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Changes in Emergency Care During the COVID-19 Pandemic at a University Hospital in Barcelona

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ABSTRACT

Purpose: To determinate the impact of the COVID-19 pandemic on emergency department (ED) attendance in 2020 compared to 2019, and to analyze the trend of this change across different waves.

Methods: Descriptive study of ED visits (January 1st, 2019 – December 31st, 2020) at university hospital in Barcelona. The number of emergency cases was analyzed by age, sex, socioeconomic index, triage level, type of discharge, and diagnosis. Three periods were compared: pre-pandemic, first wave, and second wave with the corresponding periods in 2019. The Chi-square test compared proportions.

Results: 84,826 episodes were analyzed. The number of emergencies decreased significantly during both waves, (41.09% and 27.60% respectively) affecting both sexes (p=0.439), all age groups (p<0.001) but in socioeconomic groups, no differences were found. Throughout 2020, non-urgent and less-urgent cases decreased (p <0.001). Visits related to ophthalmological-otorhinolaryngological, and musculoskeletal cases decreased (-41.97% and -36.09% respectively). Conversely, infectious, and parasitic diseases increased substantially (225.39%) due to COVID-19 cases.

Conclusion: The SARS-CoV-2 pandemic reduced in ED attendance among both sexes, across all age and socioeconomic groups, irrespective of the type of pathology being treated.

Keywords: Pandemics; COVID-19; Emergency Service; Health Services Accessibility

Abbreviations: ED: Emergency Department; BUH: University Hospital of Bellvitge; SEI: Socioeconomic Index; ICD-10: International Classification of Diseases, 10th Edition; BHA: Basic Health Area

Introduction

Coronavirus disease (COVID-19) is a respiratory infection caused by the SARS-CoV-2 coronavirus, which was first reported in Wuhan on December 31st, 2019 [1]. On March 11th, 2020, the World Health Organization declared the COVID-19 a global pandemic [2]. In Spain, a state of alarm was declared on March 14th, 2020, as a measure to control the transmission of the coronavirus. This led to a population lockdown from March 15th to June 21st, 2020 [3]. Following the population lockdown, healthcare activity was affected to attend to COVID-19 cases. Although strategies were implemented to adapt to the health needs, coordination was challenging due to the increased demand for healthcare services and the limited capacity to reorganize the care of chronic diseases [4]. Consequently, in the Central Catalonia health region, there was a 31.1% reduction in the detection of new diagnoses in primary care in 2020 compared to 2019 [5]. Globally, several studies have documented a significant decrease in the utilization of hospital care services during 2020.

This decrease was observed in both the frequency of outpatient visits [6] and in the volume of hospital emergency care attended [7-9]. Moreover, it has also been noted that emergency department visits for both COVID and non-COVID-related conditions were influenced by certain sociodemographic factors. For instance, emergency department visits among young people decreased [10,11], there was a decline in healthcare service utilization among women [12], and among population with low incomes or limited health coverage [13]. The changes observed during the pandemic varied between countries, as the health response differed in each territory, and the characteristics of each population were different. In Spain, there are limited studies that describe the changes in the frequency of hospital emergency visits and determine if there are any sociodemographic factors associated with these changes. The objective of this study is to analyse the change in the frequency of hospital emergency visits during the year 2020 compared to 2019 considering sociodemographic, clinical, and diagnostic factors and examine the trends of change across different pandemic waves in 2020.

Materials and Methods

A cross-sectional observational study was conducted on the emergency care attended at the University Hospital of Bellvitge (BUH), a third-level hospital in the city of Barcelona, during the period from January 1st, 2019, to December 31st, 2020. The study included patients attending the emergency department of the hospital's reference area, aged 18 years or older, and with one or more emergency episodes. Episodes without registration in any of the explanatory variables of interest in the study were excluded. To select the comparison period, the distribution of emergency visits in 2018 and 2019 was analyzed according to the explanatory variables of the study. The distribution was similar in both years, so 2019 was chosen as the comparison period with 2020.

Variables

The variable of interest was the number of emergency visits attended during the study period. This variable was analyzed based on sociodemographic variables: age, sex, and socioeconomic index (SEI); variables related to the episode: triage level and discharge class; and clinical diagnoses classified according to the International Classification of Diseases, 10th edition (ICD-10). Each patient was assigned an SEI based on their Basic Health Area (BHA) of residence. This variable was obtained from information available in the Catalonia Health System Observatory [14], based on the standardized percentage of the population exempt from pharmacy copayment (year 2018) in all BHA of Catalonia. Three categories of SEI were created considering the distribution of the variable in percentiles as follows: low socioeconomic index (≥ 4,7), medium (2,8-4,6), high (≤ 2,7). The triage level was classified into five categories following the Andorran triage model. Thus, an emergency episode with level 1 was considered as immediate urgency, and an emergency episode with level 5 was considered non-urgent [15]. Patients with COVID-19 were identified based on the clinical diagnosis of SARS-CoV-2 disease using the following ICD-10 codes: U07.1, J12.89, B97.29, and B34.2. Three periods were analyzed: pre-pandemic period (January 1st, 2020 - March 11th, 2020), first COVID-19 wave (March 12th, 2020 - April 25th, 2020), and second COVID-19 wave (October 15th, 2020 - November 23rd, 2020) and were compared with the same periods of the previous year. All study variables (except the SEI variable) were obtained from the Minimum Basic Dataset for Emergencies, a mandatory record in Catalonia since 2010.

Statistical Analysis

A descriptive analysis of the number of emergencies attended was conducted using qualitative variables through frequencies and percentages. The chi-square test was used to compare proportions between groups, and Bonferroni correction was applied for multiple comparisons. Statistical significance was established at a p-value of less than 0.05. SPSS version 27.0.0 was used for statistical analysis.

Ethical-Legal Considerations

The study adhered to the guidelines of the International Conference on Harmonization's Good Clinical Practice and received evaluation and approval from the Clinical Research Ethics Committee of Bellvitge Hospital (Ref. PR189/21).

Results

A total of 84,826 emergency episodes from BUH were analyzed during the period from January 1st, 2019, to December 31st, 2020, meeting the inclusion criteria (Figure 1). Exclusion criteria led to the removal of 1,413 episodes (1.66%) due to missing information on emergency triage level or diagnosis. The distribution of emergencies according to sociodemographic variables was highly similar in both years (Table 1). The percentage of emergencies was higher among women and individuals aged 75 or older. However, during the first wave, the percentage of emergencies among men was higher than that among women (50.50% vs. 49.50%; p=0.041), and the 45-64 age group was the most frequent (p<0.001). There were no significant differences observed between years or waves in terms of socioeconomic status. Regarding the distribution of emergencies based on clinical variables, there was an increase in triage level 2 and a decrease in levels 4 and 5 in 2020 compared to 2019 and across both waves (p<0.001). The percentage of hospital admissions, referrals, and deaths was higher in 2020 and in both waves, with significant differences observed among discharge class categories (p<0.001). The distribution of emergencies among COVID and non-COVID patients differed in certain sociodemographic variables (Table 2). The percentage of COVID-related emergencies was higher in men in both waves (51.58% and 54.30%), although the differences between men and women were not significant. The most frequent age group for COVID patients was 45-64 years (p<0.001).

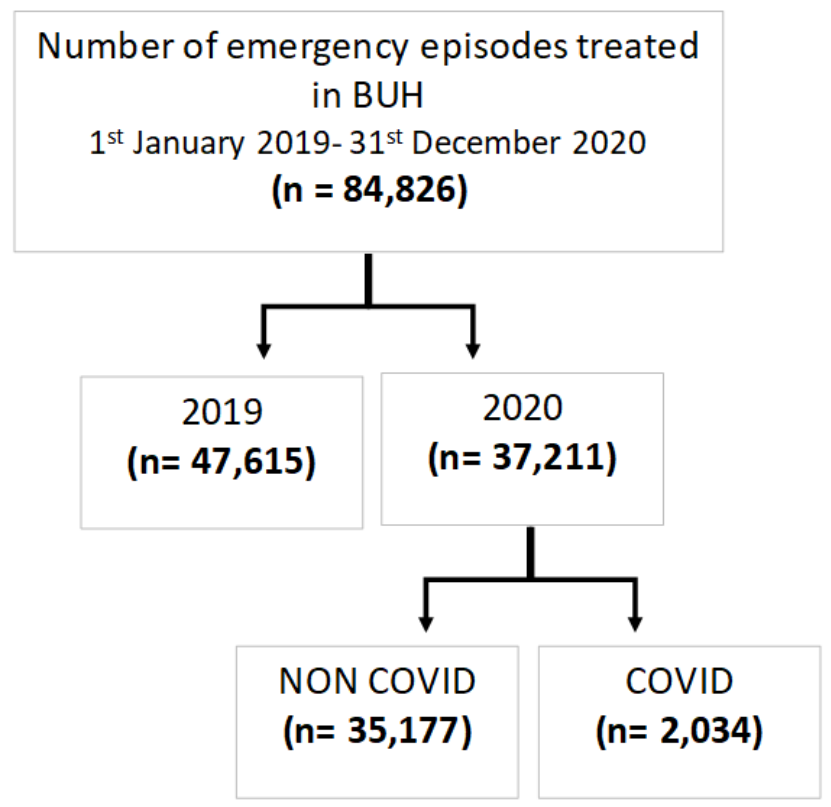

Figure 1: Number of analyzed emergency episodes from BUH. Period January 1st, 2019 - December 31st, 2020.

Table 1: Distribution of emergencies according to sociodemographic and clinical variables in different periods.

						2020				
		2019		2020			Pre-pandemic[a] period	1st wave[b]	2nd wave[c]	
		N	%	N	%	p value	%	%	%	p value
Sex						0.439				0.041
	Male	23,078	48.47%	18,135	48.74%		48.21%	50.50%	49.77%	
	Female	24,537	51.53%	19,076	51.26%		51.79%	49.50%	50.23%	
Age Groups						<0.001				<0.001
	18-44 years	11,404	23.95%	8,586	23.07%		23.31%	20.96%	22.28%	
	45-64 years	12,191	25.60%	10,222	27.47%		26.17%	30.79%	28.35%	
	65-74 years	9,348	19.63%	6,843	18.39%		18.78%	18.62%	17.78%	
	>=75 years	14,672	30.81%	11,560	31.07%		31.75%	29.63%	31.59%	
Socioeconomic Status						0.073				0.905

	High	14,542	30.54%	11,623	31.24%		30.83%	31.36%	30.44%	
	Medium	27,944	58.69%	21,675	58.25%		58.33%	58.06%	58.45%	
	Low	5,129	10.77%	3,913	10.52%		10.84%	10.58%	11.11%	
Triage[d]						<0.001				<0.001
	Level 1	142	0.30%	195	0.52%		0.44%	0.37%	0.72%	
	Level 2	3,475	7.30%	4,994	13.42%		10.61%	18.45%	17.11%	
	Level 3	22,866	48.02%	18,867	50.70%		52.29%	48.05%	50.01%	
	Level 4	14,725	30.93%	10,014	26.91%		27.06%	27.04%	24.98%	
	Level 5	6,407	13.46%	3,141	8.44%		9.61%	6.08%	7.18%	
Discharge Status						<0.001				<0.001
	Admitted as inpatient	6,967	14.63%	6,792	18.25%		16.29%	39.04%	20.19%	
	Discharged to home	39,760	83.50%	29,536	79.37%		81.91%	57.24%	77.19%	
	Death	113	0.24%	128	0.34%		0.23%	0.91%	0.46%	
	Transferred to other hospital	775	1.63%	755	2.03%		1.57%	2.81%	2.17%	

Note: [a]1st January - 11th March; [b]12th March - 25th April; [c]15th October - 23rd November; [d]Triage.

Level 1: inmediate; Level 2: very urgent; Level 3: urgent; Level 4: standard; Level 5: non urgent

Table 2: Distribution of emergencies among COVID and NON-COVID patients according to sociodemographic and clinical variables in different periods.

	1st wave[a]						**2ndwave[b]**				
		Non-COVID		**COVID-19**			**Non-COVID**		**COVID-19**		
		N	**%**	**N**	**%**	**p value**	**N**	**%**	**N**	**%**	**p value**
Sex						0.29					**0.1**
	Male	1,113	49.82%	663	51.68%		1,695	49.37%	164	54.30%	
	Female	1,121	50.18%	620	48.32%		1,738	50.63%	138	45.70%	
Age Groups						<0.001					**0.055**
	18-44 years	544	24.35%	193	15.04%		778	22.66%	54	17.88%	
	45-64 years	643	28.78%	440	34.29%		955	27.82%	104	34.44%	
	65-74 years	390	17.46%	265	20.65%		615	17.91%	49	16.23%	
	>=75 years	657	29.41%	385	30.01%		1,085	31.61%	95	31.46%	

Socioeconomic Status						0.007					**0.648**
	High	680	30.44%	423	32.97%		1,046	30.47%	91	30.13%	
	Medium	1,291	57.79%	751	58.53%		2,001	58.29%	182	60.26%	
	Low	263	11.77%	109	8.50%		386	11.24%	29	9.60%	
Triage[c]						<0.001					**<0.001**
	Level 1	12	0.54%	1	0.08%		27	0.79%	0	0.00%	
	Level 2	340	15.22%	309	24.08%		469	13.66%	170	56.29%	
	Level 3	1,108	49.60%	582	45.36%		1,763	51.35%	105	34.77%	
	Level 4	580	25.96%	371	28.92%		909	26.48%	24	7.95%	
	Level 5	194	8.68%	20	1.56%		265	7.72%	3	0.99%	
Discharge Class						<0.001					**<0.001**
	Admitted as inpatient	463	20.73%	910	70.93%		575	16.75%	179	59.27%	
	Discharged to home	1,691	75.69%	322	25.10%		2,771	80.72%	112	37.09%	
	Death	21	0.94%	11	0.86%		14	0.41%	3	0.99%	
	Transferred to other hospital	59	2.64%	40	3.12%		73	2.13%	8	2.65%	

Note: [a]12th March - 25th April; [b]15th October - 23rd November; [c]Triage.

Level 1: immediate; Level 2: very urgent; Level 3: urgent; Level 4: standard; Level 5: non urgent

In non-COVID patients, the ≥75 age group was the most frequent in both waves (p<0.001). In terms of clinical variables, the percentage of patients with triage level 2 was higher among COVID patients compared to non-COVID patients in both waves (24.08% vs. 15.22% in the first wave; 56.29% vs. 13.66% in the second wave). Regarding discharge class, the percentage of emergencies resulting in hospital admission was higher among COVID patients compared to non-COVID patients (70.93% vs. 20.73% in the first wave; 59.27% vs. 16.75% in the second wave). In 2020, there was a reduction of -21.85% in the number of attended emergencies compared to 2019. This reduction commenced with the onset of the pandemic (Figure 2) and persisted throughout the year 2020. The maximum reduction peak (-52.61%) occurred in April, and the second peak (-31.38%) was observed in November. The reduction in emergencies affected both men and women equally in both waves (-40.46% and -41.71% in the first wave; -27.04% and -28.15 in the second wave) (Table 3).

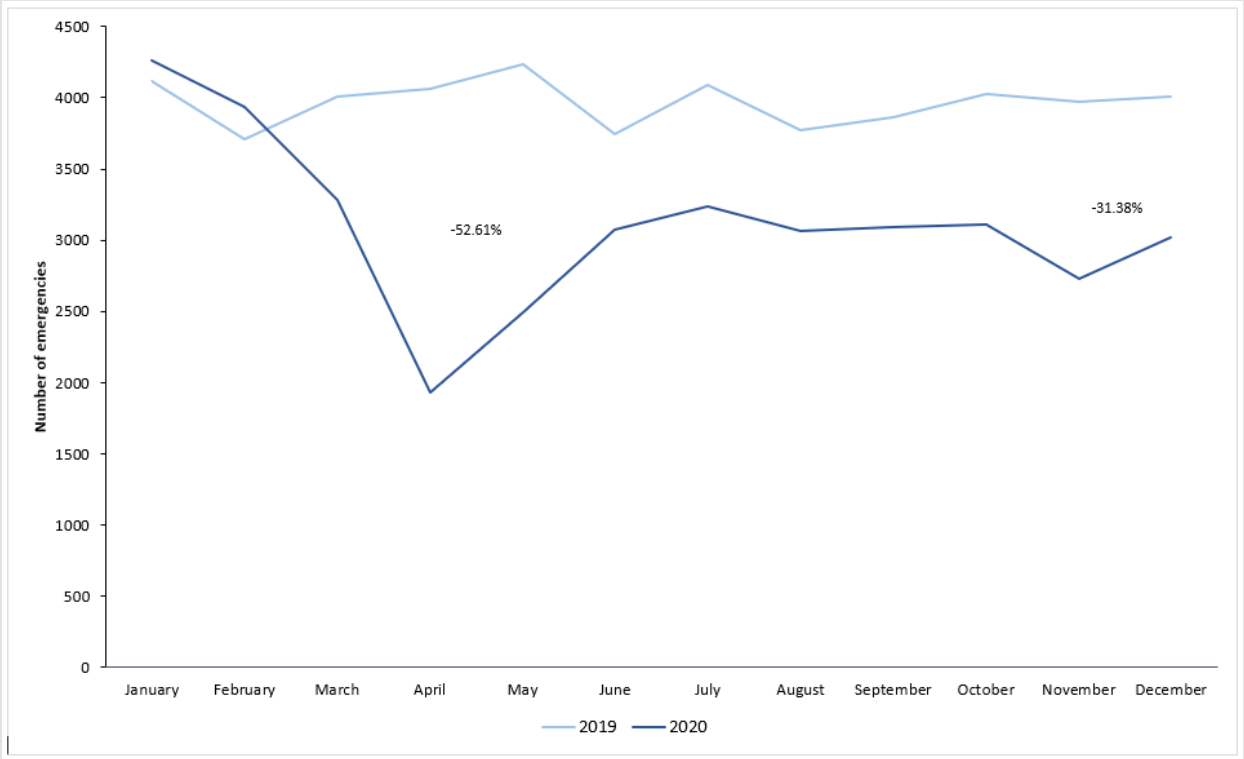

Figure 2: Change in the frequency of hospital emergency visits during the year 2020 compared to 2019.

Table 3: Reduction in emergencies during 2020 year, first and second pandemic wave according to sociodemographic and clinical variables.

		2020		
sex		**Global**	**1st wave[a]**	**2nd wave[b]**
	Male	-21.42%	-40.46%	-27.04%
	Female	-22.26%	-41.71%	-28.15%
Age Groups				
	18-44 years	-24.71%	-48.53%	-35.00%
	45-64 years	-16.15%	-28.84%	-18.29%
	65-74 years	-26.80%	-45.37%	-29.96%
	>=75 years	-21.21%	-42.65%	-27.83%
Socioeconomic Status				
	High	-20.07%	-40.05%	-28.85%
	Medium	-22.43%	-41.77%	-27.81%
	Low	-23.71%	-40.29%	-22.72%
ICD10 Chapters				
	Symptoms, signs, and abnormal clinical and laboratory findings	-21.00%	-57.57%	-33.33%
	Diseases of the eye, ear, and adnexa	-41.97%	-81.22%	-47.64%
	Diseases of the musculoskeletal system	-36.09%	-80.79%	-41.03%
	Injury, poisoning and certain other consequences of external causes	-19.36%	-69.51%	-30.04%

	Diseases of the digestive system	-22.86%	-65.84%	-23.27%
	Diseases of the respiratory system	-31.31%	-28.69%	-48.68%
	Diseases of the circulatory system	-17.61%	-61.54%	-12.08%
	Diseases of the genitourinary system	-21.93%	-67.04%	-18.44%
	Certain infectious and parasitic diseases (with COVID-19)	225.39%	1298.98%	255.79%

Note: [a]12th March - 25th April; [b]15th October - 23rd November

It affected all age groups, although the 45-64 age group experienced the smallest reduction throughout the study period. A similar reduction was observed in all three socioeconomic groups during the first wave. In the second wave, the reduction was lower in the less privileged socioeconomic group (-22.72% vs. -28.85% for high SEI and -27.81% for medium SEI). Regarding the analysis by ICD-10 chapters, there was a reduction in emergencies in all chapters except for the chapter of infectious and parasitic diseases, which increased by +225.39% compared to 2019 due to COVID-19 infection. Ophthalmic, otologic, and musculoskeletal disorders experienced the most significant reductions during both the first and second wave (Table 3).

Discussion

In 2020, attendance at the emergency department of Bellvitge University Hospital decreased by 21.85% compared to 2019. This reduction was more significant during the pandemic waves, with the first wave being the most affected. Similar results were observed in Europe and the USA. In England [11,16] the number of emergencies decreased by 40% during the first wave, and a study conducted in Massachusetts [12] reported a reduction of 30.9% in March-April 2020 compared to the same period in 2019. Possible barriers that could explain this decrease in service utilization during the pandemic have been identified. This includes the fear of contracting COVID-19, the stigma associated with receiving a COVID-19 diagnosis, perceived poor service quality, worsening socioeconomic conditions for patients, increased technological barriers, as well as the perception of minimizing the risk of complications and the need for medical care [17].

In our study, the reduction in emergency department visits affected both men and women similarly. However, some studies have shown that women, especially those with non-COVID-related conditions, had lower utilization of healthcare services [12]. Furthermore, the reduction in the number of emergency visits affects all age groups, with a greater decrease observed in the younger population and the 65-74 age group compared to the previous year. This could be attributed to a decrease in less urgent episodes, especially among young individuals [11], and lower healthcare utilization among chronic patients due to increased concerns about contracting COVID-19 [17]. In our study, unlike in other countries, the average age of patients visiting the emergency department during the first wave did not vary between years. However, hospitals located in Massachusetts and England reported an increase in the average age of approximately 3 years [11,12,16].

Similarly, in Italy and France, the patients attended during the pandemic were also older than usual [10,18]. Regarding socioeconomic status, the utilization of emergency services has maintained a proportional distribution among different groups, and the reductions in each level were similar between both years. However, during the first wave, the analysis by COVID-19 status showed that the less privileged group attended emergency services less frequently. Similar results have been observed in other studies, which found lower emergency department utilization among groups with lower income, limited healthcare coverage [13], or minority ethnicities [12]. Despite this lower utilization, in Anglo-Saxon countries, minority ethnic groups were more represented among those admitted with COVID-19 compared to non-COVID cases [12,16,19]. In non-COVID patients, a lower rate of urgent care attendance has been observed in rural populations [6,20].

In the case of Italy, it was generally found that those who reduced mobility the most were patients from provinces with higher population density, as well as those who were unemployed or working in the industrial or service sectors, with higher levels of education, and the elderly [21]. In 2020, all emergency department visits decreased except for those related to infectious and parasitic diseases, which increased due to COVID-19. The conditions that experienced the most significant reduction in the first wave were eye and ear-related disorders, as well as musculoskeletal disorders. However, these diagnostic groups remained among the most frequently visited in 2020, similar to 2019. These reductions, along with the increase in infectious and parasitic diseases (including COVID-19), align with preliminary studies [22,23]. Other admissions that have been reduced include those for traumatic causes, acute cerebrovascular events, mental health, and dermatological conditions, among others [10,11,18,22-25]. In 2020, an increase in the most urgent triage levels and a decrease in the less urgent levels were observed compared to 2019, consistent with other studies [22].

During the pandemic, there has been an increase in hospital admissions, deaths, and referrals to other centers. Similar to our study, different countries have reported an increased percentage of deaths among non-COVID patients treated in emergency departments in 2020 [10,11,24,26,27]. This study analyzed the total number of emergency department visits by the population in the catchment area of a tertiary-level hospital during the years 2019 and 2020. It is a descriptive study with limitations inherent to this study design, but due to the analysis of all the records, it reflects the change in emergency

department utilization that the territory has experienced during the waves of the SARS-CoV-2 pandemic. The criteria for confirming suspected COVID-19 diagnoses and the subsequent coding of the attended emergencies varied throughout the pandemic, which could have led to deviations in the percentages of COVID diagnoses, particularly during the first wave. To minimize this information bias, emergency episodes attended during the first wave of 2020, classified as non-COVID, were cross-checked for suspected SARS-CoV-2 infection (secondary diagnosis or positive diagnostic test).

The socioeconomic level was treated as a cluster variable, assigning each patient the socioeconomic index of the basic health area in which they reside. This classification of patients may not accurately reflect the social reality of the attended emergencies and could, therefore, affect the differences between socioeconomic groups. To determine if the differences found in age groups and the lack of differences between socioeconomic groups were influenced by gender patterns, a gender-stratified analysis was conducted. The results obtained were analogous to those without stratification.

Conclusion

This study identified a reduction in emergency department utilization during the SARS-CoV-2 pandemic. This reduction occurred in both men and women, across all age groups, among different sociodemographic strata of the population, and for all types of pathologies attended in a university teaching hospital emergency department. The findings of this study can serve as a guide to compare and determine the impact of the pandemic on emergency department attendance in different countries. However, it is important to consider that the Catalan healthcare system is publicly accessible and free, which may reduce barriers to accessing medical care.

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Conflict of Interest

None.

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