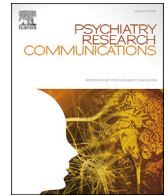




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Sociodemographic and clinical changes in pediatric in-patient admissions for mental health emergencies during the COVID-19 pandemic: March 2020 to June 2021

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ABSTRACT

COVID-19 pandemic may affect children's mental health. Children <18 years in-patiently admitted for mental health emergencies between March 2020 and June 2021 were compared to those admitted in the same period of 2018–2019 in terms of sociodemographic and clinical characteristics. There were 49 admissions in the pre-pandemic period and 60 in the pandemic period (IRR: 1.22; 95% CI: 0.84–1.79), with the latter more likely to have a family history of psychiatric disorders, a personal history of physical disturbances, present with suicidal risk, and being diagnosed with an externalizing disorder. This study underscores the increased need for pediatric mental health services.

1. Introduction

By the end of 2019, the first cases of severe acute respiratory syndrome due to the novel coronavirus (SARS-CoV2) were detected in China. Towards January 2020, the virus had already shown rapid spread and high pathogenicity, being claimed as a Public Health Emergency of International Concern (Cucinotta and Vanelli, 2020). The first reported case in Italy was on February 21, 2020, and thereafter the country was one of the most affected, with northern Italy resulting the European epicenter of the pandemic. On 5th March, school and university face-to-face teaching was suspended throughout the country and, as of 9th March, a national quarantine was implemented. Progressively more strict containment measures were adopted, which were eased only in May. Given a subsequent exponential increase in the contagion curve, a new decree-law in force from 13th October limited again free movement. Only since April 2021 has there been a gradual relaxation of containment measures, along with the implementation of the vaccination campaign, until the beginning of June 2021 with the abolition of the night curfew.

As for other countries, the pandemic led to the massive reorganization of many Italian public healthcare facilities into intensive care units to assist the increasing number of COVID-19 patients. The healthcare system redeployment also affected psychiatric services, curtailing outpatient appointments and, in some cases, suspending assistance (Ornell et al., 2021). Despite the remarkable development of telemedicine (Shore et al., 2020), since the pandemic outbreak, data has been emerging about how COVID-19 and related restrictions may have had an impact on the mental health of both children suffering from pre-existing mental health vulnerabilities (Colizzi et al., 2020) and otherwise healthy youth (Pigaiani et al., 2020). In particular, research evidence indicates increased rates of youth suicidal ideation and attempts starting from the very early stages of the pandemic (Hill et al., 2021), urging the search for novel treatment approaches in the field. For instance, the potential benefits of ketamine as a rapid antidepressant and anti-suicidal have been widely investigated, warranting the need for longer clinical trials assessing its long-term effect and safety (De Berardis et al., 2018). Most evidence so far has focused on the early effects of the pandemic on pediatric mental health-related

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emergency referral rates, reporting reductions worldwide (Chen et al., 2020; Davico et al., 2021; Krass et al., 2021; McNicholas et al., 2021; Ougrin et al., 2021; Raffaldi et al., 2021). However, there is a paucity of longer-term data, especially in terms of in-patient admission rates, clinical presentations, diagnoses, and severity.

The aim of this study was to describe the in-patient admissions for mental health emergencies of children presenting to a tertiary children's hospital inpatient ward during the COVID-19 pandemic (March 2020 to June 2021) as compared to those admitted in the immediately preceding same time window (March 2018 to June 2019), both in terms of incidence and sociodemographic and clinical characteristics. An increased pressure on the pediatric emergency departments (EDs) in terms of mental health emergencies that could not be managed on an outpatient basis was hypothesized, along with more severe clinical presentations including an increased risk of suicide.

2. Methods

This study was conducted at the Child and Adolescent Neuropsychiatry Unit, Maternal-Child Integrated Care Department, of the Integrated University Hospital of Verona, Italy, a nationwide tertiary referral inpatient facility for pediatric mental health emergencies. Out of all mental health-related inpatient admissions over the study period (March 2020 to June 2021), only urgent referrals were eligible for inclusion in the study. Most common reasons for urgent referral were: (i) EDs or (ii) outpatient assessment of clinical instability requiring increased intensity of care, (iii) inpatient transfer request from the pediatric department after physical stabilization (e.g., suicidal attempt by overdose, excessive weight loss in anorexia nervosa), (iv) inpatient admission request from local hospitals due to lack of adequate resources. Same inclusion criteria were applied to the control group (inpatient admissions from March 2018 to June 2019). Mental health-related scheduled admissions were excluded from the study.

The following data was collected retrospectively from the electronic medical records of all consecutive emergency admissions to the inpatient service over the period March 2020 to June 2021 and those admitted in the same period before the pandemic outbreak: (i) age, (ii) sex, (iii) access day (midweek/weekend), (iv) reason for admission (anxiety-agitation/suicidal thoughts-self-harm/other), (v) family composition (no parent-community/1 or 2 parents), (vi) family history of psychiatric disorders (no/yes), (vii) psychiatric disorders in the family (none/1/2 or more); (viii) number of relatives with psychiatric disorders (none/1/2 or more), (ix) personal history of psychiatric disorders (no/yes); (x) previous psychiatric admissions (no/yes); (xi) psychopharmacological therapy at admission (no/monotherapy/polytherapy); (xii) personal history of physical disturbances (none/1/2 or more); (xiii) other medication at admission (no/yes); (xiv) traumatic events (no/yes); (xv) substance use (no/yes); (xvi) school attendance (attending/not attending); (xvii) cognitive impairment (no/yes); (xviii) cognitive functioning (homogeneous/inhomogeneous); (xix) length of stay; (xx) multidisciplinary treatment approach during hospital stay (no/yes); (xxi) behavioral diagnosis (internalizing disorder/externalizing disorder/both); (xxii) psychopharmacological therapy at discharge (no/yes).

Collected data was described by mean and standard deviation for gaussian continuous variables, median and interquartile range in case of skewed distribution, and by counts and percentages for categorical variables. Normality distribution of continuous variables was verified by Shapiro-Wilk test. Differences between the two time periods were analyzed by *t*-test in case of normally distributed continuous variables, and Mann-Whitney tests for skewed data. Unadjusted distributional differences between categorical variables were analyzed by ordinary chi-squared tests, and Fisher exact for low sized (<5) cells. Incidence-Rates Ratio (IRR) and 95% confidence intervals were estimated by simple Poisson regression and the smoothed hazards of hospitalization over the two time periods were graphed to evaluate admission temporal trends. A stepwise binomial logistic regression model with backward stepwise

selection was developed to identify the sociodemographic and clinical characteristics associated with the pandemic period. Low thresholds (removal with $p > 0.1$ and addition with $p < 0.05$) were set to obtain the most parsimonious model.

The analysis had exploratory and hypothesis-generating aims. No *a priori* strategies for treating missing data were established and no formal power analysis was performed. A 5% statistical significance threshold was set. The analyses were conducted by the statistical package STATA.16.0 (www.stata.com). The study was part of a larger research which was approved by the research ethics committee at the Integrated University Hospital of Verona (CESC 2242 and CESC 2243).

3. Results

The study counted 49 in-patient admissions in the pre-pandemic period and 60 in the pandemic period. The two periods lasted 463 days each and the unadjusted Incidence Rates Ratio was 1.22 (95% CI: 0.84–1.79). A graphical representation is provided in the Supplementary Fig1.

Children's median age was 14 years (IQR: 12–16) in the pre-pandemic period and 15 years (IQR: 14–16) in the pandemic period ($p = 0.075$), with a similar length of stay between the pre-pandemic (median: 5 days; IQR: 4–7 days) and the pandemic (median: 6 days; IQR: 4–8 days) periods ($p = 0.10$). The stepwise regression model indicated that during the pandemic period children in-patiently admitted for mental health emergencies were more likely to have a family history of psychiatric disorders (OR: 3.12; 95% CI: 1.08–9.04) and a personal history of at least two physical disturbances (OR: 6.34; 95% CI: 1.17–34.28), present with suicidal thoughts-self-harm (OR: 3.18; 95% CI: 1.00–10.12) and a homogeneous cognitive functioning (OR: 0.24; 95% CI: 0.07–0.80), and being diagnosed with an externalizing disorder (OR: 3.34; 95% CI: 1.11–10.08). Finally, during the pandemic period, children were less likely to have a weekend access (OR: 0.22; 95% CI: 0.08–0.62) and to receive multidisciplinary interventions (OR: 0.12; 95% CI: 0.03–0.41).

Descriptive statistics of all data collected are reported in Table 1.

4. Discussion

The current study aimed at investigating the longer-term mental health impact of COVID-19 in a pediatric population, focusing on inpatient admissions for mental health emergencies as the most reliable measure at a time when other services might have been inaccessible or unavailable, leaving EDs as the privileged point of care for youth experiencing mental health issues. Results indicate that children in-patiently admitted for mental health emergencies during the pandemic period report more frequently a family history of psychiatric disorders and personal physical comorbidities, are more likely to suffer from suicidal thoughts-self-harm and externalizing disorders, and present more often with a homogeneous cognitive functioning. Also, as a potential direct consequence of reduced service availability, a higher rate of admissions was observed in the midweek and multidisciplinary interventions were less likely to happen.

Evidence from developing middle-income, developing high-income, and developed high-income countries (Chen et al., 2020; Krass et al., 2021; McNicholas et al., 2021; Ougrin et al., 2021), including Italy (Davico et al., 2021; Ougrin et al., 2021; Raffaldi et al., 2021), indicates a decrease in the number of pediatric mental health-related hospital emergency department (ED) visits in the first weeks following the beginning of the pandemic. Invoked reasons for such phenomenon include fear of the infection overcoming concerns (Raffaldi et al., 2021), low attendance at general practitioners or emergency departments (Huang and Ougrin, 2021), quarantine measures and school closures (Ougrin et al., 2021), and the implementation of alternative ways of managing acute psychopathology (Davico et al., 2021). However, studies reporting on both the numbers and proportions of mental health emergencies offer a clearer perspective on youth mental health needs during a

Table 1
Sociodemographic and clinical characteristics of pediatric in-patient admissions for mental health emergencies during the COVID-19 pandemic.

		Pre-pandemic period		Pandemic period		Total	p
		n	%	N	%		
Sex	Female	30	45.45	36	54.55	66	0.869
	Male	19	44.19	24	55.81	43	
Access day	Midweek	23	33.33	46	66.67	69	0.001
	Weekend	26	65	14	35	40	
Reason for admission	Anxiety-agitation	27	55.1	22	44.9	49	0.145
	Suicidal thoughts-self-harm	17	35.42	31	64.58	48	
	Other	5	41.67	7	58.33	12	
Family composition	no parent-community	8	47.06	9	52.94	17	0.849
	1 or 2 parents	41	44.57	51	55.43	92	
Family history of psychiatric disorders	No	30	50	30	50	60	0.241
	Yes	19	38.78	30	61.22	49	
Psychiatric disorders in the family	None	31	50	31	50	65	0.336
	1 disorder	11	44	14	56	25	
	2 or more	7	31.82	15	68.18	22	
Number of relatives with psychiatric disorders	None	32	50.79	31	49.21	63	0.345
	1 relative	8	38.1	13	61.9	21	
	2 or more	9	36	16	64	25	
Personal history of psychiatric disorders	No	13	40.63	19	59.38	32	0.558
	Yes	36	46.75	41	53.25	77	
Previous psychiatric admissions	No	43	42.16	59	57.84	102	0.025*
	Yes	6	85.71	1	14.29	7	
Psychopharmacological therapy at admission	No	19	43.18	25	56.82	44	0.122
	Monotherapy	14	63.64	8	36.36	22	
	Polytherapy	16	37.21	27	62.79	43	
Personal history of physical disturbances	None	24	35.29	44	64.71	68	0.029
	1 disturbance	16	64	9	36	25	
	2 or more	9	56.25	7	43.75	16	
Other medication at admission	No	41	44.47	51	55.43	92	0.489
	Yes	8	47.06	9	52.94	17	
Traumatic events	No	25	49.02	26	50.98	51	0.424
	Yes	24	41.38	34	58.62	58	
Substance use	No	41	43.16	54	56.84	95	0.326
	Yes	8	57.14	6	42.86	14	
School attendance	Attending	34	42.5	46	57.5	80	0.392
	Not attending	15	51.72	14	48.28	29	
Cognitive impairment	No	35	41.67	49	58.33	84	0.206
	Yes	14	56	11	44	25	
Cognitive functioning	Homogeneous	32	38.55	51	61.45	83	0.016
	Inhomogeneous	17	65.38	9	34.62	26	
Multidisciplinary therapeutic approach	No	24	33.33	48	66.67	72	0.001
	Yes	25	67.57	12	32.43	37	
Behavioral diagnosis	Internalizing disorder	18	51.43	17	48.57	35	0.578
	Externalizing disorder	20	40	30	60	50	
	Both	11	45.83	13	54.17	24	
Psychopharmacological therapy at discharge	No	10	62.5	6	37.5	16	0.308
	Monotherapy	11	40.74	16	59.26	27	
	Polytherapy	28	42.42	38	57.58	66	

Pre-pandemic period, March 2018–June 2019; Pandemic period, March 2020–June 2021; p, estimated by ordinary chi-squared test except * estimated by Fisher's exact test.

time when non-urgent hospital visits have been discouraged. In particular, while a decrease in pediatric mental health-related emergency referral rates has been reported, an increased proportion of mental health-related emergency visits among all pediatric visits has also been observed, compared to rates from 2019 (Coates et al., 2021; Leeb et al., 2020). Emerging data suggests that the initial drop in mental health-related emergencies may have been an artifact of an overall decrease in utilization of any kind of healthcare services. Such hypothesis is corroborated by limited longer-term evidence that, from the second half of 2020, there has been an increase in referrals that have required urgent assessment and in-patient services (Chadi et al., 2021; Coates et al., 2021; Krass et al., 2021; McNicholas et al., 2021), resulting in overall admissions significantly higher than those during the pre-pandemic period (Coates et al., 2021).

Further, evidence is emerging that children presenting to ED for mental health issues during the pandemic are more likely to be older (Davico et al., 2021; Krass et al., 2021), female (Krass et al., 2021), present with higher levels of depression (Zhou et al., 2020), suicidal thoughts (Mayne et al., 2021) and attempts (Coates et al., 2021),

self-harm in the context of an emotional disorder (Ougrin et al., 2021), and eating disorders (Chadi et al., 2021; Otto et al., 2021), possibly due to social isolation, school closures and continuous uncertainty (Huang and Ougrin, 2021). Also, results from a systematic review indicate poorer mental health outcomes in youth living with a neurodiversity and/or chronic physical conditions (Samji et al., 2021). Less clear is the effect on anxiety, with a potential benefit of early lockdown measures which has been counterbalanced by the subsequent easing of lockdown restrictions and reintegration back to school and with peers (Hawes et al., 2021).

Evidence from the current study confirms and extends emerging evidence that, following the COVID-19 pandemic, increasing numbers of young people are being referred to children and adolescent mental health services (CAMHS) with a complex clinical picture. Such finding may reflect the pandemic acting as a social stressor on children's mental health as well limited access to previously available routine and essential mental health services (Brown et al., 2020; Fegert et al., 2020). The latter, in particular, may result in potentially unmet needs in terms of pediatric mental health care and treatment resources.

The limitations of this study include the difficulty to comprehensively

account for the complex clinical presentation of pediatric mental health-related emergency and the limited generalizability to outpatient services and non-children's hospitals. Also, results provided by the regression model can only be interpreted as exploratory and the stepwise analysis can produce oversized coefficients and underestimated p values, while a larger sample would have allowed more precise estimates, especially considering the large number of predictors considered in the analysis. Further, as the electronic system is not primarily designed for research purposes, clinical notes may lack of standardization and information that is not important to clinical care may be missing. For instance, information on type of trauma or patterns of substance use were not systematically reported, precluding the evaluation of the effect of more specific risk factors. Nevertheless, findings of this study may have important public health implications, as they underlie the increased need for pediatric mental health services.

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Conflicts of interest

M.C. has been a consultant/advisor to GW Pharma Limited and F. Hoffmann-La Roche Limited, outside of this work. All the other authors declare no conflict of interest.

Author statement

Conceptualization, R.B., G.D.G., G.A., F.M., L.P., V.R., M.S., F.D., L.Z. and M.C.; methodology, R.B., G.D.G., G.A., F.M., L.P., V.R., M.S., F.D., L.Z. and M.C.; validation, R.B., G.D.G., G.A., F.M., L.P., V.R., M.S., F.D., L.Z. and M.C.; formal analysis, R.B., G.D.G. and M.C.; investigation, R.B., G.D.G., G.A., F.M., L.P., V.R., M.S., and M.C.; resources, R.B., G.D.G., G.A., F.M., L.P., V.R., M.S., F.D., L.Z. and M.C.; data curation, R.B., G.D.G., G.A., F.M., L.P., V.R., M.S., F.D., L.Z. and M.C.; writing—original draft preparation, R.B., G.D.G. and M.C.; writing—review and editing, R.B., G.D.G., G.A., F.M., L.P., V.R., M.S., F.D., L.Z. and M.C.; visualization, R.B., G.D.G., G.A., F.M., L.P., V.R., M.S., F.D., L.Z. and M.C.; supervision, M.C.; project administration, M.C. All authors have read and agreed to the published version of the manuscript.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.psychom.2022.100023>.

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