

How did restrictions mandated by the COVID-19 pandemic affect the performance of orthopedic trauma surgery in a Level-1 tertiary trauma hospital?

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ABSTRACT

BACKGROUND: This present study was designed to evaluate the effect of restrictions on fracture admission to a Level-I tertiary trauma hospital between COVID-19 pandemic and pre-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: 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 and 65 years of age, and over 65 years of age. The patients' data included age, gender, trauma mechanism, fracture type, and any COVID-19 radiological or clinical symptoms.

RESULTS: The number of patients >65-years-old admitted to the orthopedic trauma center was high at pandemic intervals 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 the pandemic group.

CONCLUSION: We observed a decrease in fracture admission to orthopedic 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 mobilize at home and have permission to walk and make physical activity to avoid osteoporosis for a limited time daily.

Keywords: COVID-19; fracture; orthopaedics; osteoporosis; pandemic.

INTRODUCTION

Coronavirus disease-19 (COVID-19) is a severe acute respiratory syndrome caused by a new coronavirus and was declared a pandemic by the World Health Organization on March 11, 2020,^[1] the day on which the first cases were officially announced in Turkey. On March 10, 2020, the Turkish Health Ministry designated all private and public state and university hospitals as pandemic hospitals.^[2] On June 1, 2020, this des-

ignation was lifted and all hospitals returned to pre-pandemic operations, but the use of masks was mandated, as were careful hygiene and social distancing. No specific virus treatment, vaccine, or drug is yet available; most countries strictly limit human association by quarantining cities, controlling traffic, limiting community activities, and imposing home self-isolation.^[3] Elderly patients infected with COVID-19 are at higher risk than others.^[4,5] The Turkish Ministry of Health imposed strict nationwide measures to limit people's movement. Viral

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spread was effectively prevented. A very valuable protective strategy was the prohibition of contact between those aged over 65 years and those younger than 20 years; the elderly were at high risk of mortality and younger people (mostly asymptomatic) were at risk of transferring the virus to older individuals.^[6]

Osteoporosis is the most common bone disorder; it is associated with low bone mass and strength, and microarchitectural deterioration. Coughlan and Dockery reported that 40% of women and 20% of men aged over 50 years will experience an osteoporosis-related fracture, of which hip fracture is the most devastating.^[7] Weight-bearing exercises (such as walking) are important to maintain the bone mineral density (BMD) of the hips and lower extremities. Thus, when the mobility of older persons is restricted (when they were confined to their homes during the pandemic), the BMD may have fallen, increasing the incidence of serious hip fractures. Persons aged >65 years were told to self-isolate because their comorbidities increased the risk of a life-threatening viral infection. Furthermore, their higher frequencies of osteopenia and osteoporosis increased the risk of falls and related fractures.^[8,9]

In this retrospective single-center study, we reviewed the data on hospitalized, orthopedic trauma patients admitted to our trauma center (in a Level-I tertiary trauma hospital) during the pandemic compared to those admitted over the same time interval before the pandemic; we divided patients into those aged <20 years, 20–65 years, and >65 years.

MATERIALS AND METHODS

This epidemiological, retrospective cohort study adhered to the principles of the Declaration of Helsinki and was approved by the Local Ethics Committee of the Turkish Health Directorate (approval no. 2020-05-11T21-38-53). The pandemic group was treated in the 10-week period from 10 March to June 1, 2020 (83 days). The pre-pandemic group was treated from 10 March to June 1, 2019 (also 83 days). The inclusion criteria were hospitalization with a fracture and a willingness to participate. The exclusion criteria were fractures caused by metastatic or primary bone tumors, an unwillingness to participate, re-fracture of old fractures, and incomplete medical data. All data were retrieved from our digital archive by an orthopedic resident who was not involved in the study. The data included age, gender, the cause of trauma, the affected side, fracture location, and any COVID-19 radiological or clinical symptoms. The primary outcomes were the differences between the two groups in terms of fracture type and mechanism, and restriction-related admissions. Patients were subgrouped by ages of 0–20 years, 20–65 years, and >65 years (Groups 1–3 respectively). Groups 1 and 3 were in mandatory home isolation. Fractures were divided into upper or lower extremity, or multiple, fractures. Trauma was classified as low or high energy (thus a simple fall; or a fall from height, a traffic

accident, or a firearms injury). Lower-extremity fractures were those of the proximal, diaphyseal, or distal femur; the proximal or distal tibia; the tibia diaphysis; and the foot. Upper-extremity fractures were those of the humerus, radius/ulna, or hand. Multiple trauma was defined as a serious injury to two or more of the head, thorax, abdomen, and extremities.

Statistical Analysis

All data were analyzed with the aid of IBM SPSS ver. 22.0 software. We employed the Chi-squared test with the Yates' continuity correction. $P < 0.05$ was considered to reflect statistical significance.

RESULTS

We evaluated 458 patients including 300 (65.5%) pre-pandemic and 158 (34.5%) pandemic patients (267 [58.3%] males and 191 [41.7%] females of mean age 44.55 ± 27.61 years [range 1–102 years]) (Table 1). Age differed significantly between the two groups ($p < 0.05$). The proportions of patients aged <20 and 20–65 years were higher in the pre-pandemic group, whereas the proportion aged >65 years was higher in the pandemic group. We found no between-group gender difference ($p > 0.05$) (Table 2). For those aged <20 years, we found no between-group difference in the fracture type ($p > 0.05$). For those aged 20–65 years, a significant difference was apparent ($p < 0.05$). Lower-extremity fractures were more common in the pre-pandemic group and multiple traumas

Table 1. Demographic distribution of the patients

	Min–Max	Mean±SD	n	%
Age (years)	1–102	45.61±30.32		
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

Min: Minimum; Max: Maximum; SD: Standard deviation; COVID-19: Coronavirus disease-19.

Table 2. Age and gender assessment according to groups

	Before pandemic	Post pandemic	p
	n (%)	n (%)	
Age			
<20	109 (36.3)	45 (28.5)	0.001**
20–65	151 (50.3)	64 (40.5)	
>65	40 (13.3)	49 (31)	
Gender			
Male	172 (57.3)	95 (60.1)	0.564
Female	128 (42.7)	63 (39.9)	

**Chi-square test.

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)	

Chi-square test was used. *P<0.05.

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)	0.142
High energy	28 (25.7)	6 (13.3)	
20–65 age			
Low energy	123 (81.5)	30 (46.9)	0.001**
High energy	28 (18.5)	34 (53.1)	
>65 age			
Low energy	40 (100)	49 (100)	1.000
High energy	–	–	

1Continuity Correction (Yates) test, 2Chi-square test, **p<0.01.

were more common in the pandemic group. The upper-extremity fracture rates did not differ between the two groups ($p>0.05$). The fracture types of patients >65 years did not differ between the two groups ($p>0.05$) (Table 3). The cause of fracture in those aged <20 years did not differ between the two groups ($p>0.05$). For those aged 20–65 years, a significant between-group difference was apparent ($p<0.01$). Low-energy trauma was more common in the pre-pandemic group and high-energy trauma was more common in the pandemic group. The cause of fracture in those aged >65 years did not differ between the two groups ($p>0.05$) (Table 4). COVID-19 status differed significantly by age ($p<0.001$); infection was highest in those aged >65 years and higher in those aged 20–65 than 0–20 years (Table 5).

DISCUSSION

Our main finding is that although admitted patient numbers fell during the pandemic, the proportion of those aged >65 years increased. Most fractures were low-extremity fractures,

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)	
Low energy trauma	39 (86.7)	30 (46.9)	49 (100)	0.001**
High energy trauma	6 (13.3)	34 (53.1)	0 (0)	
COVID-19 (–)	45 (100)	51 (79.7)	29 (59.2)	0.001**
COVID-19 (+)	0 (0)	13 (20.3)	20 (40.8)	

Chi-square test was used. **P<0.01. COVID-19: Coronavirus disease-19.

especially pertrochanteric fractures that are common in the elderly. Multiple traumas were evident in patients whose movements were not restricted. The numbers admitted fell (by approximately 52.6%) during the pandemic (compared to the same period the previous year); fewer people left home. Turgut et al.^[10] reported a decrease of 66% and Bram et al.^[11] reported a pediatric decrease of 60%. Our decrease was comparable; although we normally receive patients from a wide catchment, we treated only local patients during the pandemic. Our results also confirmed those of Bram et al. However, a significantly higher proportion of patients aged >65 years were admitted during the pandemic ($p < 0.05$) because of fractures caused by osteoporosis; many also had hypotension. Ample epidemiological evidence links inactivity to an increased risk of hip fracture.^[12,13] There is also an association between sarcopenia, osteoporosis, and the risk of hip fracture.^[14] Staying at home and inactivity of those aged >65 years age during the pandemic may have increased the rates of osteoporotic hip fractures. For these reasons, those of older age with fragile bones should be encouraged to remain mobile and physically active.^[15]

We found no between-group difference in fracture type in those aged <20 and >65 years. In those aged 20–65 years, multiple traumas were more common in the pandemic group, but lower-extremity fractures were more common in the pre-pandemic group. When outside work ceased, population mobility decreased, as did traffic and workplace accidents.^[16] We believe that the significant increase in multiple trauma patients was attributable to the fact that local hospitals were overstretched and thus sent patients with fractures requiring surgery and intensive care to us. The proportion of patients admitted for lower-limb fractures requiring surgery was higher in the pre-pandemic time; during the pandemic, trauma caused by sporting activities, and traffic, industrial, and domestic accidents, fell (Wong and Cheung).^[17]

Most patients with fractures and viral infections were aged >65 years, had comorbidities, were of low socioeconomic status (living with more than five others or in a small flat), and did not engage in social distancing. Only one COVID-19-positive patient was aged 20–65 years (a polytrauma case). All patients in this age group worked through the pandemic; all stated that they used surgical masks, washed their hands frequently, and engaged in social distancing. In terms of trauma cause, no significant between-group difference was apparent for those aged <20 and >65 years, but those aged 20–65 years exhibited significantly more high-energy traumas during the pandemic, despite the fact that outdoor activities were curtailed, and workplaces and sports centers closed. The risks of high-energy trauma were thus reduced; however, as stated above, more patients than usual were referred from other hospitals.

Our work had several limitations. This was a retrospective single-center study, and outpatients who were treated conservatively were not included.

Conclusion

The proportions of patients aged <20 and 20–65 years with fractures admitted to our orthopedic trauma center fell during the pandemic compared to before the pre-pandemic, but the proportion of those aged >65 years rose. Older persons should be encouraged to be mobile at home and should be allowed to walk outside and engage in physical activity (to avoid sarcopenia and osteoporosis) for a limited period every day.

Ethics Committee Approval: This epidemiological retrospective cohort study was carried out in compliance with the principles outlined in the Declaration of Helsinki and also approved by the Health Sciences University İstanbul Kanuni Sultan Süleyman Training and Research Hospital, Clinical Research Ethics Committee (2020-05-11T21-38-53).

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ORİJİNAL ÇALIŞMA - ÖZET

COVID-19 salgını sırasındaki kısıtlamalar üçüncü basamak travma hastanesinde ortopedik travma ameliyatlarını nasıl etkiledi?

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AMAÇ: Bu çalışmanın amacı, birinci düzey üçüncü basamak travma hastanesinde 20 yaş altı, 20–65 yaş ve 65 yaş üstü hasta grupları için kısıtlamaların, COVID-19 pandemisi ve pandemi öncesi dönem arasındaki kırık başvurusu üzerindeki etkisini değerlendirmek amacıyla tasarlanmıştır.

GEREÇ VE YÖNTEM: Pandemi döneminde 10 Mart–1 Haziran tarihleri arasında ortopedik tedavi için hastaneye kaldırılan ve tedavi edilen hastalar geriye dönük olarak incelendi. Kontrol grubu, 2019 yılında aynı zaman aralığında hastaneye başvuran hastalardan oluşturuldu. Hastalar 20 yaş altı, 20–65 yaş ve 65 yaş üstü olmak üzere üç gruba ayrıldı. Hastaların verileri yaş, cinsiyet, travma mekanizması, kırık tipi, herhangi bir COVID-19 radyolojik veya klinik semptomu içeriyordu.

BULGULAR: Ortopedik travma merkezine başvuran 65 yaş üstü hasta sayısı pandemik aralıkta pre-pandemi zamanına göre yüksekti. Gruplar 20–65 yaş grubu hastalarla karşılaştırıldığında; kırık tipi açısından anlamlı fark vardı ($p < 0.05$). Pandemi öncesi grupta alt ekstremitte kırıkları yüksek, pandemik grupta ise çoklu travmalar yüksekti. 20–65 yaş alt gruplarında düşük enerjili travmalar pandemi öncesi grupta daha yüksek, yüksek enerjili travmalar pandemi grubunda daha sıkı.

TARTIŞMA: COVID-19 pandemisi sırasında ortopedik travma merkezlerine kırık başvurusunda 20 yaş altı ve 20–65 yaş alt gruplarında azalma, 65 yaş ve üzeri için önemli bir artış görülürken, çoğu osteoporotik kalça kırıkları ile ilişkilidir. Bu nedenle ileri yaş grubu, osteoporozdan kaçınmak için her gün sınırlı bir süre için evde harekete geçmeye ve yürüme ve fiziksel aktivite yapma iznine sahip olmaya teşvik edilmelidir.

Anahtar sözcükler: COVID-19; kırık; ortopedi; osteoporoz; pandemi.

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