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Impact of COVID-19 pandemic on maxillofacial trauma etiology

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ABSTRACT

Objective: Maxillofacial trauma (MFT) is a frequent presentation in the emergency department (ED) which requires a multidisciplinary approach. Although, its etiology and diversity of injuries are almost similar worldwide, the causes may differ among the countries depending on the sociocultural and environmental factors and local traffic regulations. This study aims to evaluate etiologies of maxillofacial traumas (MFTs) in ED and to compare etiologies of MFTs during COVID-19 pandemic with the previous year.

Patients and Methods: Totally 84 (61 males, 23 females) patients admitted to ED of our center with MFT between March 15th – April 30th, 2020 were included. The control group consisted of 148 (112 males, 36 females) MFT patients admitted to ED in the previous year (March 15th-April 30th, 2019). Data including age, sex, cause of trauma, treatment, and COVID-19 infection status within 14 days after ED admission were compared between groups.

Results: Mean age was 31.88±2.53 years in the patient group and 31.40±1.74 years in the control group. Number of patients admitted to ED with MFTs decreased by 43.3% during pandemic compared to the previous year. Majority of MFTs occurred at home, followed by public places, traffic, and workplaces in both time periods. During pandemic, the rate of home accidents increased and MFTs occurred in the public places decreased.

Conclusion: COVID-19 pandemic-mandated social restrictions lead to a decrease in the number of MFTs. However, home accidents are the main cause of MFTs. Spread of COVID-19 infection in the hospital setting can be minimized with necessary precautions.

Keywords: Maxillofacial trauma, COVID-19, Emergency department, Plastic Surgery, Lockdown

1. INTRODUCTION

Maxillofacial trauma (MFT) is a frequent presentation in the emergency department (ED) which requires a multidisciplinary approach. Although, its etiology and diversity of injuries are almost similar worldwide, the causes may differ among the countries depending on the sociocultural and environmental factors and local traffic regulations[1-3]. Review of the literature has shown that traffic accidents [4], assaults [5], and traumas during daily life [6] are the main causes of MFTs. Studies conducted in Turkey have shown that assaults and road traffic accidents are the leading causes of MFTs [7-10].

After the first identification of novel coronavirus-2019 (COVID-19) in the Hubei province of China in December 2019 and rapid spread to the whole world, the World Health Organization (WHO) declared COVID-19 pandemic on March 11th, 2020 [11]. The first case of COVID-19 was identified on March 11th, 2020 in Turkey [12]. The pandemic caused an unprecedented disruption in work life, social life, academic life, and healthcare systems with strict restrictions across the country. These restrictions mainly included closing schools and attending to online learning, social distancing, encouraging remote and/or flexible working, limiting social gatherings, postponing meetings, limiting the number of passengers in public transport vehicles, postponing elective surgeries, and weekend lockdowns.

In the present study, we aimed to evaluate etiologies of MFTs in the ED, to compare the etiologies of MFTs at the time of this study with the previous year, to assess whether COVID-19 pandemic affected the treatment decisions, and to investigate the COVID-19 infection rate within the first 14 days after admission.

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2.MATERIALS and METHODS

Study design and study population

This single-center, retrospective study was conducted at Marmara University, Faculty of Medicine between March 15th, 2020 and April 30th, 2020. A written informed consent was obtained from each participant. The study protocol was approved by the Marmara University, Faculty of Medicine, Ethics Committee with the Approval No. 09.2020.540 in May 20th, 2020. The study was conducted in accordance with the principles of the Declaration of Helsinki.

A total of 84 (61 males, 23 females) patients admitted to the ED of our center with MFT during the study period were included in the study. The control group consisted of 148 (112 males, 36 females) MFT patients admitted to the ED in the previous year (March 15th, 2019 and April 30th, 2019). Data including age, sex, cause of trauma, treatment, and the COVID-19 infection status within 14 days after ED admission were recorded. Demographic and clinical characteristics of the control group were also recorded and compared with the patient group.

Study variables

The causes of MFTs were classified as traffic accidents, falls, assault, sports injuries, industrial accidents, injuries related to sharp objects, and human or animal bites. The settings where MFTs occurred including home, work, traffic, and other were documented. Injuries of the soft tissue, bone, tooth, and mucosa were noted.

Treatments applied, medical treatments and recommendations, interventions in the ED setting, operation in the operating room, referral of the patient to an external center, and refusal of the treatment by the patient were assessed.

All patients admitted to the ED were questioned regarding COVID-19 infection using a screening questionnaire (Table I). Physical examination findings including body temperature, and finger oxygen saturation, and complete blood count and biochemistry test results were documented. The patients suspected of COVID-19 underwent reverse transcriptase polymerase chain reaction (RT-PCR) analysis to confirm the diagnosis. The patients requiring hospitalization were taken to the single-patient wards and caregivers and/or companions were not allowed. The patient rooms were visited by the healthcare workers, when necessary, wearing personal protective equipment (PPE) such as face mask, gloves, goggles, glasses, face shields, gowns. All caregivers and/or companions were asked to wear a mask in the patient room. All patients admitted to ED with MFT were followed for COVID-19 infection symptoms for 14 days.

Statistical analysis

Statistical analysis was performed using the SPSS version for Windows 15.0 software (SPSS Inc., Chicago, IL, USA). Continuous variables were expressed in mean ± standard deviation (SD), median (min-max), while categorical variables were expressed in number and percentage. The independent *t*-test was used to compare continuous random variables between the time periods, while the chi-square test was used to compare discrete random variables. A p value of <0.05 was considered statistically significant.

Table I. *COVID-19 infection screening questionnaire*

Question	Yes	No
Have you had a new onset of fever, cough, or diarrhea within the past two weeks?		
Have you travelled overseas or been in contact with a traveller within the past two weeks?		
Have you been exposed to someone known to have had COVID-19 infection within the past two weeks?		

3. RESULTS

Of a total of 84 patients admitted to the ED with MFT, 61 were males and 23 females with a mean age of 31.88±2.53 (range, 1 to 93) years. Of the control group (n=148), 112 were males and 36 females with a mean age of 31.40±1.74 (range, 2 to 95) years. There was no statistically significant difference in the sex and age of the patient and control groups between the time periods (p=0.721 and p=0.874, respectively).

The number of patients admitted to ED with MFTs decreased by 43.3% during the pandemic compared to the previous year. In addition, the rate of falls was higher and the rate of MFTs caused by assault decreased in the COVID-19 pandemic, although not statistically significant (p=0.416). According to the age groups, the rate of MFTs decreased in the 0-20 years age group and increased in the 21-64 and ≥65 years age groups in the COVID-19 pandemic, compared to the previous year (p=0.612). However, it did not reach statistical significance. Etiological factors of MFTs according to age and time periods are shown in Table II.

According to the setting of MFTs, the majority of MFTs occurred at home, followed by public places, traffic, and workplaces in both time periods. However, during the pandemic, the rate of home accidents increased and MFTs occurred in the public places decreased, although the difference was not statistically significant (p=0.815). On the other hand, the rate of traffic related MFT's lightly increased and workplace-related MFTs remained unchanged. In the home setting, the most common cause of injury was fall and this rate increased from 81.08% in the previous year and up to 88% in the COVID-19 pandemic. The second leading cause of MFTs was injuries related to sharp objects to the face which decreased from 17.57% in the previous year to 8% in the COVID-19 pandemic. The settings where MFTs occurred are presented in Table III.

Table IV shows the injury sites of MFTs. The rate of mucosal injuries significantly increased during the pandemic than the previous year (p=0.020). However, the rates of soft tissue lacerations and defects, bone fractures, and tooth trauma decreased during the pandemic, although it did not reach statistical significance (p=0.256). The most common fracture site was the nasal bone in both time periods (43.9% in 2019, 34.5% in 2020).

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According to the treatments applied, the number of ED interventions and the rate of patient discharge with medical treatment and recommendations decreased, while the rate of inpatients having an operation increased during the pandemic, compared to the previous year; however, no statistically significant difference was found (p=0.080) (Table V). In our study, the rate of refusal of treatment was 5.4% in the previous year, while none of the patients refused treatment during the pandemic.

Table II. *Etiological factors of MFTs according to age and time periods*

		Etiological factors n (%)							
Age	Year	Fall	Assault	Traffic accident	Injury related to sharp objects	Sports injury	Industrial injury	Animal/ human bite	Total
0-20 years	2019	29 (51.8%)	13 (23.2%)	4 (7.1%)	7 (12.5%)	2 (3.6%)	1 (1.8%)	0	56 (37.8%)
	2020	22 (81.5%)	2 (7.4%)	2 (7.4%)	1 (3.7%)	0	0	0	27 (32.1%)
21-64 years	2019	23 (28.8%)	26 (32.5%)	16 (20%)	6 (7.5%)	0	8 (10%)	1 (1.3%)	80 (54.1%)
	2020	17 (35.4%)	13 (27.1%)	10 (20.8%)	5 (10.4%)	0	2 (4.2%)	1 (2.1%)	48 (57.1%)
≥65 years	2019	12 (100%)	0	0	0	0	0	0	12 (8.1%)
	2020	8 (88.9%)	1 (11.1%)	0	0	0	0	0	9 (10.7%)
Total	2019	64 (43.2%)	39 (26.4%)	20 (13.5%)	13 (8.8%)	2 (1.4%)	9 (6.1%)	1 (0.7%)	148 (100%)
	2020	47 (56%)	16 (19%)	12 (14.3%)	6 (7.1%)	2 (2.4%)	2 (2.4%)	1 (1.2%)	84 (100%)
p value	2019	p= 0.001*							
	2020	p= 0.029*							
Total		111 (47.8%)	55 (23.7%)	32 (13.8%)	19 (8.2%)	2 (0.9%)	11 (4.7%)	2 (0.9%)	232

*Data are given in number and percentage, unless otherwise stated. *p<0.05 indicates statistical significance. MFT: maxillofacial trauma.*

Table III. *The settings where MFTs occurred*

March 15th – April 30th	Setting of MFTs n %				
	Home	Traffic	Workplace	Other	Total
2019	79 53.4%	19 12.8%	13 8.8%	37 25%	148 100%
2020	50 59.5%	11 13.1%	7 8.3%	16 19.1%	84 100%
p value	0.815				
Total	129 55.6%	30 12.9%	20 8.6%	53 22.9%	232 100%

Data are given in number and percentage, unless otherwise stated. p<0.05 indicates statistical significance. MFT: maxillofacial trauma.

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Table IV. *Injury sites of MFTs*

	Injury sites n (%)				
Year	Soft tissue laceration	Soft tissue defect	Mucosal injury	Bone fracture	Tooth trauma
2019	60 (40.5%)	2 (1.4%)	18 (12.2%)	107 (72.3%)	5 (3.4%)
2020	27 (32.1%)	1 (1.2%)	21 (25%)	54 (64.3%)	1 (1.2%)
p value	0.259	1.000	0.020*	0.234	0.422
Total	87 (37.5%)	3 (1.3%)	39 (16.8%)	161 (69.4%)	6 (2.6%)

*Data are given in number and percentage, unless otherwise stated. * p<0.05 indicates statistical significance. MFT: maxillofacial trauma.*

Table V. *Treatments of MFTs*

Year	**Treatment** n (%)					
	Medical treatment and recommendations	Intervention in ED setting	Hospitalization and operation	Referral	Refusal of treatment	Total
2019	38 (25.7%)	91 (61.5%)	11 (7.4%)	1 (0.7%)	7 (4.7%)	148 (100%)
2020	32 (38.1%)	44 (52.4%)	8 (9.5%)	0 (0%)	0 (0%)	84 (100%)
p value	0.080					
Total	70 (30.2%)	135 (58.2%)	19 (8.2%)	1 (0.4%)	7 (3%)	232 (100%)

Data are given in number and percentage, unless otherwise stated. p<0.05 indicates statistical significance. MFT: maxillofacial trauma.

In the current study, one patient was suspected of COVID-19 based on the COVID-19 screening questionnaire and physical examination findings and underwent thoracic CT and PCR to confirm the diagnosis. Although the patient tested negative, COVID-19 measures were implemented. Repeated RT-PCR yielded a negative result after surgery and, therefore, the patient was considered negative for COVID-19 and discharged from the hospital. During follow-up, no additional signs and symptoms were observed. Another patient developed high fever postoperatively and thoracic CT once and RT-PCR tests were performed with two days interval. Both test results were negative and the patient was considered negative for COVID-19. During 30-day follow-up after surgery, no additional signs and symptoms were observed. In our clinic, none of specialists were infected with COVID-19 which can be explained by the implementation of strict preventive measures (*i.e.*, the patients requiring hospitalization were taken to the single-patient wards and caregivers and/or companions were not allowed; all healthcare workers complied with the donning/doffing procedures of PPE). However, other staff including anesthesiologists and nurses involved in the treatment process were not analyzed, as it is beyond the scope of this study.

One patient suspected of COVID-19 due to fever underwent thoracic computed tomography (CT) and RT-PCR analysis to confirm the diagnosis and the test result was negative.

4. DISCUSSION

Our study results showed that the number of patients admitted to ED with MFTs decreased by 43.2% during the pandemic compared to the previous year. In the literature, the rate of MFTs decreased by 80% [13-19]. This can be attributed to the higher time spent at home due to restrictions worldwide. According to the Istanbul Metropolitan Municipality data, the use of mass transportation vehicles and passage of vehicles decreased by 86.4% in Istanbul province during the pandemic and the number of elderly aged ≥60 years (94%) and students (93%) using these vehicles significantly reduced [20]. As a result, the probability of accidents in the outside decreased. In our study, the rate of injuries in the public places and traffic was higher (47%) than home accidents (37%). In addition to being a pandemic center, our hospital remained open for all emergency cases during the study period. Many patients had a fear of infected with COVID-19 in the hospital setting and were unwilling to visit hospitals during the pandemic. Therefore, most of MFT cases with mild injuries may have visited private hospitals and clinics than state hospitals. The significantly lower rate of soft tissue injuries (63%) during the pandemic (24 in 2019 *vs.* 9 in 2020, respectively) supports this probability. These patients may have applied self-care and self-remedy at home using cream, ointment, or adhesive bandages during the pandemic. The higher number of MFT cases with oral mucosal injuries can be explained by the fact that these patients may have immediately visited the ED after trauma and patients can not treat themselves easily.

Also, the nasal bone was the most affected bone in MFTs in our study, consistent with the literature [21]. However, some authors found the mandibular fractures to be the most common fractures both before and after pandemic [15].

According to the treatments applied for MFT cases, the number of ED interventions such as suturation and external fixation of the nasal bone decreased according to the rate of patient

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discharge with medical treatment and recommendations. This may have resulted from the fact that many patients and healthcare workers have a fear of infected with COVID-19 in the hospital setting and are unwilling to visit hospitals during the pandemic. Therefore, soft tissue wounds can be closed by tissue adhesives rather than sutures in the ED setting. In addition, some authors have discussed conservative treatment methods for head and neck injuries before pandemic [22]; therefore, conservative methods may have been applied in the ED in selected cases. The negligible decrease in the rate of patients operated in the operating room indicates that patients who are not considered eligible for conservative treatment in the ED setting continue to be operated during the pandemic. Although more complex cases can be treated in the ED setting, operating room setting can be preferred to save time spending in ED room during the pandemic. In case of more than two types of injuries or bone involvement, serious trauma is considered. In our study, the rate of traffic accidents slightly increased. Previous studies have shown that road accidents are the leading causes of serious MFT fractures [23]. In our study, similarly, we observed a mild decline in the rate of operated patients. In addition, as many patients avoided hospital admission and readmission during the pandemic as much as possible, none of the patients refused the treatment given in the study.

The unchanged mean age (~31.5 years) and male sex predominance in both study periods can be explained by the fact that the majority of the individuals in the social circle, work life, and drivers in traffic are young males in our country [24]. According to the General Directorate of Security of Turkey data, the rate of traffic accidents decreased by 52.1% with a decrease in the accidents leading to death by 24.03% during the pandemic; however, the severity of the accidents became more traumatic [25]. According to the Istanbul Metropolitan Municipality, Transportation Management Center data, there was an increase in the average road speed of the moving vehicles in Istanbul province [20]. This finding indicates that, although the rate of road accidents decreased by more than 50% and the associated MFT rates decreased by 40% during the pandemic, the severity of the accidents was more traumatic.

Previous studies have shown that traffic accidents, assaults, falls, and sports injuries are the leading causes of MFTs [4-6]. In three of four studies conducted in Turkey, traffic accidents were the main cause of MFTs [8-10], while assaults were the primary reason in the remaining study [7]. However, three of these four studies included only patients with facial bone fractures related to MFTs. However, MFTs consists of many types of injuries including soft tissue, mucosa, tooth, and bone [26]. In our study, all types of MFTs were included to gain a better understanding of the extent of the trauma and falls were found to be the most common etiological factors.

Furthermore, the most common cause of MFTs was fall in both time periods in our study (51.8% *vs.* 56%, respectively), primarily affecting the 0-20 years age group. This result is not surprising, as this age group includes infants and toddlers, restless young children, and those having attention deficits [27], tendency to stumbling [28], and having a high head-to-body ratio [29]. Unlike our study, previous studies showed that the main causes of MFTs were motor vehicle crashes [29] and assault [30]. Some of the studies, however, found falls to be the main cause of MFTs, similar to our study [16,17,19]. Both during the pandemic and the previous year of pandemic, the only cause of MFTs was fall in patients aged ≥65 years; however, one patient had assault-induced MFT in the COVID-19 pandemic. Previous studies have reported a higher rate of MFTs in advanced age than young population, probably due to daily living activities – and fall-related injuries [6]. In a study, Brucoli et al., reported that falls were the main cause of MFTs in elderly [31]. In our study, the number of all cause-related MFTs decreased during the pandemic (43.3%) and the least decline was seen in the rate of falls-related MFTs (27%).

According to the age groups, MFTs related to violence and/or assaults most frequently occurred in the 21-64 years age group and decreased in this age group during the COVID-19 pandemic, compared to the previous year. The increased social distancing and reduced social gatherings during the pandemic may have played a role in the decreased number of assaults-related MFTs. On the other hand, alcohol consumption is common in most violent acts [32]. During the lockdown, the Turkish government implemented an alcohol sales ban, which may have decreased the violent acts.

The higher rate of MFTs related to home accidents can be explained by the fact that individuals spent much more time at home and less time outside. In addition, those who were living in crowded settings may have experienced much more home accidents, such as falls, as reported in the literature [17]. Increased domestic violence and self-destruction may contribute to the increased rates [33]. Also, a higher perceived risk to COVID-19 infection may aggravate anticipatory fear and anxiety which affects mental health and makes individuals more aggressive and irritable during the crisis [18].

There are some limitations to this study. First, different pandemic restrictions were implemented according to age groups in our country and, therefore, we included broad age groups such as 0-20, 21-64, and ≥65 years. Second, the education, employment or retirement status were unable to be evaluated. On the other hand, the main strength of the present study is that it evaluated etiological factors of MFTs according to the age groups during the COVID-19 pandemic. In addition, the rate of COVID-19 infection was examined in the operated cases in the emergency setting.

In conclusion, COVID-19 pandemic-mandated social restrictions lead to a decrease in the number of MFTs. The home accidents are the main cause of MFTs, while the rate of MFTs occurring in the workplace remain unchanged. Based on these findings, we believe that the spread of COVID-19 infection in the hospital setting can be minimized with necessary precautions. The present study may be a useful guide for ED admissions of MFT cases and management planning in the future pandemics.

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Compliance with the Ethical Standards

Ethical Approval: The study protocol was approved by the Marmara University, Faculty of Medicine, Ethics Committee with the Approval No. 09.2020.540 in May 20th, 2020. A written informed consent was obtained from each participant. The study was conducted in accordance with the principles of the Declaration of Helsinki.

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