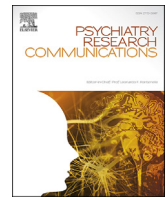




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Confirmation of increased and more severe adolescent mental health-related in-patient admissions in the COVID-19 pandemic aftermath: A 2-year follow-up study

Dario Marin^{a,b}, Gianfranco Di Gennaro^c, Margherita Baracetti^d, Rossella Zanetti^a, Matteo Balestrieri^e, Paola Cogo^d, Marco Colizzi^{e,f,*}

^a Unit of Child and Adolescent Neuropsychiatry, Friuli Centrale Health University Authority, 33100, Udine, Italy

^b Department of Agricultural, Food, Environmental and Animal Sciences (DIAA), University of Udine, 33100, Udine, Italy

^c Department of Health Sciences, School of Medicine, University of Catanzaro Magna Græcia, 88100, Catanzaro, Italy

^d Unit of Pediatrics, Department of Medicine (DAME), University of Udine, 33100, Udine, Italy

^e Unit of Psychiatry, Department of Medicine (DAME), University of Udine, 33100, Udine, Italy

^f Department of Psychosis Studies, Institute of Psychiatry, Psychology and Neuroscience, King's College London, London, SE5 8AF, UK

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ABSTRACT

COVID-19 pandemic may have affected youth's mental wellbeing. Youth admissions for mental health emergencies over the 2-year period following the COVID-19 outbreak (March 2020–February 2022) were compared to those occurring in the same period of 2018–2020, with reference to individual and clinical data. The study identified 30 admissions in the pre-pandemic period and 65 (+116.7%) in the post-pandemic period, with the latter being younger, less likely to have a personal psychiatric history, and more likely to receive psychopharmacological treatment. A higher likelihood of earlier, *ex novo* psychiatric manifestations, requiring medication to reach clinical stability, in the post-COVID era, is suggested.

1. Introduction

The COVID-19 pandemic has been suggested to result in detrimental consequences for the lives of children and adolescents. Relapses among children with pre-pandemic mental health difficulties (Colizzi et al., 2020), increased and more severe mental health emergencies requiring inpatient stays (Bortoletto et al., 2022), and higher psychological distress in otherwise healthy adolescents (Pigaiani et al., 2020) have been reported. COVID-19 related restrictions, such as school closures and home confinement, have produced sudden changes in daily routines of children, who have been shown to indulge more in internet and social media use, to perform less physical activity, and to engage in less healthy diets (Wang et al., 2020).

Common mental health conditions, such as depression and anxiety, have been found to be highly prevalent in earlier surveys performed in China after the pandemic outbreak (Zhou et al., 2020), with an increase in the number of emergency department (ED) mental health assessments in the longer-term, both in Italy (Bozzola et al., 2022), the Europe pandemic epicenter, and the rest of the Western world (Ibeziako et al.,

2022). Studies have become to focus on youth admission rates and characteristics, as a reliable measure of post-pandemic mental health status. European (McDonnell et al., 2022) and Italian (Bozzola et al., 2022) data indicate increased youth admissions due to eating disorder (Bozzola et al., 2022; McDonnell et al., 2022), depression and suicidality (Bozzola et al., 2022), anxiety (McDonnell et al., 2022), and substance use (Bozzola et al., 2022), over the 12 months following the COVID-19 outbreak. Such findings were confirmed in a 1-year follow-up study performed in the United States, that also suggested an increase in admissions for obsessive-compulsive disorders (Ibeziako et al., 2022). Interestingly, trauma and stressor-related disorders decreased, while neurodevelopmental conditions remained stable (Ibeziako et al., 2022). Increased admissions for eating disorders were also identified in Australia (Haripersad et al., 2021).

As emerging evidence from post-COVID longer-term studies converges on a rise in youth mental health admissions, this study aimed at describing the admissions for mental health emergencies of adolescents presenting to a pediatric inpatient unit in the 2 years following the beginning of the COVID-19 pandemic (March 2020 to February 2022) as

* Corresponding author. Unit of Psychiatry, Department of Medicine (DAME), University of Udine, 33100, Udine, Italy.

E-mail address: marco.colizzi@uniud.it (M. Colizzi).

compared to those admitted in the immediately preceding same period (March 2018 to February 2020), both in terms of incidence and socio-demographic and clinical characteristics. To our knowledge, studies with such a long observation period are lacking. Based on previous evidence, youth mental health admission rates were hypothesized to have increased in the post-pandemic period, as compared to the pre-pandemic one, and to be clinically more severe in terms of timing and therapeutics needs.

2. Methods

This study was conducted at the Unit of Pediatrics of the Friuli Centrale Health University Authority, Udine, Italy, a referral inpatient facility for children and adolescent mental health emergencies. A retrospective study design was adopted to collect critical information from the electronic medical records regarding all consecutive mental health emergency admissions to the pediatric inpatient service over the 2-year period following the COVID-19 outbreak (March 2020–February 2022). To obtain a control group, the same strategy was applied to collect data regarding the inpatient admissions occurring over the same period before the beginning of the pandemic (March 2018–February 2020).

The following data was collected for each admission: (i) age (years), (ii) sex (male/female), (iii) access season (spring/summer/autumn/winter), (iv) reason for admission (anxiety-agitation/eating disorder/suicidal thoughts-self-harm/other), (v) length of stay (days), (vi) personal history of psychiatric disorders (no/yes), (vii) psychopharmacological therapy at admission (no/yes), (viii) other medication at admission (no/yes); (ix) psychopharmacological therapy at discharge (no/yes); (x) traumatic events (no/yes); (xi) substance use (no/yes); (xii) school attendance (no/yes).

Mean and standard deviation were used to describe normally distributed variables. Median and interquartile range were used for skewed data. Categorical variables were expressed as counts and percentages. Normality distribution of continuous variables was verified by Shapiro-Wilk test. The frequency distribution of the variables was compared using the *t*-test and Mann-Whitney for normally distributed and skewed continuous variables, respectively, between the pre-pandemic and post-pandemic periods. Differences between categorical variables were analyzed by ordinary chi-squared tests, and Fisher exact in case of low sized (<5) cells. The monthly Incidence Rate Ratio between pre-pandemic and post-pandemic periods was estimated using a simple Poisson regression. The adjusted characteristics of inpatient admissions in the pre- and post-pandemic periods were also studied using a multiple logistic model. Specifically, the period variable (pre-/post-pandemic) was regressed on inpatient admission characteristics. The most parsimonious model was selected by introducing all variables with a univariable $p < 0.25$ and backward removing all variables that did not affect model performance as determined by the Likelihood-ratio test. To identify outliers and assess the model goodness of fit, Pearson-standardized residuals Hosmer and Lemeshow tests were used. 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 (StataCorp, 2019). The study was conducted according to the guidelines of the Declaration of Helsinki, and ethical approval was not required.

3. Results

The retrospective study identified 30 and 65 (+116.7%) adolescent in-patient admissions for mental health emergencies in the pre-pandemic and post-pandemic periods, respectively, with an observed preponderance of female patients both before (80%) and after (81.5%) the pandemic outbreak. Patients in the pre-pandemic period were significantly older (mean, 18.9 years; standard deviation, 0.8) when compared to those admitted after the pandemic outbreak (16.6 ± 1.7 years; $p <$

0.001). Median length of stay did not significantly differ between the pre-pandemic (median: 8.5; IQR: 4–21) and post-pandemic (median: 8; IQR: 3–35) periods. In the post-pandemic period, a larger number of in-patient admissions occurred in the Autumn (post-pandemic vs pre-pandemic, 24.6% vs 16.7%) and Winter (27.7% vs 13.3%) seasons as well as for eating disorder (36.9% vs 30.0%) and suicidal thoughts-self-harm (26.15% vs 16.7%), although failing to reach statistical significance. Patients admitted in the post-pandemic period were less likely to present with a personal history of psychiatric disorders (52.3%), as compared to those admitted in the pre-pandemic period (80%; $p = 0.010$). Frequency distributions of all collected variables are reported in Table 1a.

When patients' characteristics were adjusted for each other in a logistic regression analysis (Table 1b), a lower age was confirmed as a characteristic of patients admitted in the post-pandemic period (OR: 0.20; 95% CI: 0.09–0.45). Patients with a personal history of psychiatric disorders remained less likely to be admitted in the post-pandemic period (OR: 0.09; 95% CI: 0.01–0.90). During the post-pandemic period, patients were prescribed with a psychopharmacological therapy at discharge more likely (OR: 30.34; 95% CI: 2.43–378.75). The regression logistic model showed a satisfactory goodness of fit (Hosmer and Lemeshow test: $p = 0.979$) and the analysis of Pearson-standardized residuals did not show the presence of possible highly influential data.

4. Discussion

To the best of our knowledge, evidence regarding the longer-term mental health effects of the COVID-19 pandemic is limited, especially among youth populations. The current report focused on inpatient admissions as the most unbiased representation of mental health loss over the 2 years following the pandemic outbreak. In fact, many health services have gone through substantial redeployment, if not discontinuation, to absorb the pandemic spread (Ornell et al., 2021).

This study found that, since the beginning of the pandemic, a more than double rate of adolescent in-patient admissions has occurred. Youth admitted to inpatient services for mental health emergencies are younger, less likely to have a personal history of psychiatric disorders, but more likely to get discharged with a psychopharmacological treatment in place. In other words, results suggest a higher likelihood of earlier, *ex novo* onset of psychiatric manifestations, requiring medication to reach clinical stability, in the post-COVID era.

The large majority of studies performed worldwide (Chen et al., 2020; Krass et al., 2021; McNicholas et al., 2021; Ougrin et al., 2022), including Italy (Davico et al., 2021; Ougrin et al., 2022; Raffaldi et al., 2021), indicates a reduction in the requests for mental health assessments among pediatric hospital emergency department (ED) visits in the immediate aftermath of the of pandemic outbreak. This has been suggested to be due to objective issues, such as quarantine measures and school closures (Ougrin et al., 2022), as well as subjective reasons, such as the fear of being infected preventing people from undergoing a medical visit (Raffaldi et al., 2021). Thus, patients and their families would have canceled their appointment or given up an emergency assessment (Huang and Ougrin, 2021). When comparing overall pediatric emergency rates with mental health emergency rates specifically, while the former rates have been confirmed to be reduced, in proportion the latter have increased (Coates et al., 2021; Leeb et al., 2020). If a reduction in pediatric mental health-related emergency referrals there has been, it has concerned only the very initial months of the pandemic, because of the overall under-utilization of any healthcare services. Instead, a subsequent increase in referrals and associated inpatient admissions has been consistently reported in the second half of 2020 (Chadi et al., 2021; Coates et al., 2021; Krass et al., 2021; McNicholas et al., 2021) and in 2021 (Bortoletto et al., 2022), that exceeded the rates observed before the pandemic (Coates et al., 2021).

Findings presented here confirm the increasing number of young individuals in-patiently admitted for mental health emergencies since the COVID-19 pandemic, also indicating an earlier occurrence of first

Table 1a

Sociodemographic and clinical characteristics of adolescent in-patient admissions for mental health emergencies during the pre-pandemic and post-pandemic periods.

age (years)	Pre-pandemic		Post-pandemic		P	
	M	SD	M	SD		
	18.9	0.8	16.6	1.7	<0.001	
	N	%	N	%		
Sex	Female	24	80.0	53	81.5	0.859
	Male	6	20.0	12	18.5	
Season	Spring	10	33.3	14	21.5	0.238
	Summer	11	36.7	17	26.2	
	Autumn	5	16.7	16	24.6	
	Winter	4	13.3	18	27.7	
Reason for admission	anxiety-agitation	13	43.3	17	26.15	0.409
	Eating disorder	9	30.0	24	36.9	
	suicidal thoughts-self-harm	5	16.7	17	26.15	
	Other	3	10.0	7	10.8	
Length of stay (days)	Median	IQR	Median	IQR		0.505
	8.5	4–21	8	3–35		
	N	%	N	%		
Personal history of psychiatric disorders	No	6	20.0	31	47.7	0.010
	Yes	24	80.0	34	52.3	
Psychopharmacological therapy at admission	No	16	53.3	45	69.2	0.133
	Yes	14	46.7	20	30.8	
Other medication at admission	No	30	100	56	86.2	0.053
	Yes	0	0.0	9	13.8	
Psychopharmacological therapy at discharge	No	11	36.7	14	21.5	0.120
	Yes	19	63.3	51	78.5	
Traumatic events	No	28	93.3	60	92.3	0.612
	Yes	2	6.7	5	7.7	
Substance use	No	28	93.3	57	87.7	0.405
	Yes	2	6.7	8	12.3	
School attendance	No	7	23.3	6	9.2	0.063
	Yes	23	76.7	59	90.8	

Table 1b

Multivariate logistic regression model assessing differences in the pre-pandemic and post-pandemic adolescent in-patient admissions for mental health emergencies.

Outcome: post-pandemic (vs pre-pandemic)	O.R.	95% C.I.	P
Age	0.20	0.09 – 0.45	<0.001
Personal history of psychiatric disorders	0.09	0.01 – 0.90	0.040
Psychopharmacological therapy at discharge	30.34	2.43 – 378.75	0.008
School attendance	4.03	0.55 – 29.38	0.169

M, Mean; SD, Standard Deviation; N, sample size; %, percentage; IQR, Interquartile Range; P, probability; O.R., Odds Ratio; C.I., Confidence Interval; Hosmer and Lemeshow goodness-of-fit test: p = 0.979.

episodes of mental distress, that are possibly more severe and not explained by a pre-existing vulnerability. Thus, acting as a social stressor, the pandemic might have accelerated the cascade of events leading to the manifestation of acute mental health symptoms (Brown et al., 2020; Fegert et al., 2020). There is independent evidence that the pandemic may have represented a collective traumatic experience (Hirschberger, 2018), with detrimental psychosocial consequences (Stanley et al., 2021).

This study must be seen considering its limitations. Due to the complex nature of acute psychiatric manifestations, especially among youth populations, and the limited sample size, additional variables of interest may have been overlooked. The generalizability of these findings to outpatient services and non-children's hospitals is limited. While being resourceful to rapidly obtain patients' information, the electronic system lacks the standardization and detailed assessment that would be needed in research contexts.

In conclusion, this study confirms higher rates of admissions to

pediatric mental health inpatient services since the beginning of the COVID-19 pandemic, that may result from earlier, sudden, and more rapidly deteriorating clinical pictures.

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Declaration of competing interest

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

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