

How Did the Restrictions Effect the Orthopaedic Trauma Surgery During Covid-19 Pandemic at a Level 1 Tertiary Trauma Hospital?

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Abstract

Background

The aim of the study was to evaluate and compare the demographic characteristics, the trauma mechanism, and fracture types between patients under 20 years of age, 20-65 years of age, and over 65 years of age between the COVID-19 pandemic and the pre-pandemic period.

Methods

Patients who were hospitalized and treated for orthopedic treatment between 10 March and 1 June during the pandemic period were retrospectively analyzed. Control group consisted of patients admitted to the hospital in the same time interval in 2019. The patients were divided into three groups, under 20 years of age, between 20-65 years of age, and over 65 years of age. The patients' data included age, gender, trauma mechanism, fracture type, any COVID-19 radiological or clinical symptoms.

Results

The number of patients > 65 years old admitted to orthopaedic trauma center were high at pandemic interval compared to pre-pandemic time. When the groups were compared for patients of 20-65 years old; there was a significant difference for the fracture type ($p < 0.05$). Lower extremity fractures were high at pre-pandemic group whereas multiple traumas were high at pandemic group. For sub-group 20-65 ages, low energy traumas were higher at pre-pandemic group whereas high energy traumas were more frequent at pandemic group.

Conclusion

We observed a decrease in fracture admission to orthopaedic trauma centers during COVID-19 pandemic for subgroups of < 20 years old and 20-65 years old ages, whereas there was a significant increase for > 65 years old age, most of them related to the osteoporotic hip fractures. So that older age group should be encouraged to mobilized at home and have permission to walk and make physical activity to avoid osteoporosis for a limited time daily.

Background

Coronavirus disease (COVID-19) is a severe acute respiratory syndrome determined by the new coronavirus, which was declared a pandemic by the World Health Organization on March 11, 2020 [1]. On March 11, 2020, the first reports were officially announced in Turkey, Since March 10, the Turkish Health Ministry assigned all private and public state and university hospitals as pandemic hospitals. By June 1, the normalization was proposed by the government and all organisations were returned to pre pandemic time by care of using masks, hygiene and social distance.

As this was a new kind of virus infection, there was no specific treatment protocol, vaccine or drug, so most countries formed their own protocols and have implemented strict control measures to limit the flow of people, including city blockades, traffic control, strict access to the community, and self-isolation at home [2]. Sufficient evidence has demonstrated higher morbidity and mortality rates in elderly patients infected with COVID-19 [3, 4]. The Turkish Ministry of Health took strict nationwide measures to limit the movement and travel of people and strengthened protective measures. The spread of the epidemic was effectively prevented. In Turkey, one of the most popular protective strategies was the restriction of people older than 65 years old and younger than 20 years old. This was due to the high mortality rates in the older age group, and as the younger age group is mostly asymptomatic, they constitute a greater risk when in contact with older individuals [5]. One of the restrictions implemented was to avoid mobility of the population groups aged > 65 years old as the older group tends to have many comorbidities that could be life-threatening in this pandemic. In addition, there is an increased concern that the elderly might be at a higher risk of falls and related fractures, due to the higher prevalence of osteopenia and osteoporosis in the elderly [6, 7].

In this retrospective single centre study, the data were analyzed of hospitalized orthopaedic trauma patients who were admitted to our trauma center during the COVID-19 pandemic and compared with the same time interval before pandemic. The primer aim of the study was to compare the demographic characteristics, the trauma mechanism, and fracture types mechanism between pre-pandemic and pandemic restriction time intervals that included groups of younger than < 20 years old, 20–65 years old and older than aged > 65 years old.

Methods

This epidemiological retrospective cohort study was carried out in compliance with the principles outlined in the Declaration of Helsinki and also approved by the Local Ethics Committee of Turkish health directorate (2020-05-11T21-38-53). The pandemic group consisted of patients receiving treatment in the 10-week period from 10 March to June 1 2020. The control cohort named as pre-pandemic group consisted of patients from the same time of year in the past year (from 10 March to June 1 2019). Inclusion criteria of the present study were as follows; 1. Patients diagnosed and hospitalized with a fracture at the same time interval, 2. Patients willing to participate the study. Exclusion criteria were as follows; pathological fractures due to metastatic or primary bone tumors, patients unwilling to participate in the study, old fractures, and patients with incomplete medical data.

The same time interval was used for the comparison of both groups which was 83 days. The data of patients were gathered from the digital archive. All patient data were collected by an orthopaedic resident, who was not involved in the study. The data included age, gender, trauma mechanism, affected side, fracture location, any COVID-19 radiological or clinical symptoms. The primary outcomes consisted of differences between the pandemic and pre-pandemic groups in terms of fracture type, fracture mechanism, restriction related admissions to orthopaedic trauma center.

Patients were sub-grouped according to age: Group 1; 0–20 years, Group 2; 20–65 years, Group 3; >65 years. The grouping was made on the rationale of the < 20 years and > 65 years age groups being in isolation at home.

The fractures were divided into three groups; upper extremity, lower extremity or multiple trauma. The trauma mechanism was classified as low-energy and high-energy. Low-energy trauma is defined as a simple fall, and high-energy trauma as a fall from height, traffic accident, and firearms injuries. Lower extremity fractures were defined as proximal femur, diaphyseal femur, distal femur, proximal tibia, tibia diaphysis, distal tibia, foot fractures. Upper extremity fractures were defined as humerus, radius-ulna and hand fractures. Multiple trauma was defined as serious injury to two or more regions of the body (head, thorax, abdomen and extremities).

Statistical Analysis

Data obtained in the study were analyzed statistically using IBM SPSS vn. 22.0 software. The Chi-square test and Continuity Correction (Yates) were applied in the evaluation of the data. A value of $p < 0.05$ was accepted as statistically significant.

Results

Evaluation was made of a total of 458 patients included 300 (% 65.5) of pre-pandemic time and 158 (%34.5) of pandemic time of restriction, comprising 267 (58.3%) males and 191 (41.7%) females with a mean age of 44.55 ± 27.61 years (range, 1-102 years) (Table 1).

Table 1
Demographic distribution of the patients

		Min-Max	Mean ± SD
Age (years)		1-102	45.61 ± 30.32
		n	%
Gender	Male	267	58.3
	Female	191	41.7
Comorbidities	No	269	58.7
	Yes	189	41.3
Covid-19	Negative	125	79.1
	Positive	33	20.9
Fracture type	Lower extremity	302	65.9
	Multiple trauma	21	4.6
	Upper extremity	135	29.5
Fracture mechanism	Low energy	362	79
	High energy	96	21

A statistically significant difference was determined between the pre-pandemic and pandemic group in respect of age ($p < 0.05$). The number of patients younger than < 20 and between $20-65$ years old were higher at pre-pandemic time whereas the number of patients > 65 years old were high at pandemic time compared to pre-pandemic time. There was no statistically significant difference between the pandemic and pre-pandemic groups with respect to the gender ($p > 0.05$) (Table 2).

Table 2
Age and Gender Assessment According to groups

		Before Pandemic	Post Pandemic	P
		n; %	n; %	
Age	< 20 age	109; 36.3	45; 28.5	0.001**
	20–65 age	151; 50.3	64; 40.5	
	> 65 age	40; 13.3	49; 31	
Gender	Male	172; 57.3	95; 60.1	0.564
	Female	128; 42.7	63; 39.9	
<i>Chi-Square test *p < 0.05</i>				

There was no statistically significant difference for the fracture type between the pre-pandemic and pandemic groups at patients younger than 20 years old ($p > 0.05$). When the groups were compared for patients of 20–65 years old; there was a significant difference for the fracture type ($p < 0.05$). Lower extremity fractures were high at pre-pandemic group whereas multiple trauma was high at pandemic group. There was no difference for the upper extremity fractures between the groups ($p > 0.05$). There was no statistically significant difference for the fracture type between the pre-pandemic and pandemic groups at patients older than 65 years old ($p > 0.05$) (Table 3).

Table 3
Fracture Type Assessment according to the age sub-groups

Fracture Type		Before Pandemic	Post Pandemic	P
		n; %	n; %	
< 20 Age	Lower Extremity	41; 37.6	13; 28.9	0.264
	Polytrauma	7; 6.4	1; 2.2	
	Upper Extremity	61; 56	31; 68.9	
20–65 Age	Lower Extremity	118; 78.1	44; 68.8	0.033*
	Polytrauma	5; 3.3	8; 12.5	
	Upper Extremity	28; 18.5	12; 18.8	
> 65 Age	Lower Extremity	38; 95	48; 98	0.442
	Polytrauma	-	-	
	Upper Extremity	2; 5	1; 2	
<i>Chi-Square test was used *p < 0.05</i>				

There was no statistically significant difference for the mechanism of fracture between the pre-pandemic and pandemic groups at patients younger than 20 years old ($p > 0.05$). There was a statistically significant difference for the mechanism of fracture between the pre-pandemic and pandemic groups for patients between 20–65 years old ($p < 0.01$). Low energy traumas were higher at pre-pandemic group whereas high energy traumas were more frequent at pandemic group. There was no statistically significant difference for the mechanism of fracture between the pre-pandemic and pandemic groups for patients older than 65 years old ($p > 0.05$) (Table 4).

Table 4
Evaluation of Trauma Mechanism according to the age sub-groups

	Trauma Mechanism	Before Pandemic	Post Pandemic	P
		n; %	n; %	
< 20 Age	Low Energy	81; 74.3	39; 86.7	¹ 0.142
	High Energy	28; 25.7	6; 13.3	
20–65 Age	Low Energy	123; 81.5	30; 46.9	² 0.001**
	High Energy	28; 18.5	34; 53.1	
> 65 Age	Low Energy	40; 100	49; 100	³ 1.000
	High Energy	-	-	

¹Continuity Correction (Yates) test ²Chi-Square test ** $p < 0.01$

Table 5
COVID-19 distribution in pandemic group

Pandemic group	< 20 Age (n = 45)	20–65 Age (n = 64)	> 65 Age (n = 49)	P
	n; %	n; %	n; %	
Lower Extremity	13; 28.9	44; 68.8	48; 98	0.001**
Polytrauma	1; 2.2	8; 12.5	0; 0	
Upper Extremity	31; 68.9	12; 18.8	1; 2	0.001**
Low Energy Trauma	39; 86.7	30; 46.9	49; 100	
High Energy Trauma	6; 13.3	34; 53.1	0; 0	0.001**
COVID-19 (-)	45; 100	51; 79.7	29; 59.2	
COVID-19 (+)	0; 0	13; 20.3	20; 40.8	

Chi-Square test was used ** $p < 0.01$

A statistically significant difference was determined between the age groups in respect of COVID-19 status ($p < 0.001$). The frequency of COVID-19 positivity was significantly higher in the > 65 years age group compared to the other two groups and was higher in the 20–65 years age group than in the 0–20 years group (Table-5).

Discussion

The main finding of the present study was that admissions of patients older than 65 years old to the orthopaedic trauma center were increased although there was a global decrease during the COVID-19 pandemic. Most of the fractures were low extremity fractures, especially pertrochanteric fractures seen in the older age group. Multiple trauma was seen in patients with no restrictions on movement.

When the groups for compared according to the admission to the hospital, there was a significant decrease during pandemic time. We believed that this was a result of decreased human mobility outside in order to prevent the spread of virus as recommended by Turgut et al.[8]. The decrease was approximately 52.6% of the pre-pandemic time. Turgut et al. stated that the decrease was one-third of the pre-pandemic time, and in another study Bram et al.[9] concluded that the pediatric fracture volume had decreased 2.5 fold during the COVID-19 pandemic. The decrease in our study was comparable to the literature, as we included the patients that were interned for surgical operations, because during pandemic time we only admitted the patients with surgical indications from the area. Our results also confirmed the outcomes of Bram et al. But when the groups were compared with regard to the patients older than 65 years old, there was a significant difference, the admission was significantly higher at pandemic time ($p < 0.05$). This can be considered due to osteoporosis, and comorbidities that could result in hypotension in the older age group. Physical activity is a factor as there is ample epidemiological evidence linking inactivity to increased risk of hip fracture [10, 11]. Atik et al.[12] stated that osteoporosis was a real burden of older age hip fractures and importance of awareness and diagnosis of the disease was highlighted. The requirement for the > 65 years age groups to stay at home during the pandemic may have increased the rate of osteoporotic hip and pertrochanteric femur fractures. To prevent these fractures, the older age group should be encouraged to be mobile and be physically active at home.

When the fracture types were compared between the groups, there was no significant difference between the groups for subgroups of < 20 years old age and > 65 years old age. But when the fracture types of subgroups 20–65 years old age were compared, at pandemic group the multiple trauma was more significant whereas lower extremity fractures were more significant at pre-pandemic period. Together with the cessation of work and production, the mobility of the population will decrease and there will be an inevitable decrease in fractures resulting from traffic accidents and workplace accidents [13]. We believed that the significant increase of the multiple trauma patients were due to the fact that the surrounding hospitals limited patient acceptance and the fractures requiring surgery and intensive care were directed to our hospital could cause this increase. The number of hospital admissions and surgical procedures for the treatment of lower limbs were higher in pre-pandemic group, whereas this was

decreased during COVID-19 pandemic, this was due to the reductions seen across all causes of trauma including sports, traffic, industrial and domestic as recommended by Wong et al[14].

When the sub-groups were compared due to the COVID-19 (+), most of the COVID-19 (+) fractures were in the older age group (> 65 years), which could be attributed to the comorbidities of the elderly, low socio-economic status living together with more than 5 people or in small flats, and lack of awareness of social distancing. However, there was only one COVID-19 (+) patient in 20–65 age group, who was a polytrauma case. The patients in this age group were all of working age, and were working through the pandemic, and all stated that they used surgical masks, washed their hands frequently, and were careful about social distancing.

When the groups were compared due to the trauma mechanism. There was no significant difference for < 20 years old age and > 65 years old age sub-groups at both groups, but high energy traumas were significantly higher at pandemic group for 20–65 years old age sub-groups. We believed that this was due to the restriction of outdoor mobility, closing of work areas, restrictions of sportive activity areas, so that this age group whom were at working age could be injured to higher energy traumas which result in multiple traumas as seen in the present study.

The present study has several limitations. Firstly it was a retrospective designed study, secondly it was from a single centre, finally the outpatient admissions that were treated conservatively were not included in the study due to the lack of datas.

Conclusion

The COVID-19 pandemic has changed the routine of all hospitals. We observed a decrease in fracture admission to orthopaedic trauma centers during COVID-19 pandemic for subgroups of < 20 years old and 20–65 years old ages, whereas there was a significant increase for > 65 years old age. So that older age group should be encouraged to mobilized at home and have permission to walk and make physical activity to avoid osteoporosis for a limited time daily.

Abbreviations

COVID
Coronavirus Disease

Declarations

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Contributions

All authors have a substantial contribution in the study design, data interpretation and writing and reviewing the manuscript. The authors read and approved the final manuscript.

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Ethics declarations

Ethics approval and consent to participate

This epidemiological retrospective cohort study was carried out in compliance with the principles outlined in the Declaration of Helsinki and also approved by the Local Ethics Committee of Turkish health directorate (2020-05-11T21-38-53)

Consent for publication

Not applicable.

Competing interests

The authors declare no conflict of interest.

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