



Impact of the COVID-19 pandemic on osteoporotic hip fractures in Chile

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Received: 6 October 2021 / Accepted: 24 May 2022

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Abstract

Summary The study analyzes whether the COVID-19 pandemic affects annual hip fractures (HF) rates and weekly emergency department (ED) consultations and hospitalizations due to trauma in older people. During the COVID-19 pandemic, HF rates and ED consultation and hospitalization rates due to trauma decreased.

Purpose To describe the effect of the COVID-19 pandemic on annual HF rates and weekly ED consultation and hospitalization rates due to trauma in Chile in 2020, compared to 2016–2019.

Methods A retrospective study was conducted based on data from Chile's Department of Statistics and Health Information. Annual HF admissions, weekly ED consultations and hospitalizations due to trauma were described for the years 2016–2020, grouping the years 2016–2019 to compare them with 2020. Rates were calculated per 100.000 inhabitants.

Results From 2016 to 2020, a total of 35.050 patients aged ≥ 65 years were hospitalized in Chile with a diagnosis of HF, with the lowest number of admissions in 2020 (6.423). During 2020, annual HF rate was 273.6/100.000, representing a decrease of 18.5% compared to the average annual HF rate of 2016–2019 (335.7/100.000). In 2020, the weekly consultation rate due to trauma in older adults decreased by 20.8% and the weekly hospitalization rate due to trauma in older adults decreased by 18.5%.

Conclusion During the COVID-19 pandemic, osteoporotic HF rates decreased, along with ED consultation and hospitalization rates due to trauma in older adults. This could be a result of mobility restrictions and a significant increase in the proportion of self-reliant older adults in the Chilean population.

Keywords Hip fracture · Osteoporotic fracture · Rates · COVID-19 · Chile

Introduction

The COVID-19 pandemic has been one of the most significant events in recent years, affecting health systems all over the world and causing more than 4.8 million deaths [1]. To prevent the virus from spreading, the population's mobility has been restricted by different containment measures, and non-essential hospital activities have been limited [2].

In Chile, despite the strict measures implemented by the government, more than 1.6 million cases and 37.000 deaths have been reported due to COVID-19 [1].

Fragility fractures, caused by low-impact trauma [3], are most commonly seen in older adults as a result of falls within the home; therefore, their incidence should remain stable during the COVID-19 pandemic [4].

Due to their incidence and associated morbidity, hip fractures are the most representative of fragility fractures [5], and the recommended treatment is hospitalization followed by surgical resolution [6]. Since the beginning of the pandemic, there have been several findings on fragility hip fracture rates compared to previous periods, with similar rates reported in Scotland [7], higher rates in Peru [8] and lower rates in the USA [9], Poland [10] and Italy [11]. There have even been different findings within the same country, such as England and Spain, with studies reporting higher [12],

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lower [13, 14] and similar rates [15, 16] when compared to years before the pandemic.

During the COVID-19 pandemic, there was geographical heterogeneity in the behavior of fragility hip fractures. This, along with the lack of evidence in Latin America and specifically in Chile, raises the need to study the local behavior during the pandemic and compare it to previous years' data.

The objective of this study is to describe the effect of the COVID-19 pandemic on osteoporotic hip fracture rates and emergency department consultation and hospitalization rates due to trauma in Chile during 2020, comparing them with the period 2016–2019.

Materials and methods

Data source

A retrospective study was conducted based on information of hip fracture admissions and emergency department consultations and hospitalizations due to trauma, between 2016 and 2020. For emergency department trauma consultations and hospitalizations, all traumas were considered (not only fractures). For trauma consultations, only those caused by falls were considered. For trauma hospitalizations, those caused by falls and traffic accidents were considered.

The information was extracted from the hospital discharge records of the Chilean Department of Statistics and Health Information (DEIS), so the data were public, confidential and anonymous [17]. Approval was not indicated for use of the database as it is publicly available.

Founded in 1964, the Department of Statistics and Health Information (DEIS) collects information on all hospitalizations in Chilean public and private care settings. These data are entered on a mandatory basis for all health centers around the country, considering both inpatient and outpatient care. Therefore, the database includes patients admitted to all Chilean hospitals (avoiding biases due to socioeconomic and geographic factors) and it is open access.

Patient selection

Patients aged 65 years and over hospitalized with a principal diagnosis of hip fracture between 2016 and 2020 were identified. Using the 10th International Classification of Diseases (ICD-10) [18], patients discharged with diagnostic codes S72.0 (femoral neck fracture), S72.1 (peritrochanteric fracture) and S72.2 (subtrochanteric fracture) were included. The origin of the fracture, whether it was secondary to high energy trauma or low-energy trauma

(falls), was not specified in the database. However, since most hip fractures in patients over 65 years old are fragility fractures, we assumed that the majority of them correspond to osteoporotic fractures with low-energy trauma (falls). Weekly emergency department consultations and hospitalizations due to trauma were described according to epidemiological week in the period 2016–2020.

Statistical analysis

For each year, annual hip fracture rates per 100.000 inhabitants were calculated using the annual number of fractures divided by the overall population in that specific age group, according to the annual population reported by the Chilean National Institute of Statistics (INE) [19]. Subsequently, fracture rates were age adjusted using the 2017 Chilean Census as the standard population [20]. Weekly emergency department consultations and hospitalizations rates per 100.000 inhabitants were calculated using the same method. To compare rates with 2020, the years 2016–2019 were grouped together. Data processing and statistical analysis were performed using Microsoft Excel and SPSS Statistics version 25 (IBM Corporation, Armonk, NY, USA).

Results

From 2016 to 2020, a total of 35.050 patients ≥ 65 years old were hospitalized in Chile with a principal diagnosis of hip fracture. Of these, 6.820 were recorded in 2016, 7.163 in 2017, 7.154 in 2018, 7.490 in 2019 and 6.423 in 2020 (Fig. 1).

During 2020, an annual hip fracture rate of 273.6/100.000 was recorded in adults aged 65 and older; representing a decrease of 18.5% in comparison with the average annual rate of 335.7/100.000 for the period 2016–2019 (Table 1).

Adults aged over 80 years old accounted for 66% of hip fractures in adults aged 65 years and older. During 2020, an annual hip fracture rate of 788/100.000 was recorded in adults aged 80 and older, representing a decrease of 18% in comparison with the average annual rate of 955/100.000 for the period 2016–2019, similar to the decrease in adults aged 65 years and older.

Regarding weekly consultations and hospitalizations due to trauma in adults aged 65 and older: during 2020, stable weekly rates were observed during the first 11 weeks, fluctuating between 203.6 and 235.8 per 100.000 inhabitants in weekly consultations, and between 12.5 and 16.9 per 100.000 inhabitants in weekly hospitalizations. In week 12, there was a break in the trend, with

Fig. 1 Hip fracture admissions (columns) and hip fracture rates (line) in adults aged 65 years and over in Chile, 2016–2020

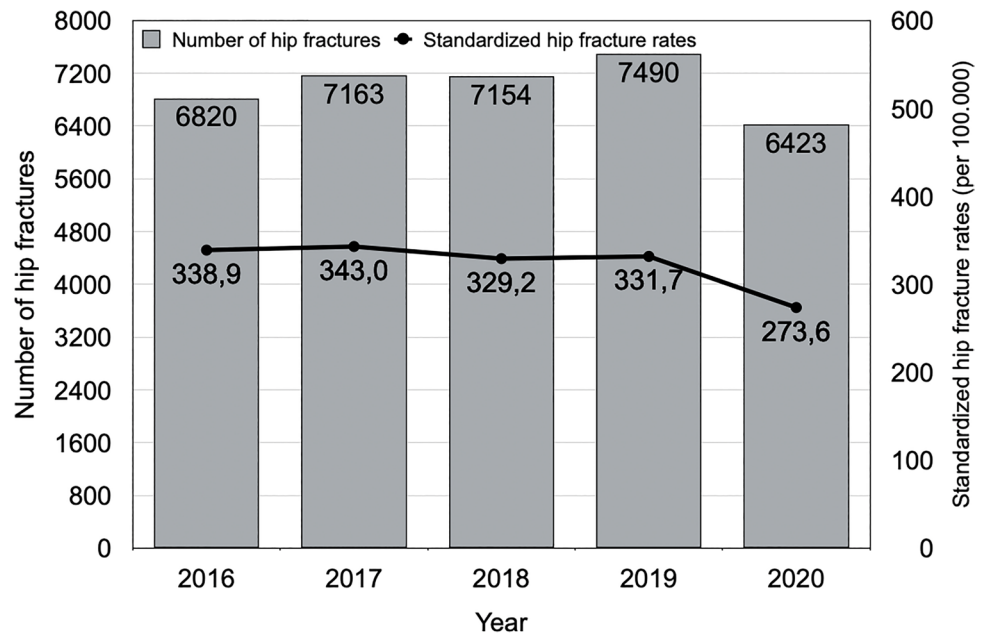


Table 1 Annual hip fracture rate, weekly trauma consultation rate and weekly trauma hospitalization rate in adults aged 65 years and over in Chile, 2016–2020

		Average years 2016–2019	Year 2020	Percentage changes
Annual hip fracture rate (per 100.000)	Both sexes	335,7 ± 10,1	273,6	-18,49%
	Men	175,0 ± 16,1	145,2	-17,04%
	Women	457,5 ± 8,1	371,0	-18,92%
Weekly trauma consultation rate (per 100.000)	Weeks 1–52	176,2 ± 2,6	139,5 ± 13,8	-20,83%
	Weeks 1–11	193,4 ± 3,5	219,9 ± 6,6	+13,70%
	Weeks 12–52	171,5 ± 2,7	118,0 ± 10,6	-31,23%
Weekly trauma hospitalization rate (per 100.000)	Weeks 1–52	13,5 ± 0,2	11,0 ± 0,7	-18,47%
	Weeks 1–11	13,4 ± 0,3	14,9 ± 0,9	+11,57%
	Weeks 12–52	13,5 ± 0,2	10,0 ± 0,4	-26,44%

weekly consultation rates decreasing to 137.8/100.000 and in week 13 to 94.5/100.000, and weekly hospitalization rates decreasing in week 12 to 11.2/100.000 and in week 13 to 9.3/100.000. Since week 13, consultations and hospitalizations rates have remained stable, with a slight upward fluctuation (Fig. 2).

Compared to the 2016–2019 period, a higher weekly rate of consultations and hospitalizations is observed during 2020 until epidemiological week 11 (increase of 13.7% and 11.6%, respectively). Since week 12, weekly consultations and hospitalizations rates in 2020 decreased in comparison with previous years (decrease of 31.2% and 26.4%, respectively) (Table 1), remaining lower than the previous period during the rest of the year.

In 2020, annual hip fracture rates in older adults decreased by 18.5% (273.6 vs. 335.7 per 100.000 inhabitants), weekly consultation rates due to trauma in older adults by 20.8% (139.5 vs. 176.2 per 100.000 inhabitants) and weekly hospitalization rates due to trauma in older adults by 18.5% (11.0 vs. 13.5 per 100.000 inhabitants) (Table 1).

Discussion

Due to the COVID-19 pandemic, Chile imposed confinement measures and mobility restrictions, which led to changes in the overall number of hip fractures, emergency department trauma consultations and emergency

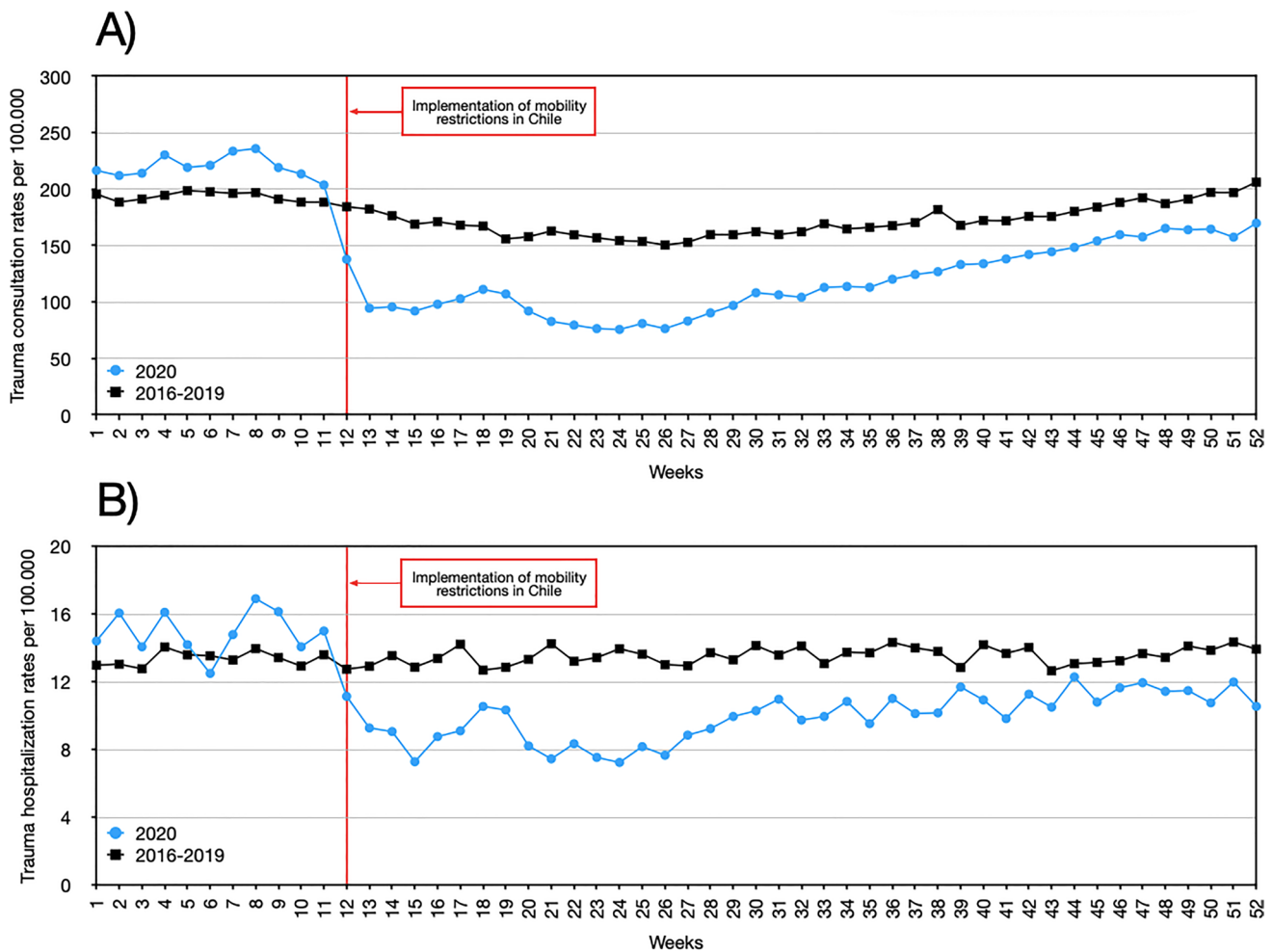


Fig. 2 Weekly trauma consultation and hospitalization rates in adults aged 65 years and over in Chile, epidemiological weeks 1–52 of the years 2016–2020. **A** Weekly trauma consultation rates (per 100,000 inhabitants) in adults aged 65 years and over in emergency departments in Chile. Average weekly rates from 2016–2019 (black line) compared to weekly rates from 2020 (blue line). In week 12 of 2020, several concrete interventions were implemented to mitigate the

imminent local spread of the virus. **B** Weekly trauma hospitalization rates (per 100,000 inhabitants) in adults aged 65 years and over in emergency departments in Chile. Average weekly rates from 2016–2019 (black line) compared to weekly rates from 2020 (blue line). In week 12 of 2020, several concrete interventions were implemented to mitigate the imminent local spread of the virus

department trauma hospitalizations in 2020. Both consultations and hospitalizations in emergency departments, analyzed according to epidemiological weeks, reveal the consequences of COVID-19's spread, the government's response and the population's social isolation.

The spread of COVID-19 in Chile started slowly, with its first confirmed case on March 3, 2020. On March 16, 2020, the Chilean government announced the closure of all daycares, schools and universities. On March 18, 2020 (week 12), the country borders were closed and the Chilean government declared a state of constitutional exception, enabling the government to restrict free movement and association, establishing a mandatory home quarantine for people older than 80 years (changed to 75 years on May 15) through the restriction of visits to long-term

care centers and the closing of all organizations for older adults. The majority of COVID-19 cases concentrated in the Metropolitan Region (where Santiago, the capital city, is located), where about a third of the country's population is concentrated. The Chilean government declared the first lockdowns during the final week of March in 7 municipalities of the Metropolitan Region and a few other cities across the country (Chile has 346 municipalities in total, and Santiago is composed of 40 municipalities). If a municipality was declared on quarantine, people that lived in that area could not leave their residence without legal authorization and non-residents were not allowed to transit in quarantined areas. Full lockdown in the Metropolitan Region was implemented on May 13th. Progressive improvements in the daily number of infected

individuals prompted the government to announce on July 16th a new policy called Step-by-Step, aimed at a slow relaxation of the confinement measures through a five-stage program of gradual opening. On July 28th (week 26), the plan was finally implemented. This policy slowed down the previous downward trend in the number of new cases and generates a break point in the downward trend observed before July 28, 2020 [21–25].

Impact of the pandemic on emergency department trauma consultations and hospitalizations

In our study, during week 12 of 2020, the weekly trauma consultation and hospitalizations rates in older adults decreased to values lower than the average of the years 2016–2019. As the pandemic progressed, consultations and hospitalizations rates always remained below previous years, with a slight increase in the last epidemiological weeks of the year.

Similar findings were reported in a review of 16 studies performed in different countries [26]. When compared to pre-pandemic years, the study revealed a 43% drop in the incidence of orthopedic trauma hospitalizations in the general population since the start of the pandemic. Self-isolation measures, fear of going to hospitals due to the risk of infection, restrictions on outdoor activities and quarantines all contributed to the findings. Despite the overall decrease in orthopedic fractures (43%) in all studies, there was a significant increase in the number of hip fractures during the pandemic (18% vs 15% pre-pandemic).

In the USA, there was a 48.3% decrease in the number of orthopedic consultations in 2020, but no significant variations in the number of hip fractures compared to 2019 [9]. Similar findings were found in studies conducted in Spain [16], the UK [7] and New Zealand [27].

The only study in a Latin American population conducted at a reference trauma center in Peru [8], found similar results. In the months of March and April 2020, emergency department consultations decreased by 55.8% and 88.6%, respectively. When the number of consultations and hospitalizations was compared before and after the government restrictive measures (15 March 2020), a decrease of 79.9% and 30.9%, respectively, was seen. Osteoporotic hip fractures were the most common cause of hospital admissions, with the total volume remaining stable.

Most of the studies mentioned analyzed shorter time periods, focusing on the first period of the pandemic (March and April) and including the entire population that consulted for trauma in emergency departments, with only one study focusing on the population over 65 years of age [12]. Meanwhile, this study conducted in Chile uses a national database (DEIS), focusing on the population over 65 years of age and analyzing the whole 2020 year.

Impact of the pandemic on hip fracture incidence

While most studies show a decrease in trauma hospitalizations during the pandemic, hip fracture epidemiology did not behave similarly across all regions. During the COVID-19 pandemic, hip fracture rates in Chile decreased in comparison with the average of the years 2016–2019. These findings are consistent with those of other European studies. Three studies in Spain that evaluated the effect of the confinement on hip fracture rates found a decrease compared to the same period in prior years [13, 14, 28]. Additionally, hip fracture rates decreased in Italy, Ireland and Poland, respectively [10, 11, 29].

In the European region, there are also studies whose findings on hip fracture rates differ from those obtained in this study. During the first 20 days of the state of emergency in Spain, a study found that hip fracture rates remained stable [16]. According to two studies from Great Britain, the average number of older patients consulting weekly for hip fracture did not change during confinement [7, 15]. Another study conducted in the Great Britain reported an increase in hip fractures [12], which is similar to what was reported in Norway [30].

Regarding studies conducted in America, the findings of this study differ from those reported in the USA [9] and Peru [8], where similar numbers of hip fractures were observed during the pandemic.

The disparities in different studies may be due to several reasons. From a methodological point of view, all the other studies that analyzed the impact of the COVID-19 pandemic on the incidence of hip fracture were limited to studying a specific period of months that reflected a specific measure or moment of the pandemic and used small sample sizes that corresponded to a specific center or area. In our study, the data utilized the whole year 2020 and the entire national territory.

A possible explanation for the differences found between this study and those of other countries might be the higher proportion of self-reliant older adults in the Chilean population [31]. Moreover, during the pandemic in Chile, a significant increase in the percentage of older adults living with other adults and/or grandchildren was observed compared to 2019 [21]. Therefore, as a result to Chile's social distancing and confinement measures, the whole family group was able to remain at home, transforming the home environment into a protective one against falls for older adults. The situation in Chile is different from that of other countries that have higher proportions of older adults living alone, needing daily caregivers or nurses, a situation that could have caused a significant increase in hip fractures, as the mobility of their caregivers was limited by the pandemic [12].

Strengths and limitations

This study has several strengths. First and foremost, it was the first study in Chile that analyzed the trend of osteoporotic hip fractures and emergency department consultations due to trauma during the pandemic. Also, the data were extracted directly from an official database that is representative of the general population.

Regarding limitations, most of them are inherent to large administrative database studies. Firstly, information on hospital discharge outcomes is limited to general measures such as age, sex and diagnosis. Therefore, there is no specific clinical information on the fractures. Secondly, discharge summaries are produced by coding specialists, which means that they are susceptible to oversights such as missing data and digitization errors. Another limitation is the origin of hip fractures (secondary to high energy trauma or low energy trauma), which was not specified in the database. Finally, the emergency department database was a limitation, because it does not allow us to know the weekly hospitalizations due to hip fracture in older adults (hip fractures can't be divided into weeks 1–11 and weeks 12–52), because the database doesn't have the admission and discharge dates, only the length of stay and year of hospitalization. However, with these limitations, the results of this study are a significant contribution both nationally and internationally, allowing us to understand the local behavior of osteoporotic hip fractures and to compare it with the results of other countries.

Conclusion

In conclusion, during the pandemic there was a decrease in emergency department trauma consultations and hospitalizations, as well as a decrease in hip fracture rates. As described in other studies, reduced/restricted mobility, social distancing measures and specific efforts to limit the exposure of older adults to the virus may have translated into less exposure to situations with risk of falling, with a consequent decrease in hip fractures.

Funding Juan Cristóbal Ormeño, Rosario Martínez, Carolina Frías, Constanza Von Plessing and Iván Quevedo have no financial support.

Data availability The information was extracted from the hospital discharge records of the Chilean Department of Statistics and Health Information (DEIS), so the data were public, confidential and anonymous.

Declarations

Conflicts of interest Juan Cristóbal Ormeño, Rosario Martínez, Carolina Frías, Constanza Von Plessing and Iván Quevedo have no proprietary interests or conflicts of interest related to this submission.

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