RI Juncar, T Lung¹, M Juncar

Department of Oral and Maxillofacial Surgery, University of Oradea, Oradea, ¹Department of Oral and Maxillofacial Surgery, County Clinical Emergency Hospital, Cluj-Napoca, Romania

ABSTRACT

Introduction: Midfacial fractures are extremely important oral and maxillofacial problems because they take varied forms and are frequently accompanied by major long-term esthetic or functional complications. Their etiology and epidemiology vary significantly in the literature, and the main causes are varied by population. The aim of this study is to identify the main traumatic etiology of midfacial fractures, along with the main categories of affected patients in our geographical area, in order to establish the need for measures that can prevent fractures in the future. **Materials and Methods:** We conducted a retrospective study over a 10-year period in 379 patients. Data were extracted from the patients' charts, and the following variables were taken into consideration: sex, age, environment of origin, education level, and traumatic etiology. **Results:** Midfacial fractures most frequently affected the 20–29 years age group (31.93%), male sex ($n = 333$, 87.86%, M:F = 7.23:1), patients from urban areas ($n = 206$, 54.35%), and patients without education (46.70%). The most frequent etiology was interpersonal violence (44.85%), followed by fall trauma (16.62%) and road traffic accidents (15.30%). Statistical correlations evidenced that urban environment favors midfacial fractures caused by interpersonal violence and road traffic accidents or sports injuries, while in rural areas, domestic accidents and animal attacks are predominant ($P = 0.000$). **Conclusions:** The overwhelming incidence of interpersonal violence in our population is currently a major public health problem. Implementing laws and initiating national programs for the prevention of interpersonal violence would lead to a considerable reduction of midfacial fractures in the Western Romanian population.

KEYWORDS: *Etiology, fracture, interpersonal violence, midface, trauma*

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INTRODUCTION

Maxillofacial traumatology is currently an extremely important health subject worldwide, the fractures of the viscerocranium being the most frequent pathology found in ambulatory health care.^[1] The importance of this pathology derives from its major potential complications, such as life-threatening hemorrhage, acute respiratory failure or neurological lesions compatible or incompatible with life, and not least, local esthetic and functional disorders.^[2] The complexity of the most often interdisciplinary treatment of midfacial traumas requires the use of considerable financial resources.^[3] Also, the treatment of the midfacial fractures itself is complex,

and the methods of choice can vary among orthopedic, surgical, or combined.^[3,4] This may cause pressure on the entire healthcare system when traumas take epidemic proportions, particularly in developing countries where the resources allocated for this disease are usually limited.^[4]

The causes of midfacial fractures are multiple and are correlated in the literature with a number of factors such as geographical location, population density, the

Address for correspondence: Dr. RI Juncar, Faculty of Medicine and Pharmacy, University of Oradea, Str. 1st December Place, Oradea, Romania.
E-mail: ralucajuncar@yahoo.ro

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environment of origin, and the socioeconomic, cultural, or religious level.^[5-7]

Assessing etiology and epidemiology in a certain geographical area, as well as their association is fundamental, underlying the adoption of an optimal preventive, diagnostic, and therapeutic approach.^[6,7] Many authors confirm a decrease in the incidence of maxillofacial traumas following the implementation or modification of specific legislative norms for their prevention in the studied population.^[3,8]

The aim of this study is to determine the main traumatic etiology and the epidemiology of midfacial fractures in Romania, in order to elaborate and subsequently implement prevention methods, an aspect which has not been studied in our country.

MATERIALS AND METHODS

For this study, patients admitted and treated for midfacial fractures in the Clinic of Oral and Maxillofacial Surgery I in Cluj-Napoca in the period of January 1, 2002 to December 31, 2011 were available. The study was approved by the Ethics Committee of the University of Oradea. All patients included in the study signed an informed consent at the time of their admission to the clinical service, by which they gave their consent for the use of their anonymized medical data for scientific research purposes.

Data were extracted from the patients' charts, and the following variables were taken into consideration: sex, age, environment of origin, education level – without education, primary education (4–8 years), medium level of education (8–12 years), elevated level of education (12 years of study) – and traumatic etiology.

The study inclusion criteria were the following: presence of at least one fracture line in the midface, history of an acute trauma episode, imaging investigations confirming the clinical diagnosis of fracture, and treatment of the fracture performed in the institution hosting the study.

Study exclusion criteria were the following: patient without fracture lines in the midface, pathological fractures, absence of complementary imaging investigations, treatment performed in another service, and incomplete data.

Data were centralized in electronic format using the Microsoft Excel software. Descriptive statistics of the assessed cases were conducted with two-decimal percentage accuracy. Statistical analysis was performed with the MedCalc statistical software, version 17.2 (MedCalc Software bvba, Ostend, Belgium; <https://www.medcalc.org>; 2017). Continuous data were expressed as

mean and standard deviation, and nominal data were expressed as frequency and percentage. The comparisons of the frequencies of a nominal variable between the categories of another nominal variable were made using the Chi-squared test. The comparison of a continuous nominal variable between two groups was made using the *t*-test for independent variables. A *P* value <0.05 was considered statistically significant.

RESULTS

Of all patients admitted and treated in the studied period, 379 patients met the study inclusion criteria.

Midfacial fractures had the highest incidence in the 20–29 years age group, and the lowest incidence in the 0–9 and 70–79 years age groups [Figure 1].

Male patients (*n* = 333, 87.86%) were more frequently affected by midfacial fractures of traumatic etiology than female patients (*n* = 46, 12.14%). The male/female ratio was 7.23/1.

The distribution of patients depending on their environment of origin evidenced a higher incidence

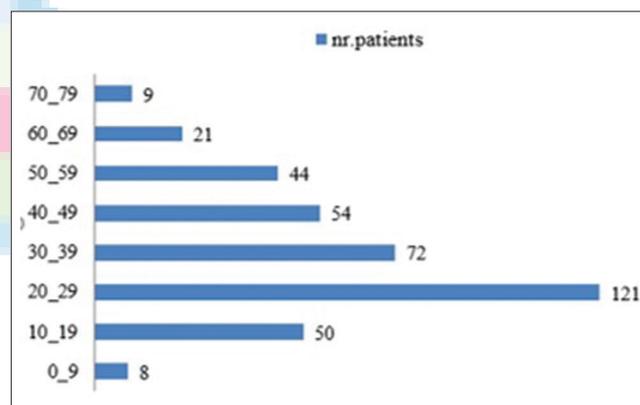


Figure 1: Distribution of patients by age groups

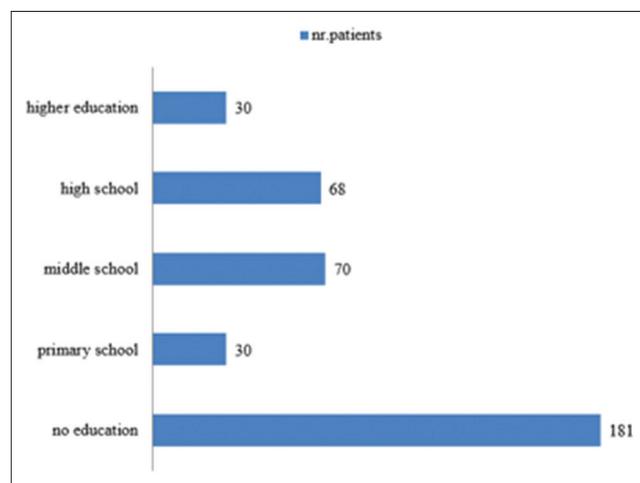


Figure 2: Distribution of patients depending on their education level

Table 1: Distribution of the types of traumatic etiology depending on sex

	Etiology of the trauma							Total
	Interpersonal violence	Road traffic accident	Domestic accident	Sports injury accident	Work accident	Fall	Animal attack	
Sex, n (%)								
Female	11 (6.6)	21 (34.4)	1 (3.1)	0 (0.0)	1 (12.5)	9 (14.3)	3 (11.1)	46 (12.1)
Male	156 (93.4)	40 (65.6)	31 (96.9)	21 (100)	7 (87.5)	54 (85.7)	24 (88.9)	333 (87.9)
Total, n (%)	167 (100.0)	61 (100.0)	32 (100.0)	21 (100.0)	8 (100.0)	63 (100.0)	27 (100.0)	379 (100.0)
P				0.000				

Table 2: Distribution of the types of traumatic etiology depending on the environment

	Etiology of the trauma							Total
	Interpersonal violence	Road traffic accident	Domestic accident	Sports injury accident	Work accident	Fall	Animal attack	
Environment, n (%)								
Rural	69 (41.3)	26 (42.6)	21 (65.6)	5 (23.8)	5 (62.5)	26 (41.3)	21 (77.8)	173 (45.6)
Urban	98 (58.7)	35 (57.4)	11 (34.4)	16 (76.2)	3 (37.5)	37 (58.7)	6 (22.2)	206 (54.4)
Total, n (%)	167 (100.0)	61 (100.0)	32 (100.0)	21 (100.0)	8 (100.0)	63 (100.0)	27 (100.0)	379 (100.0)
P				0.001				

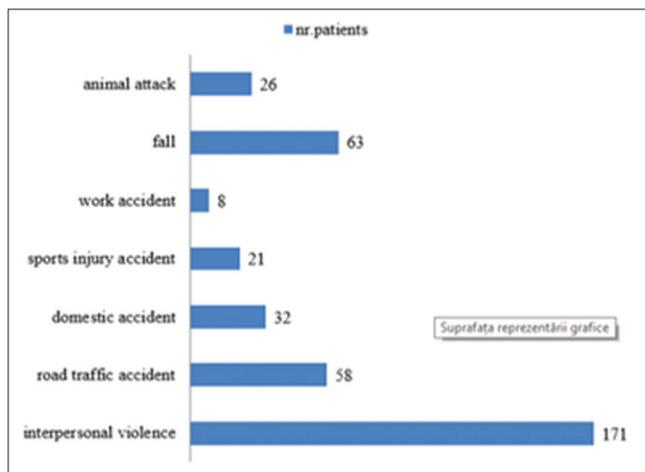


Figure 3: Distribution of patients depending on traumatic etiology

among patients from urban areas ($n = 206$, 54.35%) compared to those from rural areas ($n = 173$, 45.65%).

Depending on the patients' education level, midfacial fractures were predominant among patients without education, while they were found in a small number among patients with higher education [Figure 2].

Interpersonal violence was the most frequent traumatic etiology of midfacial fractures, followed by fall trauma and road traffic accidents. Work accidents and animal attacks had the lowest incidence among patients included in this study [Figure 3].

The source of trauma was correlated with the patients' sex and their environment of origin. Male patients were more predisposed to midfacial fractures regardless of their environment of origin and etiology compared to female patients ($P = 0.000$) [Table 1].

Patients from urban areas were more predisposed to midfacial fractures caused by interpersonal violence, road traffic accidents, and sports injuries, while in the case of patients from rural areas, domestic accidents and animal attacks (horse's hoof hit) were the most frequent ($P = 0.001$) [Table 2].

DISCUSSION

In our study, midfacial fractures were most frequently found in patients aged between 20 and 29 years. This result is similar to the findings in the literature from other geographical regions: India,^[9] Germany,^[10] Brazil,^[11] South Korea,^[12] Malaysia,^[13] and Italy,^[14] and can be explained by the fact that during this period of their lives, people are much more physically and socially active.^[15] Young people are behaviorally much more impulsive.^[12,13] This fact, along with age-specific recreational alcohol consumption, predisposes this category to conflicts and interpersonal violence that can lead to jaw fractures.^[13] Also due to age-specific behavior, young people drive at a high speed, frequently being inexperienced or careless in traffic, or even under the influence of alcohol or drugs, which dramatically increases the risk of road traffic accidents.^[15] Also, at the age of 20–29 years, sports careers are in full swing, athletes being at risk of jaw fractures from sports injuries, particularly in contact sports or extreme sports.^[16] In contrast to our results, in other geographical regions such as China^[17] or Japan,^[18] the most affected age group is the 10–19 years age group. Because of the social conditions in China, many people have to work at a very young age out of necessity, being more exposed to work accidents or falls depending on

the type of job they are performing.^[17] This explains the high incidence of midfacial fractures among the young age group in China. Also, in Japan, according to the study of Yamamoto *et al.*,^[18] the main etiology of midfacial fractures is currently represented by road traffic accidents, children and adolescents with no driving license suffering injuries as pedestrians. At the same time, other authors indicate the highest incidence in the 30–39 and 50–59 years age groups.^[19–22] These findings can be explained by the fact that between 30 and 59 years the individual is most actively involved in society, being frequently prone to conflict or different accidents and therefore to trauma.^[19,20] Not least, the overwhelming development of the healthcare level over the past decades has led to an increase in the living standards of elderly patients and implicitly to their active integration in society.^[21,22]

The incidence of midfacial fractures in this study was by far higher among men than women. This result has statistical significance and is in accordance with the results of some authors.^[9,13,14,18,21,22] This is not surprising considering that it is well known that men more frequently engage in conflicts than women, being more prone to cervico-facial trauma.^[9] On the other hand, in the majority of the countries, physical work is performed by men, which increases their risk of work accidents.^[13,14,18] The male/female ratio in our study is 7.23:1, similar to the results reported by other authors.^[13,21] Noteworthy in the increased M:F ratio of 11:1 in Arab countries, where women are restricted from social activities by tradition, thus being less exposed to trauma.^[16] On the other hand, in regions where the degree of women's freedom and participation in multiple fields of activity is high, a more balanced sex distribution is found, 2:1.^[23]

In this study, midfacial fractures were predominant among patients without education, which has been reported by other authors.^[15,24] Kar and Mahavoi^[25] observe in their research on the Indian population that the highest incidence of trauma is among workers with a low education level. Absence of education leads to low social status which is often associated with an increase in alcohol consumption. As a result of these factors, the risk of inter-human aggression and therefore the appearance of midfacial fractures increases among this group.^[24,25] These statements are supported by other publications, which emphasize the fact that interpersonal violence has an extremely low incidence among patients with higher education.^[15,24] Both our data and those reported by other studies^[15,24,25] show that an increase in the population's education level is one of the most effective methods for the prevention of facial trauma.

In our study, most of the patients were from urban areas, in accordance with data reported by other authors.^[16,26,27] Urban environment predisposes to trauma, as statistically confirmed by our study. This result is explained by the fact that accumulation of a large population with discrepancies between the social classes in the urban environment, where the study was conducted, creates the premises for interpersonal conflicts thus increasing the incidence of trauma.^[16,26,27] Also, the superior infrastructure in urban areas facilitates driving at higher speeds, thus predisposing the population to more severe road traffic accidents.^[6,28,29] However, our result is in contrast to those published by other authors which indicate an increased incidence of midfacial fractures in rural environment.^[30] These discrepancies are due to the fact that Smith *et al.*^[30] conducted his study in a trauma center which serves a large rural state. According to our results, the fact that rural environment predisposes to trauma from domestic accidents and animal attacks represented by horse and cow bites and blows is statistically significant. This can be explained by the fact that agricultural activities still largely involve domestic animals in our country.^[30]

Interpersonal violence was the main causal factor of midfacial fractures in our study, similar to the results from other geographical regions such as the United States,^[21,26] Germany,^[10] Australia,^[3] and Lithuania.^[31] A study conducted in Italy^[32] evidences a change in the etiology and epidemiology of midfacial fractures over the past 10 years, with interpersonal violence becoming the main etiological factor, replacing road traffic accidents in Italy. In contrast to our results, in regions such as China,^[2] India,^[9,28] Nigeria,^[29] Egypt,^[33] and Turkey,^[34] the main etiological factor of midfacial fractures is represented by road traffic accidents. Thus, a predominance of interpersonal violence in developed countries is found, possibly due to discrepancies between social classes, but also to social life which facilitates the access of young people to alcohol consumption.^[15,27] The association between alcohol consumption and drugs was highlighted by Strom *et al.*^[35] in a retrospective study conducted in Sweden. On the other hand, the decrease in the frequency of road traffic accidents in developed countries might be due to the implemented legislation, with the compulsory wearing of seat belts, protective helmets and special equipment for motorcyclists, as well as to the drastic penalties applied for alcohol consumption when driving.^[32] In developing countries, road traffic laws are frequently unclear and ineffective. This fact, along with the carelessness of drivers can lead to the predominance of midfacial fractures from road traffic accidents.^[9,28,29] Road traffic accidents in our study ranked only third among the causes of trauma,

while falls ranked second. This can be explained by the relatively great number of children and elderly included in the study, fall trauma being characteristic of these categories of patients.^[11,33,36] Similar results have been reported in studies carried out by other authors, exclusively in children or elderly.^[37,38] On the other hand, it should be taken into consideration that fall trauma can be secondary to interpersonal violence or to a work accident, as patients might not report the real cause out of fear, interest, or shame.^[10,39,40] Certainly, these statements are purely speculative, and further research is needed in this area. In our study, there were no gunshot midfacial fractures compared to other studies in which these are frequent.^[41-43] This is most probably due to Romanian legislation, where the possession of firearms by civilians is forbidden, and on the other hand to the fact that Romania is currently not a conflict area.

The most important limitation is the retrospective nature of the research; data collected from the patient charts depend on the accuracy of their recording at the time. Another limitation is due to the possibility that the patients might deliberately report incorrect data and change real facts because of fear or in order to avoid certain legal aspects. Nevertheless, we consider that the data obtained are representative and have a scientific and clinical impact.

CONCLUSIONS

Interpersonal violence is the main etiological factor of midfacial fractures in Romania. The epidemiological profile of patients with midfacial fractures caused by interpersonal violence is represented by men aged between 20 and 29 years, with a low education level, from urban environment. The overwhelming incidence of interpersonal violence in our population is currently a major public health problem. It is imperative to implement laws and initiate national programs for the prevention of interpersonal violence, in order to reduce the incidence of midfacial fractures in this geographical region.

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Conflicts of interest

There are no conflicts of interest.

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