

Burden of the COVID-19 pandemic on adolescent mental health in the Lombardy Region, Italy: a retrospective database review

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To cite: Clavenna A, Cartabia M, Fortino I, *et al.* Burden of the COVID-19 pandemic on adolescent mental health in the Lombardy Region, Italy: a retrospective database review. *BMJ Paediatrics Open* 2024;**8**:e002524. doi:10.1136/bmjpo-2024-002524

► Additional supplemental material is published online only. To view, please visit the journal online (<https://doi.org/10.1136/bmjpo-2024-002524>).

Received 22 January 2024

Accepted 16 September 2024



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ABSTRACT

Background Previous research has assessed the impact of the COVID-19 pandemic on adolescent mental health (MH). How the pandemic changed healthcare resource utilisation for MH conditions was investigated less, however, in particular in Italy.

Methods Data concerning outpatient visits in child and adolescent mental health services (CAMHSs), access to emergency departments (EDs), hospital admissions and drug prescriptions collected in administrative databases of the Lombardy Region, Italy, concerning adolescents 12–17 years old and occurring in the 2016–2021 period were analysed.

Annual and monthly prevalence of healthcare (CAHMS/ED visits/hospital admissions) use for MH conditions and of psychotropic drug prescriptions were estimated. A negative binomial regression model was used to model the pre-pandemic monthly number of prevalent cases by gender. The total number of pandemic (1 March 2020 to 31 December 2021) cases predicted from the model was compared with the number of observed cases.

Results The overall annual rate of healthcare service utilisation slightly increased in the 2016–2019 period (from 63.8‰ to 67.8‰), decreased in 2020 (57.1‰) and returned to values similar to 2016 (64.9‰) the following year. A 2% relative increase was observed in girls, and a 10% decrease in boys, when comparing the prevalence in 2021 with that in 2019. Differences between genders were particularly evident for ED attendance, with an observed/predicted cases ratio in 2021 of 0.81 (95% CI 0.79 to 0.83) in boys, and 1.18 (95% CI 1.16 to 1.20) in girls, and for psychotropic drug prescriptions (0.83 (95% CI 0.82 to 0.84) and 1.24 (95% CI 1.23 to 1.25), respectively).

Conclusions The current study confirms that the use of health services for MH conditions during the COVID-19 pandemic increased among adolescent girls but decreased among boys, and that gender differences emerged in the MH impact of the pandemic.

INTRODUCTION

Disruptions and restrictions introduced in several countries during the COVID-19 pandemic period had an impact on the mental health (MH) of children and adolescents.¹

WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ The impact of restrictive measures introduced during the COVID-19 pandemic on adolescents' mental health (MH) was documented in different countries.
- ⇒ Most of the available studies have focused on specific contexts, for example, emergency departments (EDs) or prescription of psychotropic drugs, and there are scant data on the overall use of healthcare resources.

WHAT THIS STUDY ADDS

- ⇒ An increase of healthcare service utilisation for MH conditions during the pandemic period was observed, but it concerned almost exclusively adolescent girls.
- ⇒ The increase of healthcare use observed in girls was more relevant for psychotropic drugs prescriptions and ED attendance.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Interventions to identify and support adolescents with MH problems and to improve access to health services, in particular for girls, are crucial.

Several studies have documented a worldwide increase in emergency department (ED) visits, hospital admissions for mental disorders, and psychotropic drug prescriptions in children and adolescents during the pandemic period compared with the pre-pandemic period.^{2–14} In particular, the increase concerned anxiety and depressive symptoms, self-harm episodes, and eating disorders.^{15–22}

Gender differences emerged in most of the studies, with girls at a greater risk of MH disorders than boys.^{6 7 13 20 21 23 24}

The Italian Lombardy Region was one of the geographical settings that was first, and most severely, hit by the COVID-19 pandemic at the European level.²⁵ Few studies are available concerning the impact of the pandemic



on paediatric MH in this region, and more generally in the Italian setting: most were performed in 2020 during the first few months of the pandemic, or involved few hospitals or geographical settings.^{13 26 27} A few studies evaluated the impact on MH in the year following the pandemic, but they are limited to individual healthcare centres.^{28–30}

Despite some limitations, administrative databases can be useful for evaluating the pattern of use of healthcare services across time and for estimating the burden of mental disorders in a large population representative of the local/regional setting.³¹

We therefore analysed the healthcare administrative databases of the Lombardy Region with the aim of evaluating if there was an increase in the use of healthcare resources by adolescents for conditions potentially related to MH during the first 2 years of the pandemic period.

METHODS

Data sources

The data sources were administrative health databases of the Lombardy Region, routinely used for reimbursement purposes. Lombardy is one of the largest Italian regions, located in the northern area of the country and one of the most prominent regions from the socioeconomic point of view.

In particular, four databases were analysed, collecting:

- ▶ Prescriptions for diagnostic tests, specialist visits and rehabilitation performed in outpatient clinics.
- ▶ Hospital discharge forms.
- ▶ Visits performed in the EDs
- ▶ Prescriptions dispensed by the retail pharmacies of the Lombardy Region and reimbursed by the Italian National Health Service (NHS).

The above databases have been previously described.^{31 32}

The observation period was 1 January 2016 to 31 December 2021, and the study population was composed of adolescents aged 12–17 years on 31 December of each year, living in the Lombardy Region (ranging from 564 440 inhabitants in 2016 to 592 436 in 2021).

Data were managed and analysed using an anonymous patient code. Each patient was identified by the same alphanumeric anonymous code in all the above databases.

Healthcare attendance: case definition

A person was defined as a case (ie, a user of healthcare resources for a presumed mental disorder) if at least once during each year that person: (a) attended an outpatient child and adolescent mental health service (CAMHS) or (b) attended an ED for an MH condition, or (c) was hospitalised for a mental disorder.

Criteria were the same as those applied in previous studies.^{13 31} Specifically:

- ▶ CAMHS attendance: youth were identified as service attendants if they received at least one prescription

for a visit and/or a psychological therapy intervention and/or rehabilitation performed in an outpatient CAMHS.

- ▶ ED attendance: ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification) codes from 290 through 319 recorded as primary diagnoses were used to identify visits due to MH conditions. Codes 983* (toxic effect of corrosive aromatics, acids and caustic alkalis), V62.82 (Bereavement), V62.84 (suicidal ideation) and V40.3 (other behavioural problems) were also included.¹³
- ▶ Hospitalisation: the rate of hospitalisation was estimated considering hospital discharge forms. Hospital discharge records included information on primary diagnoses and up to five coexisting conditions, diagnostic and therapeutic interventions, date of admission, discharge and in-hospital death. All diagnoses were coded according to the ICD-9-CM codes listed above.

MH conditions

Unfortunately, the information on the diagnosis was only partially provided for the outpatient visits. To overcome this limitation, an analysis was performed on ED visits, and the distribution of MH conditions grouped according to the ICD-9 code collected in the primary diagnosis field (online supplemental table 1) was compared by gender and by year of the observation period.

Psychotropic drug prescription

The analysis involved all paediatric prescriptions reimbursed by the health service and dispensed by the retail pharmacies in the Lombardy Region. Psychotropic drugs were defined according to the Anatomical Therapeutic Chemical classification system and comprised the following subgroups: antipsychotics (N05A), antidepressants (N06A) and stimulants (N06BA). Anticonvulsants (N03 subgroup) were excluded because in children they are mainly used to treat epilepsy, while anxiolytics were excluded because they are not reimbursed by the Italian NHS.

Statistical analysis

The annual and monthly prevalence rates (per 1000) were estimated by gender and observation year, by dividing the number of cases by the total number of residents 12–17 years old in the Lombardy Region.

The χ^2 test was applied to compare the prevalence by gender, and the χ^2 for trend was used to compare the changes across years in the proportion of ED visits related to MH conditions by disorder.

For the overall healthcare users and for each outcome of interest reported above, a negative binomial regression model was used to model the pre-pandemic (January 2016 through February 2020) monthly number of prevalent cases by gender, using month as a categorical variable, year as a continuous variable and log of number of residents as offset. The total number of pandemic

(1 March 2020 to 31 December 2021) cases predicted from the model was then compared with the number of observed cases during the same period.

To evaluate if differences exist between the first phase of the pandemic, characterised by lockdown and school closures, and the second phase, with an ease of the social restrictions, the pandemic period was further divided into two 11-month periods (1 March 2020 to 31 January 2021 and 1 February 2021 to 31 December 2021). The ratio between observed/predicted cases with 95% CIs was calculated by gender, stratified by the four indicators.

Patient and public involvement

Patients and/or the public were not involved in the design, or conduct, or reporting or dissemination plans of this research.

RESULTS

Healthcare use

During 2021 a total of 38 436 (prevalence: 64.9 per 1000; 95% CI 64.3 to 65.5 per 1000) adolescents 12–17 years old used healthcare resources for a condition potentially related to a mental disorder. In all, 95% of the cases had one or more outpatient visits in a CAMHS, 8% had one or more accesses in an ED for an MH condition and 4% were hospitalised.

The prevalence was slightly higher in boys than in girls (66.7‰ vs 62.6‰; $p < 0.001$).

The overall annual rate of healthcare service utilisation increased in the 2016–2019 period (from 63.8‰ to 67.8‰), decreased in 2020 (57.1‰), and, the following year, returned to values similar to 2016 (64.9‰) (table 1).

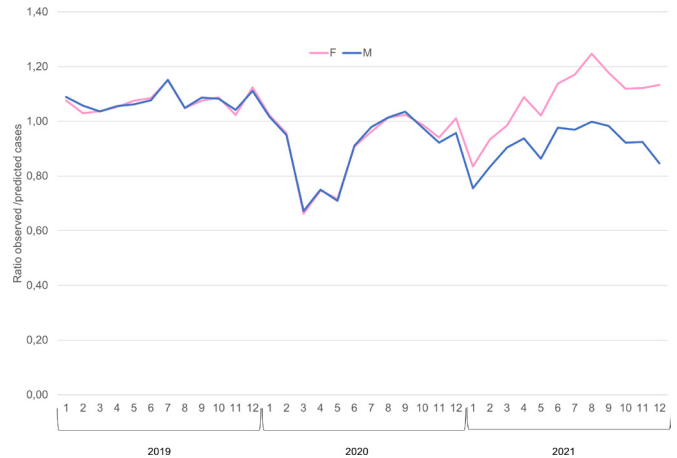


Figure 1 Ratio between the monthly number of observed versus predicted cases in the 2019–2021 period, by gender.

In the 2016–2019 period the trend was similar in boys and girls, while, when comparing the prevalence in 2021 to that of 2019, there was a 2% relative increase in girls and a 10% decrease in boys. At all observation points, there was an increase in trend access by girls compared with boys over the studied time period.

Online supplemental figures 1–5 report the trend in monthly number of cases in the 2016–2021 period by gender and indicator.

The trend of observed/predicted ratio was very similar for boys and girls during 2019–2020, with a minimum (0.68) in March, while in 2021 the trends were completely different: in girls this ratio increased to over 1, reaching a maximum of 1.25 in August, and in boys, it remained lower than 1 (figure 1).

Table 1 Prevalence (per 1000 inhabitants) of overall healthcare use, outpatient visits, emergency department (ED) attendance, hospital admission and psychotropic drug prescriptions, by gender and year

	Gender	2016	2017	2018	2019	2020	2021	Relative difference (%)	
								19 vs 16	21 vs 19
Overall	F	57.5	52.6	52.7	61.2	52.2	62.6	+6.4	+2.3
	M	69.7	61.2	63.1	74.0	61.7	66.7	+6.2	−9.7
	All	63.8	57.0	58.0	67.8	57.1	64.9	+6.2	−4.0
Outpatient visits	F	53.1	47.8	48.0	56.8	49.6	58.6	+7.0	+3.2
	M	66.4	58.0	59.9	71.0	60.0	64.9	+6.9	−8.6
	All	60.0	53.0	54.2	64.1	54.9	61.8	+6.8	−3.6
ED	F	6.2	6.6	6.6	6.6	4.5	7.6	+6.5	+15.2
	M	3.8	4.0	4.0	4.0	2.6	3.2	+5.3	−20
	All	5.0	5.3	5.3	5.3	3.5	5.3	+6.0	0
Hospital admission	F	3.1	3.3	3.3	3.6	3.0	4.0	+16.1	+11.1
	M	2.3	2.3	2.2	2.5	1.6	1.7	+8.7	−32.0
	All	2.7	2.8	2.7	3.0	2.3	2.8	+3.7	−6.7
Psychotropic drugs	F	5.7	6.1	6.3	7.1	6.0	10.0	+24.6	+40.8
	M	6.5	6.8	7.3	7.7	6.5	7.5	+18.5	−2.6
	All	6.1	6.4	6.8	7.4	6.2	8.7	+21.3	+17.6

When considering the two pandemic periods, the ratio between observed and predicted cases was 0.87 in the first, with no significant differences between girls and boys, and 1.00 in the second. In the latter period, the ratio was 0.92 (95% CI 0.92 to 0.92) in boys and 1.09 (95% CI 1.09 to 1.10) in girls.

CAMHS outpatient visits

The data on CAMHS attendance resembled those on the overall healthcare users, with a similar trend of the prevalence both for the pre-pandemic (+6.8%) and pandemic (-3.6%) period (table 1).

The ratios of observed/predicted cases in boys and girls were the same as those estimated for the overall healthcare users.

ED attendance

Consistently with other data, there was an increase in ED attendance in the 2016–2019 period, with a similar trend in boys and girls, while in 2019 and 2021 the prevalence increased by 15.2% in adolescent girls and decreased by 20% in boys (table 1).

The decrease in the first phase of the pandemic was particularly evident for ED attendance, with a ratio of observed predicted cases of 0.59 (95% CI 0.56 to 0.61) in boys and 0.61 (95% CI 0.59 to 0.64) in girls. In the second phase, the ratio was 0.81 (95% CI 0.79 to 0.83) in boys and 1.18 (95% CI 1.16 to 1.20) in girls.

Anxiety disorders and alcohol and substance abuse were the most frequent reasons for ED attendance in the entire observation period for both girls and boys, covering 45% of accesses in girls and 48% in boys in 2021 (figure 2; online supplemental table 2).

Considering adolescent girls, there was an increase in accesses due to eating disorders (from 2.6% to 9.6%; $p<0.001$), mood disorders (from 3.0% to 6.1%; $p<0.001$) and self-harm (3.1% to 4.1%; $p=0.004$). An increase was observed for alcohol and substance abuse mainly from 2016 to 2019 (13.7% to 17.8%; $p=0.01$), while accesses

for anxiety disorders decreased from 46.3% to 32.4% ($p<0.001$).

In boys a decrease was observed for accesses due to personality disorders (3.1% to 1.4%; $p<0.001$) and for anxiety disorders (29.0% to 26.0%; $p=0.002$), while accesses due to psychosis increased from 10.1% to 14.8% ($p=0.003$), and that for other behavioural problems increased from 1.6% to 3.5% ($p<0.001$).

In terms of absolute numbers, the most striking increases were observed in adolescent girls for accesses due to eating disorders (271 in 2021 vs a mean of 87.5 in 2016–2019 period) and mood disorders (171 vs 75.5).

Hospital admission

While for the other indicators the gender differences in the trend of the prevalence across time emerged only in the pandemic period, in the case of hospitalisation differences were also present in the pre-pandemic period (2016–2019), with an increase of 16.1% in girls versus 8.7% in boys (table 1). During the pandemic period, a further increase occurred in girls (+11.1%), while a 32% reduction was observed in boys.

During the first phase of the pandemic, the ratio of observed predicted cases was 0.60 (95% CI 0.57 to 0.63) in boys and 0.77 (95% CI 0.75 to 0.79) in girls. In the second phase, the ratios were 0.64 (95% CI 0.61 to 0.68) and 1.02 (95% CI 1.01 to 1.02), respectively.

Psychotropic drug prescription

The most striking differences were observed for the prevalence of psychotropic drug prescriptions: in girls, it was twofold greater in 2021 than in 2016 (10.0‰ vs 5.7‰); in boys, the estimate in 2021 was also higher than in 2016 (7.5‰ vs 6.5‰), but was similar to the 2019 value (7.7‰).

The same trend was observed when considering antidepressants and antipsychotics: the prevalence of prescription increased in girls from 4.0‰ to 7.1‰ and from 2.4‰ to 5.0‰, respectively, while in boys the estimate in

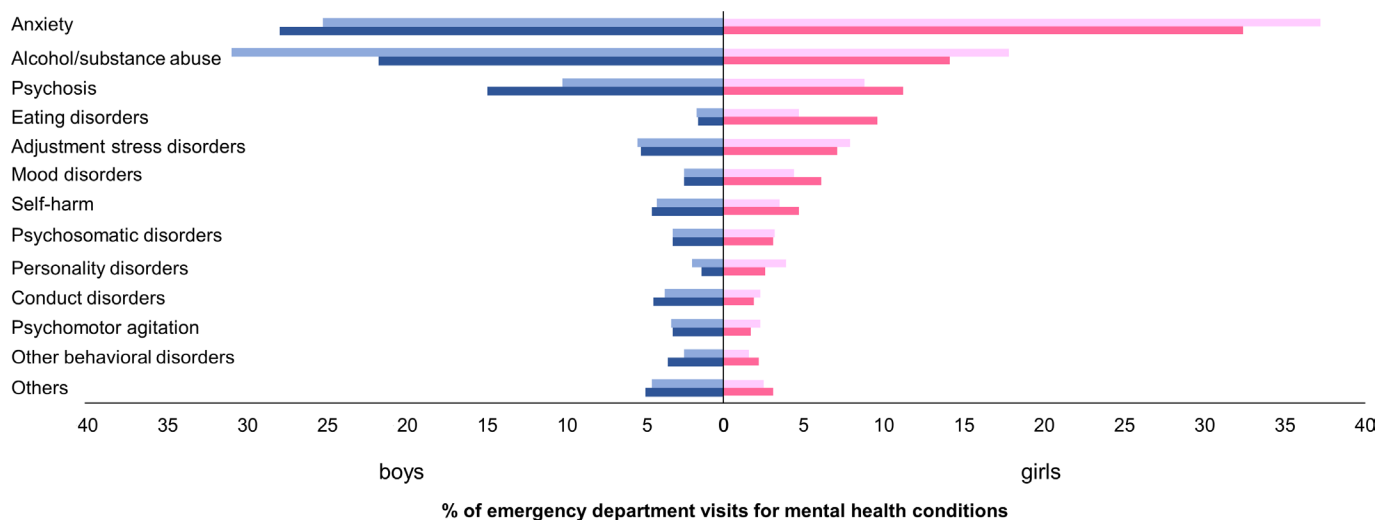


Figure 2 Percentage distribution of emergency department visits by mental disorder in 2019 (light colour) versus 2021 (dark colour).

2021 was the same as in 2019 for both classes (2.6‰ and 4.4‰, respectively).

During the first phase of the pandemic, the ratio of observed/predicted cases was 0.68 (95% CI 0.67 to 0.69) in boys and 0.72 (95% CI 0.71 to 0.73) in girls, and in the second phase, the ratios were 0.83 (95% CI 0.82 to 0.84) and 1.24 (95% CI 1.23 to 1.25), respectively.

DISCUSSION

Our study confirms that during the COVID-19 pandemic there was an increase in MH disorders in adolescents, and highlights that the associated use of health services occurred especially in girls.^{1 6 8 15}

In our sample, we observed an increase in the use of health services for conditions related to MH, both in boys and in girls, during the pre-pandemic period, which was particularly evident for the prevalence of psychotropic drug prescriptions. It is, therefore, likely, as observed by other researchers, that the pandemic exacerbated an already existing emergency concerning paediatric MH.^{33 34}

In the first few months of the pandemic, there was a 30% drop in the attendance for MH conditions. After the first wave of the pandemic (March to May 2020), the ratio between the observed versus expected cases returned to 1, and further decreased during the second wave (October 2020 to January 21).

In this period, the attendance at CAMH outpatient services was only slightly affected, with a 10% reduction, while the main impact was observed on ED attendance (-40%). The impact was similar between genders, with the only exception of hospital admission, for which the decrease was more pronounced in boys than in girls.

The situation was completely different in the second pandemic period: the prevalence of observed cases remained lower than expected for boys, while the opposite occurred for girls.

Adolescent girls used health services for mental conditions more frequently than predicted on the basis of the trend in the pre-pandemic period, with a relative increase of 24% in the case of psychotropic drug prescriptions and of 18% in the case of ED attendance.

Despite the existing differences among countries regarding geographical, cultural and socioeconomic characteristics, and the differences in the public health measures adopted to tackle COVID-19, the impact of the pandemic on adolescent MH appears similar in different settings.^{1 4-7 9-12 21 24}

Gender differences in the impact of the pandemic on MH were documented in several studies.^{6 7 13 20 21 23 24} Adolescent females suffered the consequences of COVID-19 and related lockdown measures more than males, resulting in symptoms of anxiety and depression,^{16 20 24 35} and this finding is consistent with the greater prevalence of internalising mental disorder in women compared with men.³⁶

Eating disorders, mood disorders and self-harm were the conditions associated with ED attendance with the

highest increase in girls during 2021. In boys, the access due to the same disorders decreased compared with the pre-pandemic period. Similar findings were reported in the UK.²³

An increased utilisation of healthcare resources for eating disorders, more pronounced in adolescent girls, was observed in several Italian and international studies.³⁷⁻⁴¹ Numerous stressors could trigger eating disorders during the pandemic, including increased time at home, easier access to food, social isolation, changes to routines and physical activity, and increased online media use.^{17-19 37} Differences in symptomatology of eating disorders were observed over time, with an increasing risk related to the dimensions of body concerns, dissatisfaction, asceticism and fear of maturity in the 2/3 years following the onset of the pandemic.³⁸

The fact that the rise in ED visits for eating disorders, mood disorders and self-harm, was mainly observed in the second year of the pandemic, however, when social restrictions were at least partially eased, may indicate a long-term impact of the pandemic and/or that there was a lag-time between the onset of the disorders and the help-seeking. In the case of some disorders (eg, eating disorders), it is hypothesised that the effects of the pandemic on MH may be predominantly delayed rather than immediate, with a deterioration of symptoms during the period of lockdown that became apparent later on, when the relaxation of the restrictive measures exposed adolescents to a resumption of normal routines and to new risks such as social confrontation.^{38 39} Furthermore, lockdown restrictions had different levels of impact on people's daily routines, both those with and without a medical diagnosis, on the difficulties experienced in performing daily tasks or in accessing healthcare and mental healthcare services.⁴² The aforementioned triggering environment can create additional challenges for patients with eating disorders, thereby exacerbating conditions that are not adequately addressed by online treatment or family support.

Findings from this study underline the need to monitor adolescent mental well-being beyond the conclusion of the 'acute phase' of the pandemic. For doing so, healthcare services should be potentiated and adapted to tackle new challenges,⁴³ and people with different roles (parents, primary care physicians, professionals involved in child and adolescent mental healthcare, teachers) should be involved with the aim to identify and support adolescents with psychological distress.^{33 34}

The treatment of mental disorders, regardless of the patient's age and the type of disorder, requires multi-dimensional interventions involving community-based social and health services, families, and patients.⁴⁴ The pandemic has shown that there is a need for innovative, holistic and comprehensive community-based support models, particularly in the areas of MH and healthcare for children and adolescents.^{34 45} We have also learnt that too little has been done so far for prevention, including in the context of MH. So adequate resources (human,



economic and training) should be allocated to improve treatment and prevention pathways at the community level. This should be accompanied by the conduct of appropriate efficacy studies and the implementation of positive results.

Finally, in our study, the greatest relative increase was observed for psychotropic drug prescriptions in adolescent girls, and concerned both antidepressants and antipsychotics. In the first case, it is consistent with the increase in anxiety and depressive symptoms, while antipsychotic prescriptions refer to medium-severe disorders and other conditions and comorbidities. It could be hypothesised that there was an increase in episodes of psychomotor agitation, bipolar disorder or psychotic onset. This hypothesis is at least partially supported by data on ED visits.

This study has some limitations. We had the possibility to monitor outpatient visits and drug prescriptions reimbursed by the Italian NHS. Private visits and medicines paid out-of-pocket were not evaluated. Moreover, anxiolytics are not reimbursed by the NHS in Italy, and it is, therefore, likely that the prevalence of psychotropic drug use is underestimated and that the increase observed in girls during the pandemic period is greater than reported.

The socioeconomic conditions of the family are considered one of the main risk factors for experiencing greater negative MH effects due to the pandemic,⁴⁶ but findings on healthcare utilisation are conflicting, with studies reporting a greater healthcare use in youths living in areas of higher socioeconomic status^{6 47 48} or a reduced attendance of subjects with lower socioeconomic conditions.⁴⁹ Unfortunately, healthcare administrative databases do not collect information concerning socioeconomic variables, (which are in any case limited in terms of reliability), so we were not able to analyse the influence of these factors.

CONCLUSION

The current study confirms that there was an increase in the use of health services for conditions related to MH during the COVID-19 pandemic, and highlights that girls suffered the most. The pandemic may have exacerbated an already existing crisis, and interventions at different levels (multidimensional) to identify and support adolescents with MH problems and to improve access to health services, in particular for girls, are crucial.

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Acknowledgements The authors would like to acknowledge Dr Chiara Pandolfini for the assistance in language editing.

Contributors AC conceptualised and designed the study, and drafted the initial manuscript. MC participated in the conceptualisation and design of the study, and carried out the statistical analyses. IF participated in the conceptualisation and design of the study, and reviewed and provided input into data analysis. MB conceptualised and designed the study, supervised data analysis and critically reviewed the manuscript for important intellectual content. All authors reviewed

and revised the manuscript, and approved the final manuscript as submitted and agree to be accountable for all aspects of the work. AC acted as guarantor.

Funding This study is part of the Project EPiFARM funded by the Lombardy Region (award/grant number N/A).

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval No ethics committee approval is required in Italy for epidemiological studies using healthcare administrative databases for research purposes and with individuals identified by an anonymous patient code.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available.

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