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Research paper

Trends in suicidal behavior among hospitalized adolescents in Spain over two decades

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ABSTRACT

Background: Suicide ranks as a leading cause of premature death among adolescents globally. Understanding the trends and key determinants of suicidal behavior in youth are critical for implementing educational policies and supporting preventive strategies in schools.

Methods: This retrospective study examined all hospitalizations due to suicidal behavior in children and adolescents aged 11 to 18 years in Spain, using data from the Spanish National Registry of Hospital Discharges spanning 2000 to 2021.

Results: Over the 22-year study period, there were 2,015,589 hospitalizations among adolescents in Spain, with 118,609 (5.9 %) cases involving mental disorders. There were 2855 admissions with suicidal behavior, constituting 2.4 % of the hospitalizations among youth with mental disorders. Girls represented 73.4 % of all hospitalizations, with a median age of 16 years. Admissions for suicidal behavior saw a four-fold increase during the last decade ($p < 0.001$). The in-hospital mortality rate for adolescents with suicidal behavior doubled that of those hospitalized for other mental disorders. During the first year of the COVID-19 pandemic, admissions of adolescents with suicidal behavior decreased, only to surge by 2.5-fold during 2021.

Conclusion: Hospital admissions for suicidal behavior among adolescents have risen in Spain over the last two decades. Girls represented 73.4 % of these admissions, yet in-hospital mortality was more frequent in boys.

1. Introduction

There is a mounting crisis in the mental health of children and adolescents in developed nations (Mojtabai et al., 2016; Piao et al., 2022; Castelpietra et al., 2022; Anonymous, 2023; GBD 2019 Adolescent Mortality Collaborators, 2021; Armocida et al., 2022). While the COVID-19 pandemic has highlighted the high incidence and severity of mental disorders among the youth, the problem predates the pandemic and, alarmingly, it seems to be deteriorating (Breuner and Bell, 2023). This is supported by data from the US Centers for Disease Control (CDC) (CDC, 2022), which indicates that, since 2020, suicide has surpassed cancer, traffic accidents, and congenital diseases as the leading cause of death among young people (Tanz et al., 2022; Walsh et al., 2022; Fazel and Runeson, 2020).

Globally, almost 9 % of children and adolescents are diagnosed with mental disorders, posing a significant public health challenge (Piao

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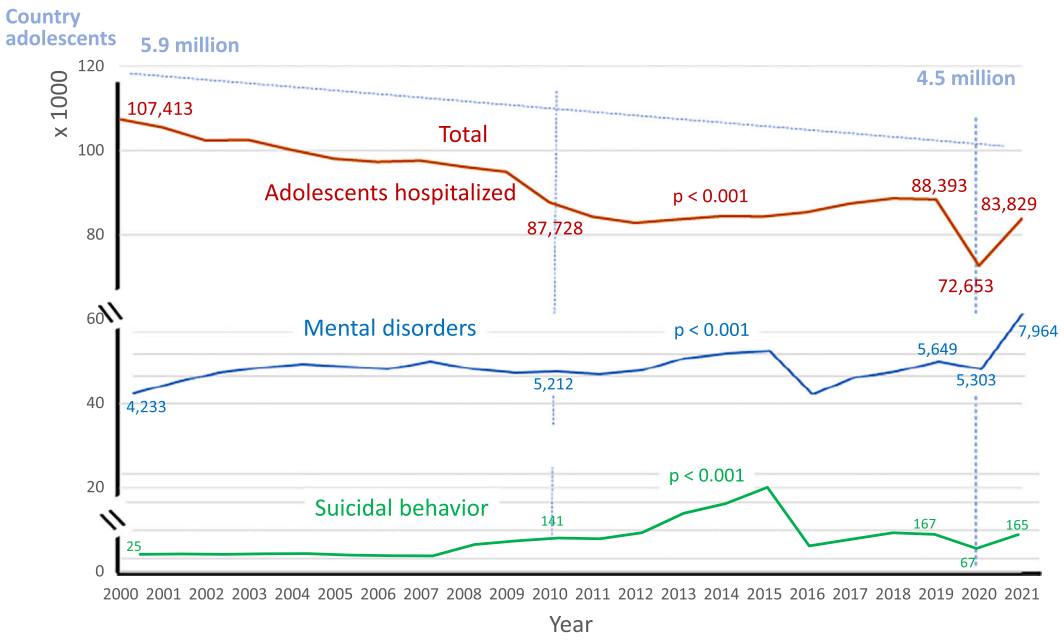


Fig. 1. Hospitalizations in adolescents by year.

et al., 2022; Castelpietra et al., 2022; Armocida et al., 2022; GBD 2019 Mental Disorders Collaborators, 2022). During recent decades, the escalating prevalence of anxiety disorders, major depression, eating disorders, addictive behaviors, sexual disorders, and suicide attempts in youth are posing unprecedented challenges to public health systems (McGinity, 2023; Botha et al., 2023). There is an increasing consensus among experts on the urgent need for preventive measures (Anonymous, 2023; McGinity, 2023; Botha et al., 2023; Gijzen et al., 2022).

Adolescents suffering from mental disorders sometimes need hospitalization. Despite the scarcity of literature on the admission rates for mental illnesses, a recent study from the United States has raised concerns about the growing demand for such admissions since the COVID-19 pandemic began (Krass et al., 2021). Specifically, suicidal behavior in adolescents has been on the rise during recent years (Lim et al., 2019). In this context, we aim to describe the main characteristics and trends over time of adolescents hospitalized for suicidal behavior in Spain over the past two decades. This analysis will provide valuable insights to inform educational policies and improve preventive strategies in schools.

2. Methods

2.1. Study design

All data were retrospectively gathered from diagnoses documented in population-based hospital discharge records. They were recorded at the Minimum Basic Data Set (MBDS) of the Spanish National Registry of Hospital Discharges (SNRHD). This administrative database encompasses information on all patients discharged from hospitals and clinics across Spain, dating back to the 1990s (Ministerio de Sanidad, Servicios Sociales e Igualdad, 2015). This extensive information repository has served multiple purposes, including budget planning and allocation, as well as ensuring the availability of hospital beds and specialized healthcare personnel for distinct medical conditions. It has yielded invaluable data for numerous infectious diseases, such as HIV, viral hepatitis, and COVID-19, in addition to cardiovascular and respiratory illnesses (Ramos-Rincón et al., 2021; Ramos et al., 2020; de Miguel-Diez et al., 2021; Ramos-Rincon et al., 2023; Ramos-Rincón et al., 2023; Ramos-Rincón et al., 2022).

Our analysis utilized data from the SNRHD spanning from January 1, 2000, to December 31, 2021, covering a period of 22 years. We did not record more recent data because the database closes officially two years after. It continuous entering and cleaning information after ending up the specific date recorded. Diseases and procedures were categorized according to the International Classification of Diseases, with the Ninth Revision (ICD-9) applied until 2015. From 2016 onwards, the Tenth Revision (ICD-10-CDM) was used. Codes for suicide attempts or suicidal ideation were E950–9 under ICD-9, and R45.851 for suicidal behavior under ICD-10. Difficulties to separate suicidal ideation and suicide attempts prompted to merge it within a single variable, suicidal behavior, which is the nomination recommended within the ICD list. For each case registered, we also analyzed hospital outcome variables, including the length of hospital stay and in-hospital mortality.

2.2. Statistical analyses

Data are presented as absolute numbers and percentages. Quantitative and qualitative variables are reported as either mean ± standard deviation (SD) or median with interquartile ranges (IQR), and as proportions, respectively. The significance of differences between two independent proportions was determined using the *Z*-ratio. Bivariate comparisons of quantitative and qualitative variables were conducted using the Mann-Whitney *U* test, Pearson's chi-squared test, or Fisher's exact test as appropriate. Time trend analyses were carried out using the Kruskal-Wallis test for quantitative variables and the chi-squared test for qualitative variables.

Predictors of in-hospital mortality were analyzed through univariate and multivariate analyses. The association measure is expressed as an odds ratio (OR) with 95 % confidence intervals (95 % CI). All statistical analyses were conducted using IBM SPSS Statistics for Windows, version 25.0 (IBM Corp, Armonk, NY). All tests were two-sided, and p values <0.05 were deemed as statistically significant.

2.3. Ethical aspects

The database was obtained from the Spanish Ministry of Health upon request, with all potential patient identifiers previously removed. In accordance with Spanish law, patient informed consent was not required for this analysis. The study received approval from the Clinical Research Ethics Committee of *Universidad Internacional de La Rioja* (UNIR) (reference PI-022/2023; dated April 27, 2023). All procedures adhered

Table 1
Yearly hospitalizations in adolescents with suicidal behavior in Spain by sex.

Year	No.	Rate × 10.000 admissions in adolescents with mental disorders	Boys	Girls	p
2000	25	2,33	52.0 %	48.0 %	0.004
2001	28	2.65	28.6 %	71.4 %	0.814
2002	25	2.44	28.0 %	72.0 %	0.874
2003	29	2,83	37.9 %	62.1 %	0.166
2004	30	3.00	46.7 %	53.3 %	0.013
2005	20	2,04	30.0 %	70.0 %	0.731
2006	15	1.54	20.0 %	80.0 %	0.561
2007	14	1.43	21.4 %	78.6 %	0.660
2008	95	9.88	32.6 %	67.4 %	0.178
2009	121	12.75	34.7 %	65.3 %	0.040
2010	141	16.07	35.5 %	64.5 %	0.015
2011	136	16.13	31.6 %	68.4 %	0.177
2012	179	21.61	35.2 %	64.8 %	0.007
2013	317	37.89	26.2 %	73.8 %	0.852
2014	385	45.60	22.3 %	77.7 %	0.041
2015	501	59.40	20.8 %	79.2 %	0.001
2016	85	9.96	15.3 %	84.7 %	0.016
2017	132	15.10	21.2 %	78.8 %	0.150
2018	178	20.08	25.8 %	74.2 %	0.089
2019	167	18.89	26.9 %	73.1 %	0.992
2020	67	9.22	46.3 %	53.7 %	<0.001
2021	165	19.68	18.2 %	81.8 %	0.012
TOTAL	2855	14.2	26.6	73.4	<0.0001

Table 2
Mean features of adolescents hospitalized with suicidal behavior in Spain.

	Suicidal behavior	Rest of admissions with mental disorders	OR (95 % CI)	P value^
Number	2855	115,744	–	–
Male sex	760 (26.6)	52,532 (45.4)	0.43 (0.40–0.47	<0001
Median (IQR) age (year)	16 (14–17)	16 (14–17)	0.99 (0.97–1.01)	0.632
Median (IQR) in-hospital stage (days)	6 (2–14)	5 (2–12)	1.00 (0.99–1.01)	0.986
In-hospital exitus	12 (0.4)	268 (0.2)	1.82 (1.02–3.24)	0.040
Period				
2000–2010	543 (19.0)	56,558 (48.9)	1	–
2011–2021	2312 (81.0)	59,196 (51.1)	4.06 (3.72–4.47)	<0.001
Other mental disorders				
Substance use disorders	498 (17.4)	44,456 (38.4)	0.34 (0.30–0.37)	<0.001
Anxiety disorders & PTSD	617 (21.6)	15,077 (13.0)	1.84 (1.68–2.01)	<0.001
Eating disorders[a]	206 (7.2)	17,949 (15.5)	0.42 (0.37–0.49)	<0.001
Mood disorders[b]	375 (13.1)	11,510 (9.9)	1,26 (1.22–1.52)	<0.001
Intellectual disability	66 (2.3)	11,574 (10.2)	0.21 (1.67–0.27)	<0.001

[a] Including anorexia nervosa and bulimia.
[b] Including major depression and bipolar disorders.
^ Pearson chi square test.

to the ethical standards outlined in the Revised Declaration of Helsinki, 2013. The database is referred to as SPAIN-HOSPI-PSYCHO-YOUTH and is available for sharing upon request.

3. Results

Over the course of the 22-year study period, a total of 2,015,589 adolescents aged 11 to 18 years were hospitalized in Spain, with 118,609 (5.9 %) diagnosed with at least one mental disorder. Although the overall number of adolescent hospitalizations decreased during the study period, the proportion admitted with mental disorders showed an increase, from 3.9 % in 2000 to 9.5 % by 2021 (Fig. 1). Notably, there was a significant rise in both the absolute number and percentage of admissions of adolescents with mental disorders in 2021 compared to the initial year of the COVID-19 pandemic ($p < 0.001$ using chi square test for tendencies).

The distribution of admissions during the study population and associated variables did not follow a normal distribution. Accordingly, we used non-parametric tests in most statistical analyses. Changes in International Classification of Diseases (ICD) listing from 9 to 10 versions, and specially changes in clinical diagnosis suspicion and criteria for hospitalization by doctors across the study period most likely contributed to it.

Throughout the study period, there were 2855 admissions of adolescents where suicidal behavior was identified as a primary diagnosis for hospitalization, accounting for 2.4 % of all admissions among adolescents with mental disorders. Notably, girls comprised 73.4 % of these admissions (Table 1). Differences between boys and girls per year were tested using the chi square test.

There was a four-fold increase in admissions for suicidal behavior during the last decade. Anxiety disorders, including post-traumatic stress disorder (PTSD), and mood disorders were significantly linked to suicidal behavior, accounting for 22 % and 13 % of cases, respectively. The median length of hospital stay for adolescents admitted with suicidal behavior was 6 days, with an interquartile range of 2 to 14 days (Table 2).

The rate of admissions for adolescents with suicidal behavior has significantly increased since 2008. The observed decline in 2016 can most likely be attributed to the transition from the ICD-9 to ICD-10 coding system, and that only suicidal behavior but not suicidal ideation was included during the ICD-10 period. However, after this adjustment, the rates of admissions for suicide resumed their upward trend, only experiencing a disruption during the first year of the COVID-19 pandemic. In 2021, admissions for suicidal behavior among adolescents surged by 2.5 times.

The median age of adolescents hospitalized for suicidal behavior in the study was 16 years (interquartile range, 14–17 years). However, as illustrated in Fig. 2, admissions were significantly higher among adolescents aged between 13 and 16 years. Conversely, the median age at hospitalization decreased significantly over the 22-year study period, from 17 to 15 years (Fig. 3). Thus, in recent years, admissions for suicidal behavior have occurred at younger ages.

The overall in-hospital mortality rate for adolescents admitted due to suicidal behavior was 0.4 %, which doubled the rate observed in adolescents admitted with other mental disorders. Predictors of in-hospital mortality were investigated (Table 3), despite being aware that the small size of the study population (only 12 patients died) was an important

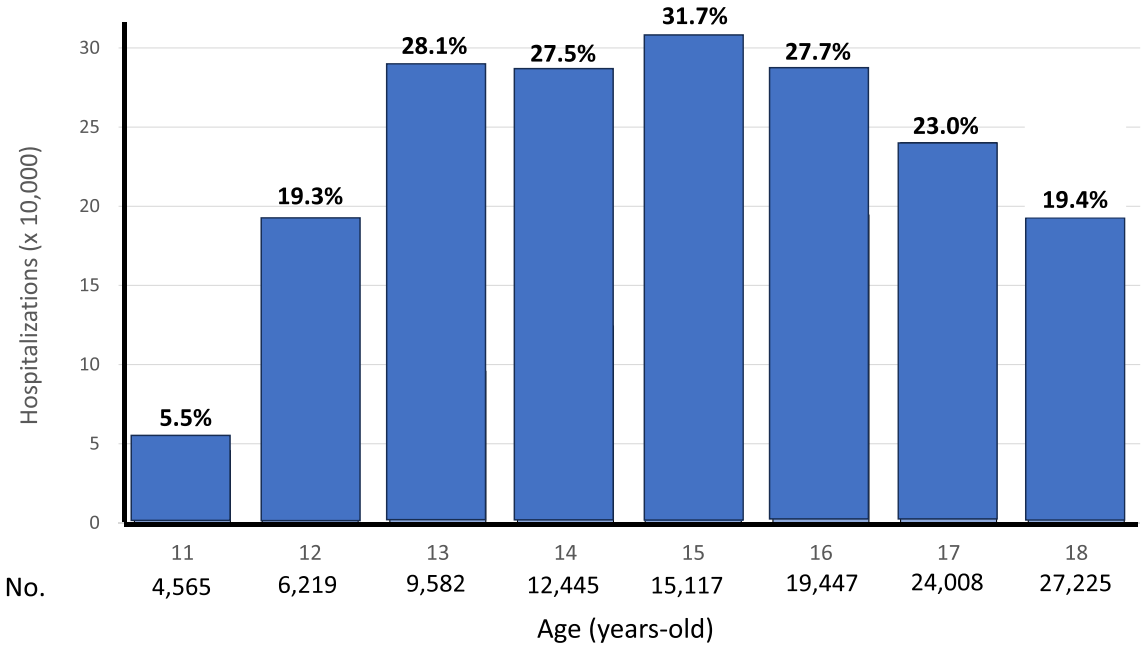
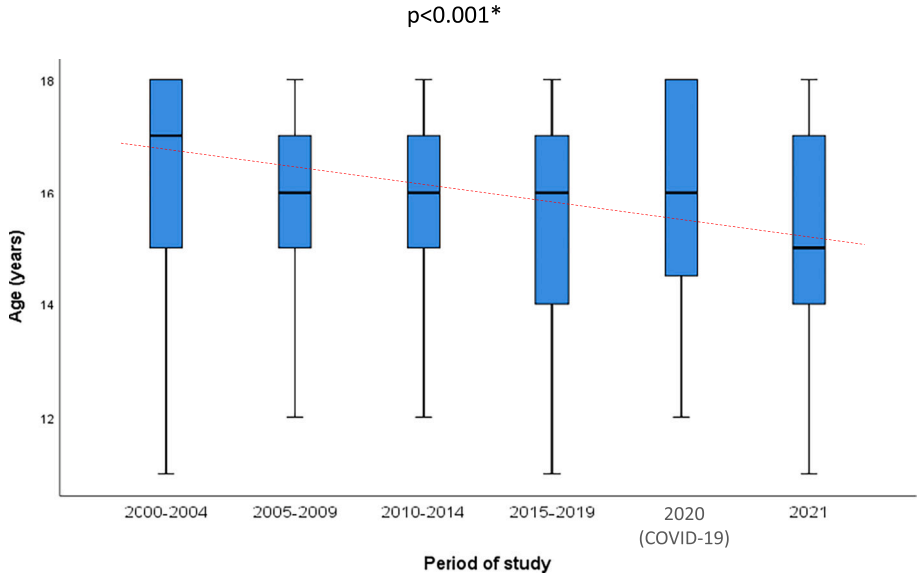


Fig. 2. Hospitalizations in adolescents with suicidal behavior in Spain by age.



Kruskal-Wallis test

Fig. 3. Median age at hospitalization in adolescents with suicidal behavior in Spain by calendar.

caveat. In the univariate analysis, boys had a higher mortality rate than girls (0.8 % vs 0.3 %, respectively), though this difference did not reach statistical significance ($p = 0.096$). None of the other variables considered showed a significant association with in-hospital mortality in the study population.

4. Discussion

The Spanish Observatory of Suicide recently published data for 2022, when the population of the country was approximately 47.4 million. During that year, a total of 4227 deaths by suicide were reported, marking the highest number ever recorded. Men accounted for up to 74 % of these cases. The figure represents an increase of 224 suicide deaths compared to 2021. Since the year 2000, there has been a 25 % rise in suicide deaths (23.4 % for men and 34.4 % for women). Among adolescents, there were 75 suicide deaths in 2022, with boys constituting 70 % of these cases (Spanish Foundation for Suicide Prevention, n.d.).

In our nationwide retrospective study, we identified significant shifts in the pattern of hospitalizations among adolescents in Spain since 2000. Whereas the overall number of hospitalizations significantly decreased over time (approximately 23 %), the proportion of those admitted with mental disorders increased 2.5-fold, now accounting for nearly 10 % of all adolescent hospital admissions. Our findings concur with the global substantial and escalating burden of mental disorders among adolescents (Piao et al., 2022).

The trend towards a rising burden of mental disorders as cause of hospitalization among youth in Spain is particularly remarkable when considering suicidal behavior. The increase in suicidal behavior we

Table 3
Predictors of in-hospital mortality in adolescents admitted with suicidal behavior in Spain.

Variable	Death ($N = 12$)	Alive ($N = 2828$)	OR (95 % CI)	P value*
Male sex	6 (50.0)	751 (26.6)	2.76 (0.88–8.06)	0.096
Median (IQR) age (year)	16 (14–17)	16 (14–17)	0.97 (071–1.33)	0.875
Period 2011–2021	8 (66.7)	2292 (81.0)	0.46 (0.14–1.5)	0.259
Comorbidity with mental disorders				
Substance use disorders	0 (0.0)	496 (17.5)	NA	0.242
Anxiety disorders & PTSD	0 (0.0)	614 (21.7)	NA	0.081
Eating disorders	1 (8.3)	202 (7.1)	1.18 (0.15–9.20)	0.590
Mood disorders	1 (8.3)	372 (13.2)	0.60 (0.77–4.66)	1
Intellectual disability	1 (8.3)	65 (2.3)	3.86 (0.49–30.37)	0.246
Attention deficit hyperactive disorder	0 (0.0)	137 (4.8)	NA	1.00
Autism spectrum	1 (8.3)	66 (2.3)	3.80 (0.48–29.89)	0.250
Psychosis & schizophrenia	0 (0.5)	94 (3.3)		1
Alcohol use disorder	0 (0.0)	10 (0.4)	NA	1

* Multivariable logistic regression using a forward stepwise selection method with the likelihood-ratio test.

noticed aligns with findings from others. As example, a recent meta-analysis that revised studies from 1989 to 2018 documented a rise in suicidal behavior, pointing out that >15 % of children and adolescents exhibited suicidal ideation. By contrast, non-suicidal self-injury was observed in over 20 % of youth (Lim et al., 2019).

The profile of children and adolescents hospitalized with suicidal ideation or suicidal behavior was female sex, and comorbid diagnosis with anxiety disorders, including PTSD and mood disorders. These risk factors are often considered "classic" in their association with suicidal thoughts and actions. As noted by Pawlak et al. (Pawlak et al., 2024), personality traits like neuroticism and extraversion can also predict the initial onset of depression, anxiety, and suicidality in adolescents at high risk. Adverse childhood experiences often lead to poor mental health outcomes, including stress, anxiety, and depression. Intriguingly, robust interpersonal support from caring adults and friends, along with a strong sense of connection to school, can buffer the effects of these adverse experiences, thereby reducing the risk of subsequent psychopathology and suicidal behavior in adolescents (Suh et al., 2024).

Finally, we found that the overall mortality rate within the hospital for adolescents admitted with mental disorders was 0.24 %. For those admitted with suicidal behavior, this rate was twice as high, underscoring the significant risk suicidal behavior poses in terms of leading to suicide completion (Ruch et al., 2019). Therefore, this population may require closer monitoring to prevent and manage attempts at self-harm more effectively (Vancampfort et al., 2019). Notably, boys exhibited a significantly higher in-hospital mortality rate than girls, even though the latter were admitted for suicidal behavior more frequently (Choi et al., 2021). Although the reason for in-hospital mortality is not recorded in the register, it can be presumed that suicide completion was one of the leading causes, since suicidal behavior is the most important predisposing risk factor associated with suicide. This finding could account for the overepresentation of boys, as males are traditionally at higher risk for suicide completion, even from the adolescence. Moreover, the gap in suicide completion rates between both sexes tends to widen as adolescents age (Ayer et al., 2022).

Our study depicts several limitations that warrant further discussion. Firstly, while our data are nationwide and spans 22 years of hospital admissions, it does not capture the true prevalence of suicidal behaviors in Spain, particularly for less severe cases that do not result in hospitalization. As such, our findings might represent only the "tip of the iceberg" in terms of the full impact of suicidal behavior among youth in Spain. Secondly, the transition from ICD-9 to ICD-10 coding systems in 2015 introduced disparities in diagnostic coding. Thirdly, our analysis did not thoroughly investigate the association between suicidal behavior and other mental disorders or multiple psychiatric conditions.

Further limitations stem from our study's design. The retrospective nature of our analysis precluded to review clinical charts to resolve any ambiguities in the data. Additionally, we were unable to determine if patients had been admitted to different clinics within the same calendar year, potentially leading to a slight overestimation of admissions. However, re-admissions during the same year were checked in a subset of patients admitted during the last period and was below 5 % in all years examined. Also, the recording of mental disorders in hospital discharge reports might have been secondary to other medical conditions that were the primary reason for admission. Despite these limitations, previous studies using the SNRHD database for other medical diagnoses, such as HIV, hepatitis B, and COVID-19, have shown that the large sample size tends to mitigate these potential biases, as sensitivity analyses align well with various methodological approaches (Ministerio de Sanidad, Servicios Sociales e Igualdad, 2015; Ramos-Rincón et al., 2021; Ramos et al., 2020; de Miguel-Diez et al., 2021; Ramos-Rincon et al., 2023; Ramos-Rincón et al., 2023).

Given these considerations, the SNRHD should be regarded as a reliable source that provides comprehensive data, covering over 98 % of hospital admissions in Spain. The register's accuracy is further ensured by regular audits. Therefore, the findings presented in our study are indicative of the clinical burden and trends over time of suicidal behavior among adolescents in Spain.

In conclusion, this extensive nationwide retrospective study on adolescents hospitalized with suicidal behavior in Spain reveals a notable increase in cases from 2000 to 2021. Girls represented 73.4 % of these admissions, yet in-hospital mortality was more frequent in boys. Of note, there has been a significant trend towards younger ages at the time of admission with suicidal behavior in recent years. Altogether, our findings indicate that Spain, like other developed nations, is experiencing a crisis of suicidal behavior among adolescents (Ruch et al., 2019; Vancampfort et al., 2019; Choi et al., 2021). There is an urgent need for primary prevention strategies in schools, involving multidisciplinary teams that can address the various factors predisposing adolescents to suicide (Walsh et al., 2022; Egorova et al., 2018). As others have recently highlighted, investing in the well-being of young people is both a fundamental responsibility of governments and an imperative of human rights (Ross et al., 2022).

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CRediT authorship contribution statement

Vicente Soriano: Writing – original draft, Validation, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **José Manuel Ramos:** Validation, Methodology, Formal analysis, Data curation. **María Inés López-Ibor:** Validation, Investigation. **Carlos Chiclana-Actis:** Validation, Investigation. **Manuel Faraco:** Validation, Investigation. **Joaquín González-Cabrera:** Validation, Investigation. **Eduardo González-Fraile:** Validation, Investigation. **Gemma Mestre-Bach:** Validation, Investigation. **Héctor Pinargote:** Validation, Investigation. **Manuel Corpas:** Validation, Investigation. **Lucía Gallego:** Validation, Investigation. **Octavio Corral:** Validation, Investigation.

Hilario Blasco-Fontecilla: Validation, Investigation, Formal analysis, Data curation, Conceptualization.

Declaration of competing interest

None for all authors.

Data availability

all data and materials are available upon request.

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