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Hip Fracture during the First Year of Pandemic in Chile

Fractura de cadera durante el primer año de pandemia en Chile

Maximiliano Barahona[1] Andres Medina[1] Macarena Barahona[1] Pablo Chamorro[1] Tomas Navarro[1] Cristian Barrientos[1] Alvaro Martinez[1]

[1] Department of Traumatology and Orthopedics, Hospital Clínico Universidad de Chile, Santiago, Chile

Address for correspondence Maximiliano Barahona, Carlos Tobar 999, Independencia, Santiago, Chile (e-mail: maxbarahonavasquez@gmail.com).

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Abstract

Introduction The pandemic triggered by SARS-COV-2 decreased the number of trauma surgeries worldwide. The aim of this study is to determine the incidence of hip fracture, epidemiology, length of hospital stay and rate of surgical resolution in Chile during the first year of the pandemic.

Material and Methods Cross-sectional study. The databases of the Department of Statistics and Health Information (DEIS) from 2019 and 2020 were analyzed, identifying patients older than 60 years with hospital discharges associated with hip fracture codes. The incidence of hip fracture was calculated using reports from the National Statistics Institute (INE).

Results The incidence of hip fracture during 2020 was 14% lower than the incidence in 2019, it had a moderate correlation with the mobility of the country and an inverse relationship to the cases of COVID-19 accumulated per month. The median length of hospital stay during 2020 was 8 days (range 5 to 14), which was significantly less ($p < 0.0001$) than in 2019 (10 days, range 6 to 16). The correlation between the number of hip fracture cases per month and the monthly surgical rate is poor.

Conclusions Hospitalizations for hip fracture in Chile decreased during the first year of the pandemic. There was a significant decrease in length of hospital stay, but the rate of surgical resolution in hip fracture is still low.

Keywords
- covid
- epidemiology
- hip fracture
- incidence
- osteoporotic fracture

Resumen

Introducción La pandemia producida por el SARS-COV-2 generó menos cirugías traumatológicas a nivel universal. El propósito de este trabajo es determinar la incidencia de fractura de cadera, epidemiología, tiempo de estadía hospitalaria y tasa de resolución quirúrgica en Chile durante el primer año de pandemia.

Material y Métodos Estudio transversal. Se analizó las bases de datos del Departamento de Estadística e Información en Salud (DEIS) de 2019 y 2020, identificando pacientes mayores a 60 años con egresos hospitalarios asociados a códigos de fractura de cadera. La incidencia de fractura de cadera fue calculada usando reportes del Instituto Nacional de Estadística (INE).

Palabras claves
- covid
- epidemiología
- incidencia
- fractura de cadera
- fractura osteoporótica

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Resultados La incidencia de fractura de cadera durante el 2020 fue un 14% menor a la incidencia del 2019, tuvo una correlación moderada con la movilidad del país y una relación inversa a los casos de COVID-19 acumulados mensualmente. La mediana del tiempo de duración de la hospitalización durante el 2020 fue de 8 días (rango intercuartílico, 5 a 14) , lo cual fue significativamente menor ($p < 0.0001$) que en 2019 (10 días, rango 6 a 16 intercuartílico). La tasa de resolución quirúrgica se mantiene por debajo del 80%.

Conclusiones Las hospitalizaciones por fractura de cadera en Chile disminuyeron durante el primer año de pandemia. Hubo un descenso en la estadía hospitalaria significativo. Sin embargo, la tasa de resolución quirúrgica en fractura de cadera persiste baja.

Introduction

The pandemic caused by SARS-COV-2 caused stress in the health system, which had to respond by prioritizing the care of patients affected by the new virus, leaving other pathologies in the background.[1] There was a decrease in trauma surgical activity worldwide, which was mainly due to a decrease in the availability of facilities and redistribution of personnel.[2,3] On the other hand, many countries, including Chile, took confinement measures to stop community transmission of SARS-COV-2, imposing restrictions for patients with comorbidities and older ages.[4,5]

Hip fracture is a disease considered an equivalent of osteoporosis and occurs more frequently in patients over 60 years of age.[6] It is considered a fragility fracture, since it occurs in a low-energy event, with more than 70% of hip fractures being the result of a domestic accident.[7] It is known that hip fracture is a public health problem in Chile, having a high incidence, high in-hospital wait for treatment and low rate of surgical resolution.[8]

Studies published in other countries show that the incidence of hip fracture during the COVID-19 pandemic did not decrease - for example the United Kingdom and Spain - even in the most intense periods of mobility restriction,[9,10] however, in Brazil, the incidence of hip fracture decreased significantly during the pandemic by 3%.[11]

The purpose of this work is to establish the incidence of hip fracture, epidemiology, length of hospital stay and surgical resolution rate in Chile during the first year of the pandemic-2020. Specifically, we seek to determine if there was an estimated incidence of hip fracture based on hospital discharges and if there were changes in the patients' age, gender, surgical resolution rate and hospital stay compared to 2019.

Method

A cross-sectional study was designed. The open database of the Department of Statistics and Health Information (DEIS) was reviewed, which records all hospital discharges in the country, both public and private. All patients aged 60 years and older who were hospitalized between January 1, 2019 and December 31, 2020 with an admission diagnosis coded according to the tenth international classification of diseases (ICD-10) with codes S72.0, S72.1 and s72.2, were included, which correspond to fracture of the head and neck of the femur, peritrochanteric fracture and subtrochanteric fracture of the femur, respectively. This base includes those patients who died during their hospitalization (deceased discharge). The following data were collected: gender, age, undergoing surgery during hospitalization, duration of hospital stay, health insurance plan, region of care, and type of healthcare facility.

The incidence of hip fracture in our country was calculated using the population estimate reported by the National Institute of Statistics (INE), while the incidence by health insurance was calculated based on the percentage of enrollees reported by FONASA.

The incidence of hospital discharges and the country's mobility were correlated, associated with the confinement measures imposed at the national level. The Global Positioning System (GPS) found in smartphones provides us with "country mobility" by tracking the amount and distance of movements generated by Chilean residents during 2020. This data is reported by the Institute of Complex Engineering Systems. The percentage variation in mobility between March 1st and March 15th, 2020, was analyzed to assess the level of confinement in the country.

Statistical analysis was performed in the STATA v.17 program (StataCorp LP, College Station, Texas, USA). Incidence, epidemiology, hospital stay and surgical resolution rate were compared in an exploratory manner. Subsequently, the correlation between hip fracture incidence and surgical resolution with the number of reported coronavirus cases per month by the Chilean Ministry of Health and country mobility was analyzed using Spearman correlation (rho). In addition, the proportion of surgical treatment between 2019 and 2020 was compared by calculating the average incidence of surgical resolution per region. Finally, heterogeneity was calculated across the entire Chilean territory.

Results

a) Incidence

The incidence of hip fracture in patients aged 60 years and over who were discharged from health centers in Chile during 2019 was 36.45 fractures per 100,000 inhabitants, while, in 2020, the rate decreased to 31.67 per 100,000

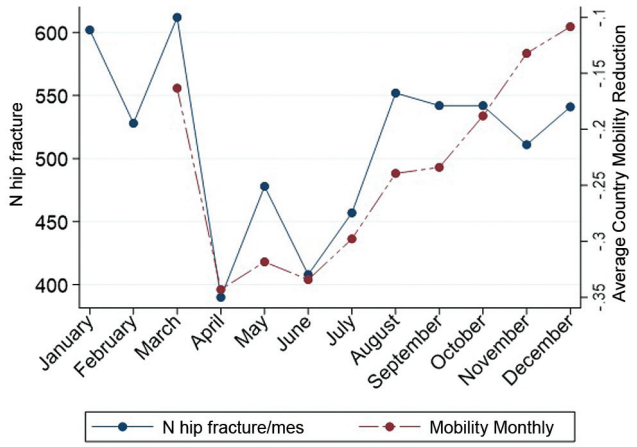

Fig. 1 Correlation between the number of hip fractures per month and the mobility of the country. A significant moderate relationship is observed with a rho of 0.66, which is significant (p = 0.0392).

inhabitants, which implies a 13% reduction in hospital admissions for this cause. The total number of cases per month was significantly lower in 2020 (paired median test, p = 0.0059).

The incidence of hip fracture had a moderate correlation with country mobility (rho = 0.65, p = 0.0392) and an inverse relationship to the accumulated COVID-19 cases per month, which did not reach a statistically significant association (rho = −0.4561, p = 0.1361) (►**Figure 1**).

The change in incidence at the national level was heterogeneous (99.9%, p = 1). The regions of O'Higgins, Maule, Magallanes, Los Lagos, Aysén, and Los Ríos showed a differential incidence favorable to 2020, greater than the national average of −3.5 per 100,000 inhabitants. Among these regions, the last three were the only ones that exhibited a significant increase in incidence in 2020 compared to 2019 (►**Figure 2**).

b) Epidemiology and hospital stay

When comparing the average age and proportion of women, patients treated in public service and belonging to FONASA, no significant differences are observed between 2019 and 2020, except for the rate of patients treated in public service institutions, which decreased to 81.15% in 2020 (►**Table 1**).

Regarding the hospital stay, the median was determined, which was 8 days (interquartile range, 5-14), which was

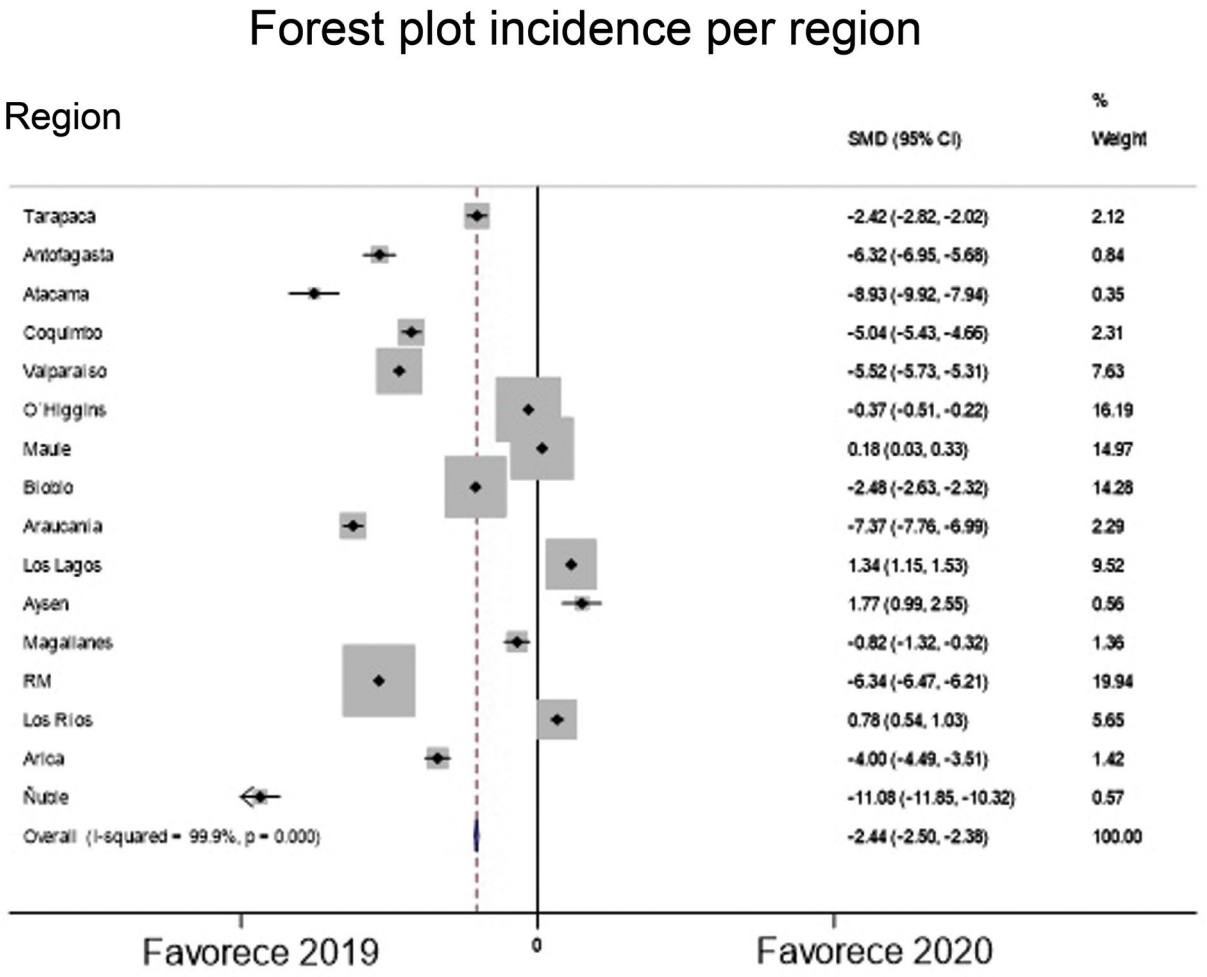

Fig. 2 Comparative incidence by region between 2019 and 2020. It is observed that the variation by region had significant heterogeneity (99.9%). Only the regions of Los Lagos, Los Ríos and Aysén had a significantly higher incidence in 2020.

Table 1 Comparison between 2019 and 2020 of the proportion of women treated for hip fracture, average age at the time of hospitalization, percentage of patients treated in the public network and percentage of patients belonging to FONASA

	2019	2020	P
Women	77.2%	76.86%	0.6850*
Age	82 [8.72]	82 [8.89]	0.9823**
Public service	83.17%	81.15%	0.0062*
FONASA	6159 (88.4%)	5393 (87.5%)	0.599***

*Proportions test.
**T-test with Welch adjustment.
***Fisher's exact test.

significantly less than in 2019 (median test, p = 0.000), a year in which the median was 10. days (interquartile range, 6-16).

c) Surgical Resolution

The rate of patients operated on during 2019 was 77.04%, which increased to 79.36% in 2020. During 2019, an inversely proportional and significant relationship between the number of monthly cases and the rate of surgery performed is observed (rho = −0.6025, p = 0.032), relationship that is lost during 2020 (rho = 0.0560, p = 0.8627).

A continuous increase is observed in the rate of surgeries until the start of the pandemic, reaching the highest rate in April 2020, reaching 84.35% at the country level (►**Figure 3**). This month shows the lowest number of total cases, however, the correlation between the number of hip fracture cases per month and the monthly surgical rate is poor (rho = −0.03, p = 0.9336).

When analyzed by region, it is observed that in all regions the surgical resolution rate for hip fractures during 2019 remained unchanged during 2020 without significant changes. The heterogeneity of the country is 0% (p < 0.0000), which means that there was a homogeneous response (►**Figure 4**).

Discussion

The main finding of this study is a decrease in the incidence of hip fracture during 2020 compared to 2019, that is, 13% during the COVID-19 health emergency. Additionally, it is noted that there was a significant decrease in the length of hospital stay and no changes in the average age, gender, and surgical resolution rate between 2020 and 2019.

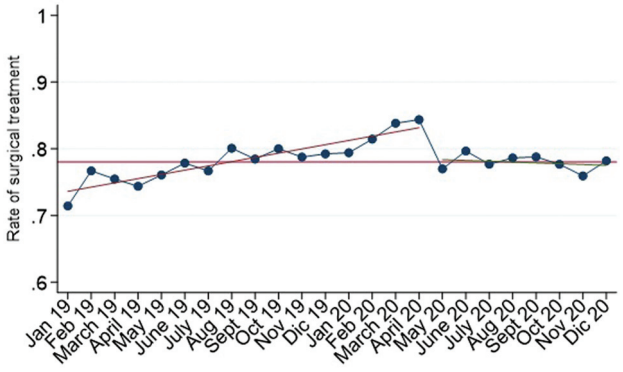

Fig. 3 Surgical resolution rate of hip fracture from January 2019 to December 2020. An average of less than 80% is observed during the two years and a linear increase between January 2019 and April 2020 in the surgical rate.

Hip fracture is a pathology that occurs in fragile patients with osteoporosis and does not require high energy to occur,[6,12] therefore, the incidence should not be directly related to the degree of confinement in the country. The present study demonstrates a 13% reduction in patients over 60 years of age, consistent with what was reported by Ormeño et al who studied the impact on patients over 65 in our country, reporting an 18% decrease.[13] On the other hand, this is different from what was reported in the United Kingdom and Spain,[9,10] where the incidence did not vary and was significantly greater than the 3% decrease reported in Brazil.[11]

In our study, we demonstrated a direct and significant correlation with the country's mobility, which raises the question of whether the incidence of fractures really decreased due to confinement - lower accident rates - or whether there was a significant number of patients who were not hospitalized due to the saturation of the healthcare system or due to the fear of patients and their families to go to the hospital in the context of a pandemic. It should be noted that the DEIS registry only records hospital discharges and not consultations in emergency services, which prior to the pandemic is assumed to be anecdotal, however due to the collapse of the health system it could have occurred during 2020. Minarro et al[14] reported that due to the pandemic and fear of contracting COVID-19, patients preferred to delay their consultation in emergency services.

On the other hand, the majority of these patients have sarcopenia or osteopenia and live alone or in the company of other older adults.[14] In a study conducted in Chile, prior to the pandemic, a prevalence of 23.2% osteoporosis, 49.8% osteoporosis and 19.5% sarcopenia in older adults was reported.[15] This probably increased in the first year of the pandemic, as reported by a study carried out in Argentina, which shows that confinement caused patients who suffered a hip fracture to be more fragile than the same population prior to the COVID-19 pandemic.[16] Additionally, mental health and cognitive function were affected in older adults due to social isolation.[17,18] Finally, the most common place where an accident that ends in a hip fracture occurs in older adults is inside their home. In short, older adult patients

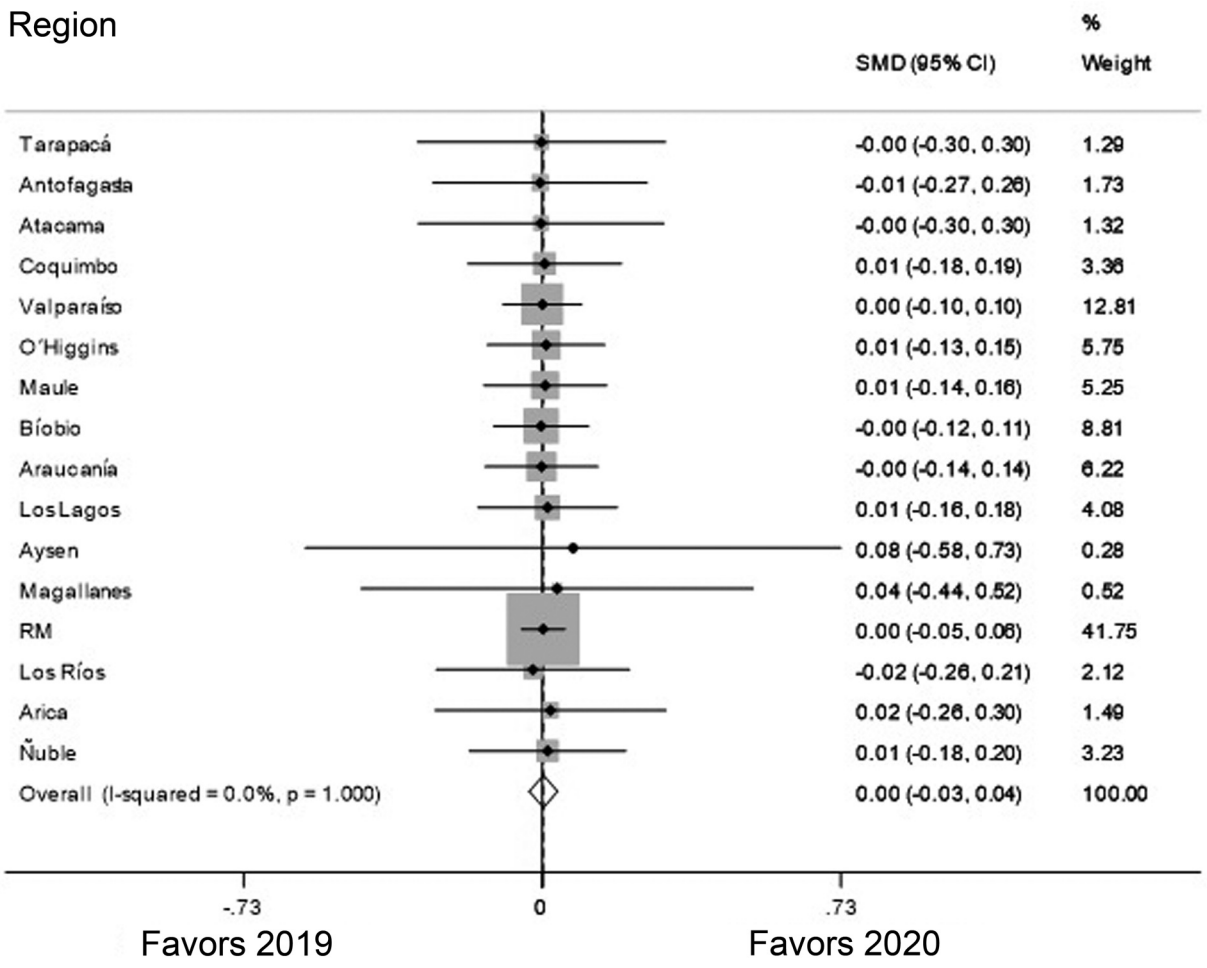

Fig. 4 Surgical resolution rate between 2019 and 2020 by region. It is observed that the surgical response was homogeneous in the country with a heterogeneity of 0%.

being more fragile due to the pandemic and spending more time inside the house, where they mostly suffer accidents, would predict at least a maintenance of the incidence rate.

However, experiences in other countries show diverse realities during the COVID-19 pandemic. Reports on the incidence of hip fracture-related emergency room visits vary, with some showing a decrease,[14] others remaining stable,[10,19] and even increases in the number of visits, as seen in a tertiary health center in Peru.[20] In a study conducted in Brazil, which used data from the public healthcare system, a decreased incidence of hip hospitalizations was observed compared to the pre-pandemic period,[11] but only by 3%. Similar to Chile, the Brazilian healthcare system collapsed,[4] especially the public system, which may result in underreporting of hospitalizations, similar to our study.

In a work prior to the pandemic carried out using the DEIS database, it is observed that the incidence of hip fracture in Chile has been increasing during the last ten years, projecting that by 2030 the incidence would have an increase of 27.9% compared to 2017,[21] therefore, the low incidence reported in this study is not attributable to the fact that in 2019 there was a particular increase. On the other hand, when analyzing by region, a heterogeneous variation in the incidence of hospitalization for hip fracture is observed, which could be attributed to the response that occurred in certain centers and the saturation of these centers. Reports on the impact of the pandemic by region in our country show that the magnitude is related to the socioeconomic level[22] and therefore explain the heterogeneity of the incidence. Diaz-Ledezma et al., using neural networks, established that factors related to the geographic location and the type of facility - public or private - are the most important for predicting hospital stay. These same factors could explain the heterogeneity in the incidence of non-hospitalization.[23]

Other causes to explain the decrease in the incidence itself would be a decrease in the accident rate and the fact that frail older adult patients were more exposed to getting sick from Covid-19 and presenting with serious illness. In fact, the DEIS registry shows a mortality rate in people over 60 years of age due to confirmed COVID of 7,946 men and 6,264 women during 2020, that is, both pathologies are high risk for this age group.

Regarding the epidemiology of the patients analyzed in this study, no significant change was observed in the proportion of women or the average age of patients admitted to hospital centers for hip fracture between 2020 and 2019. This is similar to work carried out in other countries.[16,24]

The decrease in hospital stay is a positive aspect, as reducing these times is indirectly related to a decrease in the surgical resolution time experienced by the patient.[25] Numerous studies show the relationship between delay in surgical resolution and mortality at 30 days or one year[26–28] and also with a decrease in the patient's life expectancy compared to the general population.[29] For example, in the United Kingdom the resolution period has been established by law at 48 hours,[28] Chile is far from these standards, but this finding suggests significant progress.

However, the DEIS database does not allow us to compare what happened to patients who suffered a concomitant hip fracture and COVID-19 disease. Arafa et al.[16] compared groups of patients with and without covid with respect to the year before the pandemic and their results show that COVID-19 (+) patients had a longer hospital stay compared to the other two groups. Additionally, Kayani et al[21] observed that patients with hip fracture had higher mortality if it was associated with COVID-19 (+). Additionally, a study carried out in an Argentine hospital shows that confinement increased the fragility of patients who consulted for hip fracture, which increases long-term mortality.[16] Finally, a multicenter study carried out in Chile shows a mortality greater than 30 and 90 days in those patients with hip fracture and COVID-19(+) and compared to the same period in 2019.[30]

The surgical resolution rate for hip fractures remains very low. This study demonstrates an increase compared to that reported in 2017,[8] which showed linear growth between January 2019 and the start of the pandemic. The homogeneous regional response, maintaining the resolution rate compared to 2019, is important. However, the difference in interregional resolution is vast, with regions that have less than 70% surgical treatment for hip fractures. These findings suggest the need to carry out studies designed to understand the reality of each region.

The limitations of this study include the fact that the DEIS database only provides information on hospital discharges. A patient with a hip fracture should always be hospitalized, except in exceptional cases such as a saturation of the healthcare network, as occurred during the COVID-19 pandemic. Therefore, hospital discharges would typically be used to determine the incidence of hip fractures, but this was not possible during the pandemic. Nevertheless, this study indirectly suggests that there was a collapse of the healthcare system because the magnitude of the decrease in incidence is greater than in other countries. Another limitation of the study is that the database may have data entry issues; however, this error is systematic and should affect both 2019 and 2020 equally, so it does not limit the comparison.

Conclusions

Hospital discharges due to hip fractures in Chile decreased by 13% during the first year of the pandemic in patients over the age of 60 compared to 2019. There was heterogeneity in the variation among regions compared to the immediately preceding year.

The age and proportion of affected women did not change during the pandemic. However, there was a significant decrease in hospital stay. The rate of surgical resolution in hip fractures, a health indicator in other parts of the world, remains low in our country. The COVID-19 pandemic resulted in a halt in the upward trend observed in 2019, with all regions maintaining their resolution rate uniformly despite the health emergency.

Conflict of Interest
None.

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