

Diagnosis and symptoms of mental health disorders in adolescents after the Covid-19 pandemic in a middle-income country: a cross-sectional study

Diagnóstico e sintomas de transtornos mentais em adolescentes após a pandemia de Covid-19: um estudo transversal

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ABSTRACT

Introduction: The early periods of the COVID-19 pandemic showed worrying mental health trends in multiple populations. Adolescents from low- and middle-income countries may have been disproportionately affected with mental disorders. **Objectives:** to describe the characteristics of adolescents, who returned to a public school after COVID-19, and the factors associated with symptoms of mental disorders in a middle-income country. **Methods:** A cross-sectional study was conducted with adolescents, who returned to school after the pandemic. Personal characteristics, diagnosis of mental disorder, and symptoms of mental disorders were collected by questionnaires, between May 2022 and December 2022. Pearson correlation coefficients or Chi-Square tests were used to explore the relationships between personal factors and suspicious mental disorders. **Results:** Among 365 potential participants, 145 adolescents (72 girls) agreed to answer the questionnaires. Included adolescents had a mean age of 13 years (SD 1). The percentage of adolescents, who were diagnosed with mental disorders after the COVID-19 pandemic increased by 12%. Over 50% of the adolescents reported symptoms of mental disorders. Sex ($r = 0.49; p < 0.01$), and previous COVID-19 contamination ($r = 0.18; p = 0.03$) were associated with suspicious mental disorders. **Conclusions:** The findings suggest that diagnosis and symptoms of mental disorders increased in adolescents after the COVID-19 pandemic. Sex and previous COVID-19 contamination were associated with suspicious mental disorders. Monitoring of adolescents after the COVID-19 pandemic in low- and middle-income countries is strongly recommended.

Keywords: Adolescent. Anxiety. Depression. Social Participation. Observational Study.

RESUMO

Introdução: A pandemia de COVID-19 mostrou tendências preocupantes de saúde mental em múltiplas populações. Adolescentes de países de baixa e média renda podem ter sido desproporcionalmente afetados por transtornos mentais. **Objetivos:** descrever as características dos adolescentes que retornaram à escola pública após a COVID-19 e os fatores associados aos sintomas de transtornos mentais em um país de renda média. **Métodos:** Foi realizado estudo transversal com adolescentes que retornaram à escola após a pandemia de COVID 19. Características pessoais, diagnóstico de transtorno mental e sintomas de transtornos mentais foram coletados por meio de questionários, entre maio e dezembro de 2022. Coeficientes de correlação de Pearson ou testes Qui-Quadrado foram utilizados para explorar relações entre fatores pessoais e transtornos mentais suspeitos. **Resultados:** 145 adolescentes (72 meninas) concordaram em responder aos questionários. Os adolescentes incluídos tinham idade média de 13 anos (DP 1). Percentagem de adolescentes que foram diagnosticados com transtornos mentais após a pandemia de COVID-19 aumentou 12%, e mais de 50% dos adolescentes relataram sintomas de transtornos mentais. Sexo ($r = 0,49; p < 0,01$) e contaminação prévia por COVID-19 ($r = 0,18; p = 0,03$) estiveram associados a transtornos mentais suspeitos. **Conclusões:** Os resultados demonstram que o diagnóstico e os sintomas de transtornos mentais aumentaram em adolescentes após a COVID-19 num país de renda média. Sexo e contaminação prévia por COVID-19 foram associados a transtornos mentais suspeitos. É fortemente recomendado o acompanhamento de adolescentes após a pandemia de COVID-19 em países de baixa e média renda.

Palavras-chave: Adolescentes. Ansiedade. Depressão. Participação Social. Estudo Observacional.

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INTRODUCTION

Mental health disorders are known as a variety of conditions that affect mood, reasoning and behaviour. The most common types are depression, anxiety, stress, and attention deficit disorders. It is estimated that mental health disorders are responsible for approximately 20% of the global burden of illness among people aged 10 to 19 years, and these estimates may have increased after the Covid-19 pandemic^{1,2}. During the pandemic, the routine of the population has been modified aimed at reducing the spread and the rates of contamination^{3,4}. Among various recommendations to control the spread of the disease, the closure of schools was classified as an emergency in most countries. For instance, in Brazil, over 80 million students were confined to their homes⁵.

Adolescents, who were confined to their homes, may have experienced not only physical impairments related to the virus infection, but also direct impacts on mental health, and indirect psychological impacts coming from the social restriction and longer-term socioeconomic consequences⁶. This was evidenced by some studies conducted in the early periods of the pandemic that showed worrying mental health trends involving multiple populations^{7,8}. Among children and adolescents, the prevalence of depression, anxiety, sleep disorders, and posttraumatic stress symptoms during the Covid-19 pandemic reached values between 26% and 48%⁹; however, only data from studies conducted in China could be pooled in a meta-analysis. The authors concluded that studies investigating the mental health of children and adolescents from countries other than China are urgently needed. These results were similar to the results of a recent systematic review, which constrained the investigation to adolescents¹⁰. Although a meta-analysis was not performed, there was conclusive evidence to support the potential negative impact of the pandemic on adolescent mental health based upon 16 studies from China and high-income countries¹⁰.

It has been hypothesized that adolescents from low- and middle-income countries were

disproportionately affected with mental disorders¹¹. This is because fewer people seek professional help and where they do, there are long delays with variable pathways. In addition, high- and low/middle-income countries differ not only regarding the epidemiology of mental disorders but also in social, economic and health aspects that impact mental disorders¹². The understanding of how adolescents were mentally affected by the pandemic in low- to middle-income countries will lead to a better understanding of the heterogeneity of the pandemic's impact on mental health, and the development of interventions tailored to the specific needs of low- and middle-income populations. Therefore, this study planned to describe the characteristics of adolescents, who returned to a public school after COVID-19, and the factors associated with symptoms of mental disorders in a middle-income country. The specific research questions were:

1. What is the percentage of adolescents who were diagnosed with mental disorders two years after the COVID-19 pandemic?
2. What is the percentage of adolescents who described symptoms of depression, anxiety, and stress after the COVID-19 pandemic?
3. Which factors (i.e., age, sex, family income per month, number of people in the house, COVID-19 immunization, and COVID-19 contamination) are associated with suspicious mental disorders?

The findings will help to identify the adolescents who are more likely to have symptoms of mental disorders and, therefore, help with pedagogical and medical guidance. Moreover, results from a middle-income country may provide unique insights that may be generalizable to other low- to middle-income countries.

METHODS

Design and Participants

A cross-sectional, exploratory study was conducted. Adolescents, living in a metropolitan

city, who returned to in-person classroom lessons after the COVID-19 pandemic, were recruited in a public school in Brazil. They were included if they were enrolled at the time data was collected. The study complies with ethical criteria for research with human beings and was approved by the Institutional Research Ethics Committee (CAAE: 61043422.8.0000.5060). All participants provided written consent, before data collection. Included adolescents answered the questionnaires between May 2022 and December 2022.

Outcomes

Information regarding socio-demographic and economic status, as well as the COVID-19 vaccination profile, and the presence of any mental disorder previously diagnosed by a qualified clinician was obtained by a structured questionnaire. The questionnaire consisted of two sections: (1) socioeconomic, demographic and vaccination profile characteristics, and (2) diagnosis of mental disorders.

Information regarding symptoms of depression, anxiety and stress after the COVID-19 pandemic was obtained using the Depression Anxiety Stress scale (DASS-21). The DASS-21 has 21 items, separated according to 3 subscales: DASS-D (depression), DASS-A (anxiety), and DASS-S (stress). Respondents must rate the extent to which each statement applies during the past week on a 4-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much). Because the DASS-21 is a short-form version of the DASS (42 items), the final score for each subscale is multiplied by two before the evaluation according to its severity rating index. Depression, anxiety, and stress scores are calculated by adding up the scores of the items in each separate subscale. The questionnaire has been previously validated in a population of Brazilian adolescents and demonstrated high levels of consistency¹³. The overall and the subscale scores were provided. Participants were categorized into “reported symptoms” or “did not report symptoms”.

Information regarding suspicious mental disorders was obtained using the Brazilian version

of the Self-Reporting Questionnaire (SRQ-20)¹⁴. The questionnaire has 20 questions that measure psychic and somatic symptoms, intended for tracking mood, anxiety, and somatization disorders, also called common mental disorders. The symptoms refer to insomnia, fatigue, irritability, forgetfulness, difficulty concentrating, and somatic complaints. The questions are answered dichotomously (0=No, 1=Yes), and the final score is the sum of the items (0 to 20 points). Higher scores represent extreme probability for the presence of a mental disorder. Participants were categorized as “no mental disorder” (< 8 points), or “suspicious mental disorder” (≥ 8 points)¹⁵.

Six outcomes, obtained from the structured questionnaire, were used to explore the relationships between the personal characteristics of the adolescents and suspicious mental disorders: age, sex, family income per month, number of people in the house, Covid-19 immunization, and Covid-19 contamination.

- Age: continuous outcome, defined based on participants’ date of birth, and reported in years.
- Sex: dichotomous outcome, categorized as male or female.
- Family income per month: dichotomous outcome, categorized as US dollars: ≤ U\$ 250.0 or > U\$ 250.0.
- Number of people in the house: dichotomous outcome, categorized as ≤ 3 people or over 3 people.
- COVID-19 immunization: dichotomous outcome, categorized as yes or no.
- COVID-19 contamination: dichotomous outcome, categorized as “infected or recovered” or “uninfected”.

Statistical analyses

Data were tested for normality (Kolmogorov-Smirnov) and descriptive data were calculated. Number and percentage of adolescents with diagnosed mental disorders and symptoms of mental disorders were provided, as well as means

and standard deviations (SD) for symptoms of mental disorders according to the DASS-21.

Pearson correlation coefficients or Chi-Square tests were used to explore the relationships between personal factors and suspicious mental disorders, depending on whether the factor was a continuous or dichotomous outcome. The level of significance was set at $p < 0.05$. The strength of the relationships was classified as weak ($r < 0.30$), moderate ($0.30 < r < 0.50$), and strong (> 0.50)¹⁶. All analyses were performed with the IBM SPSS Statistics software 23.0 for Windows.

RESULTS

Characteristics of the participants

145 agreed to answer the questionnaire. Thus, 145 adolescents (72 girls), with a mean age of 13 years (SD 1) were included. Most adolescents had a family income inferior to 250 dollars per month (56%) and lived in a house with more than four people (59%). When the questionnaire was applied, most adolescents reported partial or full COVID-19 immunization (84%), and only 11% reported COVID-19 contamination prior to the interview. The characteristics of the participants are summarized in Table 1.

Mental disorders after the COVID-19 pandemic

After the COVID-19 pandemic, 16 adolescents (12%) reported a mental disorder diagnosed by a qualified clinician. As before the pandemic 12 (9%) adolescents had a diagnosis of mental disorder, the total number of adolescents with a diagnosed mental disorder was 28 (20%), leaving 111 adolescents with no diagnosis (80%) among 139 adolescents. Six adolescents (4%) refused to answer whether they had received a diagnosis of a mental disorder. In addition, after the application of the SQR-20, 79 adolescents (54%) were classified

TABLE 1. Characteristics of participants

Characteristic	n = 145
Age (yr), mean (SD)	13 (1)
Sex, number girls (%)	72 (51)
Number of people in the family, number (%)	
2 to 3 people	60 (41)
> 3 people	85 (59)
COVID-19 Immunization, number (%)	
Yes	122 (84)
No	23 (11)
COVID-19 prior contamination, number (%)	
Yes	16 (11)
No	129 (89)
Suspicious mental disorders (SRQ-20), number (%)	
Yes	78 (54)
No	67 (46)
Diagnosis of mental disorders, number (%)	
Before COVID-19	12 (9)
After COVID-19	16 (12)

SRQ-20 = Self-Reporting Questionnaire.

as “suspicious mental disorder”, which should be further investigated by a qualified clinician.

The symptoms of mental disorders were examined by the DASS questionnaire, which identified that 63 adolescents (43%) reported symptoms of depression symptoms, 89 adolescents (61%) reported symptoms of anxiety, and 34 adolescents (23%) reported symptoms of stress. This information is summarized in Table 2.

Factors associated with suspicious mental disorders

Table 3 provides the correlation coefficients between the characteristics of the participants and suspicious mental disorders. Sex ($r = 0.49$; $p < 0.01$) had a moderate association with suspicious mental disorders, predominantly observed in female adolescents. Previous COVID-19 contamination ($r = 0.18$; $p = 0.03$) had a weak association with suspicious mental disorders.

TABLE 2. Symptoms of mental disorders from the DASS-21

DASS-21	Categories	All (n=141)	Girls (n=72)	Boys (n = 69)
DASS-D	No depression, n (%)	82 (57)	30 (42)	52 (75)
	Depression, n (%)	63 (43)	42 (58)	17 (25)
	Score, mean (SD)	10 (9)	13 (10)	6 (6)
DASS-A	No anxiety, n (%)	56 (39)	17 (24)	39 (56)
	Anxiety, n (%)	89 (61)	55 (76)	30 (43)
	Score, mean (SD)	12 (11)	16 (11)	7 (7)
DASS-S	No stress, n (%)	111 (77)	47 (65)	63 (9)
	Stress, n (%)	34 (23)	25 (35)	6 (9)
	Score, mean (SD)	10 (10)	13 (11)	6 (6)

DASS-21: 21 item Depression, Anxiety Stress Scale; DASS-D: 7-item DASS-21 Depression subscale; DASS-A: 7-item DASS-21 Anxiety subscale; DASS-S: 7-item DASS-21 Stress subscale.

TABLE 3. Correlation coefficients and p-values between the personal factors and suspicious mental disorders

Measures of Interest	Suspicious mental disorders	
	Correlation coefficients	p-values
Age	r = 0.080	0.92
Sex	r = 0.494	<0.01*
Family income per month	r = -0.147	0.78
Number of people in the house	r = 0.052	0.54
Covid-19 immunization	r = 0.055	0.51
Covid-19 contamination	r = 0.181	0.03*

*Significant correlations (p < 0.05).

DISCUSSION

This cross-sectional, exploratory study aimed at identifying factors associated with common mental disorders in adolescents, who returned to a public school after the COVID-19 pandemic in Brazil. Overall, the percentage of adolescents who were diagnosed with mental disorders by a qualified clinician after the pandemic was 12%; however, a screening questionnaire suggested that over 50% of the included sample potentially have a mental disorder. Sex and previous COVID-19 contamination were associated with suspicious mental disorders.

In recent years, the number of symptoms of mental disorders has increased among children and adolescents¹⁷. The consequences of depression and

anxiety among adolescents are worrying, since they affect psychological, relational, developmental, and academic dimensions. This means that untreated mental disorders may result in school absence and enhance the risk of early and permanent cessation of schooling. Although only 12% of the adolescents had a confirmed diagnosis of mental disorder, most of the adolescents in our sample had a suspicious diagnosis.

Therefore, the data suggest that mental disorders may be underdiagnosed in adolescents returning to school after the COVID-19 pandemic in low- to middle-income countries. A systematic review¹⁸, suggested that 30% to 50% of children and adolescents in China experienced depression, anxiety, sleep disorders, or stress symptoms during the COVID-19 pandemic. Those results reinforce the need to properly screen adolescents,

who are at risk of potential mental disorders, and to provide appropriate assistance in order to avoid school dropouts.

Our findings also indicated that the female sex was associated with higher reporting of symptoms of mental disorders, which is in accordance with previous studies^{10,19}. In addition, this is consistent with findings from pre pandemic mental health studies²⁰. The exact cause of this difference is multifactorial and not well understood²¹. However, previous research has shown that boys may have more difficulties acknowledging their mental health problems in comparison with girls; that is, they are more likely to compensate for their undesired feelings by antisocial behaviours or by abuse of substances²². In contrast, girls are more likely to display internalizing disorders, such as depression and anxiety, which is in accordance with our results. In addition, societal roles and cultural norms may also contribute to this difference. Girls are more commonly stereotyped as emotionally sensitive and are expected to have greater reactions to stressors and traumatic events (such as the pandemic or deaths related to the pandemic)²³.

An additional finding of our study is that adolescents who had COVID were more likely to report symptoms of mental disorders. The findings in adolescents are in accordance with a study that included children hospitalized with COVID-19. A significantly higher level of depression, in comparison with healthy controls who had not contracted COVID-19, and an increased trend in prevalence of post-traumatic stress disorder and anxiety showed that COVID-19 infection is associated with mental disorders symptoms and sleep problems²⁴. Taken together, data related to sex and previous COVID-19 contamination may help prioritize screening of adolescents at risk of mental disorders, especially in countries with less public resources for monitoring and treating those conditions. For instance, in Brazil, a federal law indicates that all schools should have psychologists and social workers; however, the current number of psychologists in schools corresponds to less than 0.1% of enrolled students²⁵.

A very high percentage of adolescents in our study reported symptoms of anxiety (61%), and depression (43%) after the pandemic. These findings are surprising when compared to data from a previous review on this topic, which reported a lower percentage of anxiety (21%) and depressive (25%) symptoms; however, their results were based on early pandemic data (Racine et al., 2021). This difference may be explained by the timing of data collection. Therefore, social isolation, school closures, and socioeconomic effects of the policies (increasing unemployment, financial insecurity, and poverty) during the COVID-19 pandemic seem to have contributed to the mental health problems among adolescents²⁶. In addition, it has been hypothesized that millennials are less happy than earlier generations, which may lead to youth unemployment, as well as loss of social mobility and delayed maturation into the independent adult social roles. Our results reinforce the importance of parents and teachers acting together to monitor any symptoms of mental disorders, specifically those related to anxiety and depression. Overall, our results bring insights on how biological and social contexts may be used for specifically tailoring the needs of adolescents at risk of developing mental disorders in low- to middle-income countries. Moreover, the results suggest that female adolescents and those who had Covid could be prioritized for screening of mental disorders, in case of limited resources.

On the other hand, it is important to highlight that mental disorders in male adolescents may be underdiagnosed. Therefore, schools and parents should work together to enhance remote counselling services²⁷, and resilience focused interventions²⁸ that work with family members to offer social support during stressful periods, such as during university entrance exams or other pandemics²⁹. Educational anti stigma interventions should also be incorporated into academic curricula to help youths self-identify signs of mental health issues and encourage help-seeking behaviours. During future public health emergencies, it is critical to minimize the impact and disruption to youths by leaving school closures as a last resort option³⁰.

This study is not without limitations. First, the cross-sectional, observational estimates are based on a convenience sample of one school, limiting generalizability of results. Moreover, the study design is insufficient to indicate any cause-and-effect relationship. Second, although a validated and appropriate instrument was used for identifying mental disorders symptoms, the study did not include confirmation of diagnosis of mental disorder from a mental health specialist.

CONCLUSION

The percentage of adolescents who were diagnosed with mental disorders after the COVID-19 pandemic increased by 12%, and over 50% of the included sample reported symptoms of mental disorders. Sex and COVID-19 contamination were associated with suspicious mental disorders. The findings indicate the need for increased mental health research, as well as monitoring adolescents after COVID-19 pandemic.

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NOTES

Authors' contributions

Conceptualization: CHS, FMGL, LRN. Investigation: LJD, ROS. Methodology: CHS, LRN, NFFO. Data collection: LJD, ROS. Data processing and analysis: CHS, NFFO, LRN, FMGL. Writing – original draft: CHS, LRN. Review and editing: NFFO, FMGL. Approval of the final version: CHS, NFFO, LRN, FMGL. Supervision: CHS, LRN.

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Conflict of interest

The authors declare no conflicts of interest.

Ethics committee approval

The research project was approved by the Research Ethics Committee of the Universidade Federal do Espírito Santo, under CAAE number 61043422.8.0000.5060 and approval opinion number 5,572,585.

Data availability statement

Research data and other materials can be obtained by contacting the authors.

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