

# Hip Fracture Following a Fall among Older Adults during the COVID-19 Pandemic

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## ABSTRACT

**Background:** Little is known regarding the impact of the coronavirus disease-2019 (COVID-19) pandemic on the incidence of hip fractures among older adults

**Objectives:** To compare the characteristics of patients with a hip fracture following a fall during the COVID-19 pandemic year and during the preceding year.

**Methods:** We conducted a retrospective cohort study of older patients who had undergone surgery for hip fracture repair in a major 495-bed hospital located in northern central Israel following a fall. Characteristics of patients who had been hospitalized in 2020 (pandemic year, n=136) and in 2019 (non-pandemic year, n=151) were compared.

**Results:** During the pandemic year, patients were less likely to have fallen in a nursing facility, to have had muscle or balance problems, and to have had a history of falls and fractures following a fall. Moreover, the average length of stay (LOS) in the hospital was shorter; however, the average time from the injury to hospitalization was longer. Patients were less likely to have acquired a postoperative infection or to have died. During the pandemic year, postoperative infection was only associated with prolonged LOS.

**Conclusions:** The COVID-19 pandemic may have had a positive impact on the behavior of older adults as well as on the management of hip fracture patients. However, healthcare providers should be aware of the possible reluctance to seek care during a pandemic. Moreover, further research on the impact of the change in management during COVID-19 on hip fracture survival is warranted.

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**KEY WORDS:** coronavirus disease-2019 (COVID-19), falls, hip fracture, older adults, pandemic

Falls are common among older adults and are the major cause of hip fractures [1-3], causing significant morbidity and mortality [4-6]. Risk factors for falls that result in hip fractures sustained in the older adult's home include older age, being female, impaired balance, decreased muscle strength, gait disorders, decreased visual acuity, cognitive impairment, dizziness, and use of sedative-hypnotics and antihypertensives [1,7,8]. Moreover, several studies have examined potential risk factors for falls that

result in a hip fracture in nursing facilities. An Australian study found that falls that resulted in a hip fracture were associated with being older, being ambulant, having dementia, and having a high fall-risk assessment. In addition, organizational and environmental factors were also found to play a role in the occurrence of falls [9]. In a German study, serious falls (including those that resulted in a hip fracture) were associated with being older, being female, and being less likely to require assistance with activities of daily living. In addition, certain activities (walking compared to transferring) were also associated with serious falls [10,11].

Little is known regarding the impact of the COVID-19 pandemic on the incidence of hip fractures among older adults [12,13]. One study reported that osteoporotic hip fractures maintained their incidence during the pandemic [14]. Then again, it could also have been expected that the incidence of falls among older adults, including those that resulted in a hip fracture, would have diminished during the pandemic, if only because during the pandemic older adults may have tended to avoid situations that might lead to falls [15]. Thus, it may also be assumed that during the pandemic, characteristics of patients with a hip fracture following a fall may have changed. Understanding the impact of the COVID-19 pandemic on falls that result in a hip fracture among older adults may help better prepare healthcare systems for treating hip fracture patients during similar crisis periods.

The aim of this study was to compare the characteristics of patients presenting with a hip fracture following a fall during the pandemic year and the year that preceded the pandemic. In addition to providing information about falls that resulted in a hip fracture among older adults during the pandemic, such a comparison may also provide information regarding the impact of the pandemic on the management of these patients by the orthopedic department.

## PATIENTS AND METHODS

We conducted a retrospective cohort study of older patients who presented with hip fracture following a fall and who underwent surgery for hip fracture repair in a major 495-bed hospital located in northern central Israel. We compared patients who had been hospitalized in 2019, that is, during the year preceding the

pandemic, and patients who were hospitalized in 2020, that is, during the pandemic.

The study was approved by the institutional Helsinki Committee. Inclusion criteria were patients aged 65 years and older admitted with a hip fracture following a fall who underwent surgery for hip fracture repair. In addition, since the first cases of COVID-19 in Israel were reported in February 2020, for the purposes of the present study the pandemic year was considered as the period between February 2020 and December 2020. Hence, patients with hip fracture who were hospitalized during this period were considered patients hospitalized during the pandemic year. The matching period between February 2019 to December 2019 was considered the year preceding the pandemic, or the non-pandemic year. In total, 287 cases of hip fracture following a fall were included, of which 151 occurred in 2019 and 136 in 2020.

The following data were collected from the patient medical records:

1. Socio-demographic characteristics
2. Clinical characteristics such as cognitive function, co-morbidities, number of regular medications, use of certain medications (especially antihypertensives, benzodiazepines, and selective serotonin reuptake inhibitors [SSRIs]), and laboratory results
3. History of falls and of fractures following a fall
4. Characteristics of the fall, including circumstances and scenario
5. Characteristics related to the hospital stay, including time from injury to hospitalization, length of stay (LOS), postoperative complications, mortality

## STATISTICAL ANALYSIS

Statistical analyses were performed using IBM Statistical Package for the Social Sciences statistics software, version 25 (SPSS, IBM Corp, Armonk, NY, USA). Chi-square tests (for categorical data) and *t*-tests for independent samples (for continuous variables) were used to compare patients admitted during the pandemic year and patients admitted during the year that preceded the pandemic. In addition, logistic regression analysis was conducted to identify predictors of LOS in both years. For all analyses, a level of significance of  $P < 0.05$  was considered statistically significant.

## RESULTS

No differences were found between the pandemic year and the year that preceded the pandemic in the socio-demographic characteristics of patients with a hip fracture following a fall. Most of the patients were, on average, 80 years old, female, married, with an average of three children, and of Jewish nationality. However, patients in the pandemic year were less likely to have been residents of a nursing facility (8.8% vs. 25.8%, chi-square = 14.15,  $df = 1$ ,  $P < 0.01$ ) [Table 1].

**Table 1.** Socio-demographic characteristics of patients with a hip fracture following a fall: non-pandemic year (2019) vs. pandemic year (2020)

Variable	Non-pandemic year 2019, n=151			Pandemic year 2020, n=136			P value
	n	%	Mean $\pm$ SD	n	%	Mean $\pm$ SD	
Age, years			82.3 $\pm$ 7.9			80.5 $\pm$ 8.58	0.29
Gender							
Male	51	33.8%		44	32.4%		0.79
Female	100	66.2%		92	67.6%		
Nationality							
Jews	111	73.5%		102	75%		0.76
Arabs	34	28.5%		34	25%		
Marital status							
Single	4	2.6%		4	2.9%		0.33
Married	68	45%		73	53.7%		
Divorced	13	8.6%		14	10.3%		
Widowed	66	43.7%		45	33.1%		
Number of children							
			2.77 $\pm$ 2.66			3.1 $\pm$ 2.81	0.62
Place of residence							
Home	112	74.2%		124	91.2%		0.01
Nursing facility	39	25.8%		12	8.8%		

SD = standard deviation

As shown in Table 2, during the pandemic year, patients with a hip fracture following a fall were less likely to have muscle (18% vs. 47.2%) or balance problems (32.3% vs. 49.5%). In addition, they were less likely to have a history of falls (33.1% vs. 78.1%) and of fractures following a fall (11.8% vs. 28.5%). In contrast, no difference was found between the pandemic year and the year that preceded the pandemic in the prevalence of cognitive impairment, number of regular medications, hemoglobin level, or use of benzodiazepines or SSRIs among patients with a hip fracture following a fall. Thus, most patients had preserved cognition, took four regular medications on average, while approximately 20% of them took benzodiazepines and SSRIs, and they had an average hemoglobin level of 12 g/dl.

Moreover, as shown in Table 2, during the pandemic year, patients with a hip fracture following a fall were more likely to fall in their home (84.6% vs. 65.6%), and less likely to fall outside their home (15.4% vs. 34.4%). In addition, during the pandemic year, falls that resulted in a hip fracture were more likely to be a result of slipping (59.6% vs. 10.6%), and less likely to be a result of tripping (38.2% vs. 74.2%) or falling from a height (2.2% vs. 15.2%).

**Table 2.** Medical characteristics of patients with a hip fracture following a fall: pandemic year (2020) vs. non-pandemic year (2019)

Medical characteristics		Non-pandemic year 2019, n=151			Pandemic year 2020, n=136			P value
		Mean ± SD	n	%	Mean ± SD	n	%	
Cognitive function	Preserved cognition		104	81.9%		110	82.7%	0.86
	Impaired cognition		23	18.1%		23	17.3%	
Benzodiazepines	Prescribed		26	22%		20	15%	0.15
Selective serotonin reuptake inhibitors	Prescribed		26	21.7%		29	21.8%	0.97
Hemoglobin level		12.01 ± 1.64			12.14 ± 1.70			0.61
Number of regular medications		4.73 ± 3.21			4.63 ± 3.48			0.10
Balance problems			55	49.5%		43	32.3%	0.01**
Muscle problems			51	47.2%		24	18%	0.01**
History of falls			118	78.1%		45	33.1%	0.01**
History of fractures following a fall			43	28.5%		16	11.8%	0.01**
Scenario of fall	Slipping		16	10.6%		81	59.6%	0.01**
	Tripping		112	74.2%		52	38.2%	
	Falling from a height		23	15.2%		3	2.2%	
Place of fall	Home		99	65.6%		115	84.6%	0.01**
	Outside home		52	34.4%		21	15.4%	

SD = standard deviation

**Table 3.** Characteristics related to hospitalization of patients with a hip fracture following a fall: pandemic year (2020) vs. non-pandemic year (2019)

	Non-pandemic year (2019), n=151			Pandemic year (2020), n=136			P value
	n	%	Mean ± SD	n	%	Mean ± SD	
Length of stay (days)			8.37 ± 5.62			6.7 ± 3.38	0.01**
Time from injury to hospitalization (days)			0.12 ± 0.43			1.73 ± 2.93	0.01**
Postoperative infection	43	28.5%		20	14.7%		0.01**
Death	44	29.1%		26	19.1%		0.04*

SD = standard deviation

As shown in Table 3, during the pandemic year, the average LOS of patients with a hip fracture following a fall was shorter (6.7 days vs. 8.37 days). However, the average time from injury to hospital admission was longer (1.73 days vs. 0.12 days).

During the pandemic year, patients with a hip fracture following a fall were less likely to acquire a postoperative infection (14.7% vs. 28.5%). In addition, during the pandemic year, patients with a hip fracture following a fall were less likely to die (19.10% vs. 29.1%).

Of note, 63 patients with a hip fracture following a fall were diagnosed with COVID-19, while three of them (4.8%) died from COVID-19 while hospitalized. The LOS of patients with a concomitant diagnosis of COVID-19 was shorter (mean 6.79 ± 0.13) than that of COVID-19-negative patients (mean 8.29 ± 0.12,  $t = 2.6$ ,  $df = 196$ ,  $P < 0.0$ )

A linear regression analysis revealed that during the year that preceded the pandemic year, postoperative infection, residing in a nursing facility, and taking SSRIs were associated with prolonged LOS among patients with a hip fracture following a fall. In contrast, during the pandemic year, only postoperative infection was associated with prolonged LOS [Table 4].

## DISCUSSION

In the present study we compared the characteristics of patients with a hip fracture following a fall during the pandemic year and during the year that preceded the pandemic. The study included 136 cases during the pandemic year, while during the year that preceded the pandemic there were 151 cases of hip fractures following a fall. Assuming that the population served by the hos-

**Table 4.** Linear regression of predictors of length of stay following a hip fracture surgery: pandemic year (2020) vs. non-pandemic year (2019)

	Beta	t	P value
<b>Non-pandemic year (2019), n=151</b>			
Postoperative infection	0.547	7.636	< 0.01
Residing in a nursing facility	0.180	2.606	< 0.05
Taking selective serotonin reuptake inhibitors	-0.136	-1.978	< 0.05
<b>Pandemic year (2020), n=136</b>			
Postoperative infection	0.556	7.396	< 0.01
Residing in a nursing facility	-0.024	-0.314	0.754
Taking selective serotonin reuptake inhibitors	-0.004	-0.059	0.953

pital did not change, it seems that during the pandemic year the number of hip fractures following a fall diminished. This finding is consistent with the assumption that during the pandemic year older adults may have not been involved in situations that might lead to falls because of their forced confinement at home [15] and thus minimized their risk of injury.

The research findings suggest differences in the characteristics of older adults who fell and sustained a hip fracture during the pandemic year versus the non-pandemic years. Thus, during the pandemic year, patients with a hip fracture following a fall were less likely to have muscle or balance problems and less likely to have a history of falls and of fractures following a fall. These findings suggest that older adults who were aware of their risk of falling, that is, those with muscle or balance problems and those who have already experienced a fall in the past, may have been more cautious during the pandemic year. A possible reason for this is, once again, intention to minimize the risk of injury and thus minimize their contact with the healthcare system and the risk of exposure to coronavirus.

The research findings reveal that during the pandemic year, patients with a hip fracture following a fall were more likely to fall in their home and less likely to fall outside their home, compared with the non-pandemic year. This finding is expected, as during the pandemic year older adults spent more time in their home due to forced lockdown and isolation.

In addition, during the pandemic year, falls that resulted in a hip fracture were more likely to be a result of slipping and less likely to be a result of tripping or falling from a height, compared with the non-pandemic year. These findings may reflect a possible change in exposure to risk factors for falling due to more time spent at home.

The research findings revealed that during the pandemic year the average time from the injury to admission was longer, compared with the non-pandemic year. This finding suggests that certain older adults may have avoided seeking care following the

injury, probably due to fear of exposure to coronavirus. The reluctance to seek care due to fear of exposure has been described in the literature [16,17]. In the case of hip fracture patients, any delay in seeking care may have a negative impact on survival [18].

The present study reveals that during the pandemic year, patients with a hip fracture following a fall were less likely to be residents of a nursing facility, compared with the non-pandemic year. This finding may possibly reflect efforts by staff at nursing facilities to prevent injuries among the residents to minimize the need for hospitalization and exposure to coronavirus.

Our findings suggest significant changes in the management of hip fracture patients following the COVID-19 pandemic. Thus, during the pandemic year the average LOS of patients with a hip fracture following a fall was shorter. This finding may reflect a change in policy by the orthopedic department, with the aim of minimizing the risk of exposure to coronavirus among vulnerable patients. It is not clear whether shortening the LOS has an impact on patient survival, although this study reveals that during the pandemic year, patients with a hip fracture following a fall were less likely to die, compared with the non-pandemic year. Therefore, further investigation is warranted.

The present study reveals that during the pandemic year, patients with a hip fracture following a fall were less likely to acquire a postoperative infection, compared with the non-pandemic year. This finding may be related to the shorter LOS. There is evidence of an association between prolonged LOS and the incidence of postoperative infections [19].

The present study shows that during the non-pandemic year, postoperative infection, residing in a nursing facility, and taking SSRIs were associated with prolonged LOS of patients with a hip fracture following a fall. Postoperative infection is a known risk factor for prolonged LOS among hip fracture patients [20]. As to taking SSRIs, exposure to SSRIs in the peri-operative period is associated with a higher risk for a range of adverse outcomes, particularly bleeding, which may lead to prolonged LOS [21]. As to residing in a nursing facility, those residents are usually frailer than community dwellers and thus are at a higher risk of complications that prolong the LOS [22]. During the pandemic year, however, only postoperative infection was associated with prolonged LOS. While the reason for this difference in factors associated with LOS is unclear, it suggests a certain impact of the pandemic on the management of hip fracture patients.

In the present study, 63 patients with a hip fracture following a fall were diagnosed with COVID-19, of whom 4.8% died from COVID-19 while hospitalized. Previous studies pointed to a much higher inpatient mortality rate among COVID-19-positive hip fracture patients [23-25]. Moreover, the inpatient mortality rate among COVID-19-positive hip fracture patients in the present study is similar to the previously reported inpatient mortality rate in non-COVID times [13]. The relatively low in-patient mortality rate among COVID-19-positive hip fracture patients in the present study may be attributed to patient characteristics or to the

longer study period and thus better accommodation of the health-care organization to the pressures resulting from the pandemic.

In the present study, the LOS of patients with a concomitant diagnosis of COVID-19 was shorter than that of COVID-19-negative patients. In contrast, in a previous study, the LOS of COVID-19-positive patients was longer [23]. This finding may reflect the local policy involving early hospital discharge of stable COVID-19-positive patients with the aim of minimizing the risk of exposure to coronavirus among other vulnerable patients. However, it is unclear whether such a policy has an impact on the survival of COVID-19-positive patients.

# LIMITATIONS

This study was conducted at a single facility; therefore, the generalizability of the findings is limited. In addition, as the study was a chart review study, the accuracy of the data cannot be confirmed. Moreover, the retrospective research design does not allow establishing cause and effect.

# CONCLUSIONS

The COVID-19 pandemic has had an impact on the behavior of older adults. It seems that older adults are more cautious, especially those who are probably aware of their risk of falling. This can be regarded as a positive effect of the pandemic, as there are fewer injuries among older adults, and as a consequence less burden on the healthcare system. However, there is evidence of possible reluctance among certain older adults to seek care for injuries during the pandemic, and healthcare providers should be aware of this tendency.

The COVID-19 pandemic has had an impact on the management of hip fracture patients by orthopedic departments, reflected in a shortened LOS, a change in factors that affect the LOS, and a lower likelihood of acquiring a postoperative infection. It is possible that these changes are reflected in the policy of the orthopedic department, whose aim was to minimize the risk of exposure to coronavirus among vulnerable patients. The findings suggest that the impact of the pandemic on the management of hip fracture patients was positive, as there is evidence of lower mortality among hip fracture patients during the pandemic year. However, further research is warranted to explore the impact of these changes on the survival of hip fracture patients.

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