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Prevalence of depression and anxiety and associated factors among students in southern Brazil: results from Respire study

César Augusto Häfele[1], Natan Feter[2], Marina Marques Kremer[1], Giancarlo Bacchieri[1], Thiago Terra Borges[1]

[1]Departamento de Educação Física, Instituto Federal Sul-Rio-Grandense (IFSul) – Pelotas (RS), Brazil
[2]Programa de Pós-Graduação em Epidemiologia, Faculdade de Medicina, Universidade Federal do Rio Grande do Sul (UFRGS) – Porto Alegre (RS), Brazil

ABSTRACT

Introduction: The prevalence of anxiety and depression symptoms has significantly increased in Brazil since the beginning of the COVID-19 pandemic. However, the studies investigating the prevalence of these symptoms in school-aged in Brazil are scanty. **Objective:** To identify the prevalence of moderate or severe symptoms of depression and anxiety and the associated factors among students in southern Brazil. **Methods:** This was a census study with all 14 sites of the Federal Institute Sul-rio-grandense. We used a self-administered, online instrument to assess biological, sociodemographic, health, nutrition, and behavior-related variables. The Hospital Anxiety and Depression Scale assessed depression and anxiety. **Results:** The sample consisted of 5,112 students. The prevalence of students who presented moderate or severe symptoms of anxiety and depression was 34.3% and 24.3%, respectively. In the fully adjusted analysis, factors associated with anxiety and depression symptoms were female sex, low income, screen time at work, worse health perception, unhealthy diet, poor sleep quality, smoking, alcohol consumption, and medication use. Early age and students whose family members or friends died from COVID-19 were associated with anxiety. Married and having less screen time during leisure was a protective factor for depression. Physical activity reduced by 18% and 33% the likelihood of moderate or severe symptoms of anxiety and depression, respectively. **Conclusion:** Public policies to improve the health care of Brazilian students during the return to face-to-face activities are required.

Keywords: adolescent; schools; mental health.

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Corresponding author: César Augusto Häfele - Departamento de Educação Física, Instituto Federal Sul-Rio-Grandense - Rua Praça 20 de setembro, 455 – CEP: 96015-360 – Centro - Pelotas (RS), Brazil - Email: hafele.c@hotmail.com

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INTRODUCTION

Beginning in March 2020, the pandemic caused by the new coronavirus (COVID-19) has had direct consequences, such as the high number of infected people and deaths[1], and indirect consequences, such as economic difficulties and damage to physical and mental health[2]. In Brazil, the prevalence of anxiety and depression symptoms has increased significantly since the beginning of the pandemic[3]. For example, in the state of

Rio Grande do Sul, located in the far south of Brazil, the proportion of adults with moderate to severe symptoms of depression and anxiety increased 6.6 and 7.4 times, respectively, between March and June 2020[4].

However, despite the widespread availability of data in the literature on the impact of the pandemic on the mental health of adults, little is known about its effects on schoolchildren. Recent nationwide studies in the United States have reported a worsening in the psychological well-being and behavioral health of children and adolescents compared to the period before the pandemic[5,6]. Similarly, two studies in Italy and Spain have shown that mental health problems such as behavioral problems, irritability, and loneliness in children and adolescents have increased during the COVID-19 lockdown[7,8]. A study of 9,470 adolescents aged 12 to 17 in Brazil in the second half of 2020 showed that a third (38 percent) of the sample felt sad during the first months of the pandemic, while almost half (49 percent) reported feeling nervous during the same period[9]. However, the number of studies investigating the prevalence of anxiety and depression symptoms in this population in Brazil is scarce.

Furthermore, identifying the factors associated with these symptoms is fundamental to facilitating the implementation of mental health promotion strategies. For example, students with difficulty concentrating in remote classes during the pandemic were 61 percent more likely to report emotional problems such as irritability and sadness than their peers without difficulties[10]. Before the pandemic, the prevalence of anxiety and depression among children and adolescents was 6.5 percent and 2.6 percent respectively[11]. However, the studies indicate a significant increase in mental health problems in children during the pandemic, which can lead to manifest disorders over time. However, there is a lack of knowledge about how this prevalence has increased or will increase in schoolchildren in southern Brazil. Thus, this study aimed to identify the prevalence of depression and anxiety and their associated factors in students in southern Brazil.

METHODS

With the advance of the COVID-19 pandemic, the Federal Institute Sul-rio-grandense (IFSul) stopped face-to-face classes on 16 March 2020, returning to non-face-to-face teaching in October of the same year.

The Respire Survey aimed to verify the health indicators of IFSul students and staff during the social distancing imposed by the COVID-19 pandemic. To this end, a census of IFSul students was conducted between May and August 2021 on all campuses and at the Rectory. The Institute is made up of several Distance Education Hubs, 14 campuses located in 13 cities in the state of Rio Grande do Sul, Brazil, and had approximately 21,939 students (13,311 face-to-face) in integrated, concurrent, subsequent, undergraduate, specialization, master's, doctoral, youth and adult education, and initial and continuing training courses before the start of the pandemic. A total of 5,112 students took part in this study.

The research was approved by the Research Ethics Committee of the School of Physical Education at the Federal University of Pelotas (protocol: 4.676.277). More details on the study protocol can be found in the study by Häfele et al.[12]. An online, self-completed instrument was developed and used to verify the effects of social distancing on the general health of the IFSul academic community. The questionnaire was developed on the QuestionPro platform and students only had access to it once they had consented to take part. For underage students, in addition to the consent form, there was a consent form to be filled in by their guardian.

To conduct the data collection, local committees were set up on each of the campuses. The collection procedures were divided into four stages. 1st stage of the approach - linking the instrument available on the Campus homepage and on the digital platform for accessing classes; 2nd stage of the approach - filling in the instrument during class time; 3rd stage of the approach - using social media (WhatsApp, Instagram, and Facebook); 4th stage of the approach - forwarding the links in standard messages in class WhatsApp groups, facilitating access to the instrument. This approach was adopted as a last resort to prevent the link from circulating among people not connected to the educational institution. Each stage of the approach was added to the previous stage, ending up together at the end of the collection.

The study outcome, mental health, was collected during social distancing using the Hospital Anxiety and Depression Scale (HDAS), which identifies symptoms of depression and anxiety[13]. The scale contains 14 items, 7 referring to depression and 7 to anxiety, with scores ranging from 0 to 3, with a maximum score of 21 points in each domain. Students with a score of less than 7 were considered to have no symptoms, scores between 8 and 10 were classified as mild symptoms, between 11 and 14 as moderate symptoms, and above 15 as severe symptoms of depression and anxiety.

The exposure variables used in the study were: a) biological: gender (male and female); b) sociodemographic: age, income (less than 1 minimum wage, between 1 and 2.9 minimum wages, between 3 and 5 minimum wages and over 5 minimum wages) and marital status (married, single, dating, separated and widowed); c) health-related: screen time during leisure and work (less than 2 hours a day, 2 to 4 hours a day and more than 4 hours) perception of health (very bad, bad, fair, good and very good), intake of unhealthy food (eating more, less, the same or never ate), quality of sleep (sleeping better, worse or the same), smoking habit (never smoked, smokes or has smoked), intake of alcoholic drinks (yes

and no), use of medication (yes and no); d) nutritional: Body mass index (normal, overweight and obese).

The practice of regular physical activity during social isolation was used as the main exposure variable. Participants were asked the following question: "*Do you currently practice physical activity regularly in your free time, such as walking, cycling, playing a sport, etc?*". The students were divided into active and inactive. Students who reported not performing any physical activity in their free time were considered inactive. Students under the age of 18 who conducted more than 300 minutes of physical activity a week were considered active, while for those aged 18 or over the cut-off point was 150 minutes[14].

The data was exported from QuestionPro to Microsoft® Excel for data cleaning and then transferred to Stata 13.1. Descriptive statistics were used to describe the sample. The data is presented as relative frequency and percentage. In the crude analysis, the Chi-squared test was used to compare the exposure variables according to the level of physical activity. Ordinal logistic regression was used for the adjusted analysis. The regression analysis included the biological, socio-demographic, behavioral, nutritional, and health variables that were associated with the outcomes in the crude analysis ($p \leq 0.05$). All the variables were entered into the regression at the same time and one by one they were removed, always the one with the highest p-value, with all the variables with $p \leq 0.20$ remaining in the regression[15].

RESULTS

The study sample consisted of 5,112 IFSul students. Most of the students were female (56.7%), aged between 14 and 29 (78.1%), single (59.4%), with an income of one to two minimum wages (52.6%), and with the worst sleep quality during the COVID-19 pandemic (40.9%). Most of the students had never smoked (88.1%), did not drink alcohol (54.6%), had a normal body mass index (62.1%) and a good or particularly good perception of health (55.1%). About physical activity, 50.1% of the students reported doing some kind of physical activity regularly. Regarding the outcomes of anxiety and depression, 55.9% and 52.2% had some symptoms (mild, moderate, or severe) of anxiety or depression, respectively (Table 1).

After the adjusted analysis, the following variables remained associated with anxiety levels: gender (female), age (younger subjects), income (lower), longer screen time at work, worse perception of health, higher consumption of unhealthy foods, poor sleep quality, smoking, alcohol consumption, medication use, death of a family member or friend due to COVID-19 and physical activity.

Depression scores were associated, after the adjusted analysis, with female gender, lower-income students, marital status (single subjects), more screen time during leisure and work, poorer

Table 1: Characteristics of the sample of IFSul students according to their level of physical activity.

Variables	Total (n)	Physical activity		
		Inactive (%)	Active (%)	p-value
Sex				
Female	2,687	52.1	47.9	<0.0001
Male	1,988	46.1	53.9	
Age (years)				
≤17	1,656	44.9	55.1	<0.0001
18 a 29	2,286	51.1	48.9	
≥30	1,104	55.0	45.0	
Income (minimum wage)				
<1	679	57.4	42.6	
1-2,9	2,638	52.4	47.6	<0.0001
3-5	1,020	46.4	53.6	
>5	668	37.1	62.9	
Marital status				
Married	858	56.5	43.5	
Dating	1,057	52.9	47.1	<0.0001
Single	2,971	46.7	53.3	
Separated/Widowed	114	49.1	50.9	
Leisure screen time (hours)				
<2	1,204	48.7	51.3	<0.0001
2-4	1,676	45.3	54.7	
>4	1,816	54.2	45.8	
Screen time at work (hours)				
<2	1,130	49.1	50.9	0.226
2-4	1,650	48.2	51.8	
>4	1,913	51.0	49.0	
Health perception				
Very bad/poor	415	70.1	29.9	<0.0001
Regular	1,720	58.8	41.2	
Good/very good	2,622	41.0	59.0	
Unhealthy food intake				
Never eaten	223	40.8	59.2	
Eating less	1,388	37.6	62.4	<0.0001
Eating the same	1,771	52.9	47.1	
Eating more	1,405	59.5	40.5	
Sleep quality				
Sleeping worse	1,954	54.5	45.5	<0.0001
Sleeping better	922	41.6	58.4	
Same thing	1,829	49.0	51.0	
Smoke				
Never smoked	4,210	49.2	50.8	0.016
Smokes or has smoked	570	54.6	45.4	
Use of alcohol				
Yes	2,173	47.7	52.3	0.008
No	2,617	51.5	48.5	
Use of medication				
Yes	865	53.8	46.2	0.010
No	3,867	48.9	51.1	
Death of a friend/family member due to COVID				
Yes	1,882	50.7	49.3	0.347
No	2,815	49.3	50.7	
BMI				
Normal	3,112	47.2	52.8	<0.0001
Overweight	1,190	50.7	49.3	
Obese	712	59.0	41.0	
Anxiety				
No symptoms	2,027	43.8	56.2	
Mild symptoms	996	51.8	48.2	<0.0001
Moderate symptoms	966	53.5	46.5	
Severe symptoms	608	60.4	39.6	
Depression				
No symptoms	2,206	42.2	57.8	
Mild symptoms	1,290	52.4	47.6	<0.0001
Moderate symptoms	938	59.6	40.4	
Severe symptoms	182	74.7	25.3	

The data is presented as relative frequency and percentage. The Chi-square test was used to check for differences between variables.

perception of health, eating unhealthy foods, poor sleep quality, smoking, alcohol use, medication use, and physical activity (Table 2).

About the main exposure variable, physical activity remained associated with levels of anxiety and depression among IFSul students. Individuals who reported regular physical activity during the pandemic had an 18 percent and 33 percent reduction in the chance of experiencing more severe symptoms of anxiety and depression, respectively (Table 2).

DISCUSSION

The study found that the variables female gender, lower income, being single, more screen time during leisure and work, smoking, alcohol consumption, and medication use were associated with a higher risk of severe symptoms of anxiety and depression. On the other hand, more sleep, physical activity, and lower intake of unhealthy foods were identified as protective factors for these symptoms.

The COVID-19 pandemic and its associated restrictions and consequences seem to have affected young people and their psychological well-being. A meta-analysis of 29 studies (n=80,879 adolescents) showed that 25.2 percent and 20.5 percent of young people worldwide have high symptoms of anxiety and depression, respectively[14]. During the implementation of social distancing measures, as a way of controlling the spread of the virus that causes COVID-19, many schools remained closed, with face-to-face activities suspended[16]. However, schools tend to be the main place to receive psychological services, with 80 percent of children and adolescents relying on school services to meet their mental health needs[17]. For many children and adolescents, these services have become unavailable due to school closures. Therefore, identifying groups most at risk of such disorders is fundamental as a way of mitigating the longitudinal effects of the COVID-19 pandemic on the mental health of young schoolchildren.

In this study, we found that females were associated with a higher risk of increased symptoms of depression and anxiety, corroborating the findings of similar studies in adolescents[16] and adults[4]. Biological susceptibility, initial low self-esteem, greater likelihood of having suffered interpersonal violence and exposure to stress associated with gender inequality may be contributing factors[17].

In line with previous studies, an inverse relationship between age and the risk of high anxiety symptoms was observed[4,18]. One hypothesis for this finding is the financial and health insecurity caused by the pandemic. In the present study, people who reported the death of a relative or friend from COVID-19 and lower family income were more likely to develop anxiety, reinforcing this hypothesis.

In addition, behavioral variables such as diet, smoking, alcohol consumption, and physical activity were associated with greater risk for both outcomes. During the pandemic, a decrease in physical activity was observed in adolescents[19]. However, there has also been an increase in the consumption of alcohol and e-cigarettes[20]. Given the high probability of behavioral habits in adolescence persisting into adulthood, it is necessary to reinforce care for this population about the damage not only to mental health but also to physical health caused by physical inactivity, smoking, and excessive alcohol consumption.

This study also found a relationship between worsening sleep quality, increased screen time, and low levels of physical activity in the risk of increased symptoms of anxiety and depression. Our results are in line with those suggested by the 24-hour activity cycle[21]. In this paradigm, the importance of the four main daily activities (light physical activity, moderate-to-vigorous physical activity, sleep, and sitting time) and the physiological mechanisms by which they affect health are reinforced. Using this study as an example, we saw that schoolchildren who spent more than four hours a day sitting were at greater risk of increased symptoms of anxiety and depression. We also saw that physical activity reduced the risk of the same symptoms. In a meta-analysis with data from more than 1 million participants, the authors identified that 60-75 minutes of moderate-intensity physical activity performed daily can eliminate the increased risk of mortality related to sitting time[22]. Considering the protective effects of physical activity against anxiety and depression[23,24], future studies could identify the amount of physical activity needed to mitigate or even eliminate the deleterious effects of screen time on symptoms of anxiety and depression.

Despite being the first study to describe the prevalence and factors associated with symptoms of anxiety and depression in a representative sample of schoolchildren in Brazil, our study has some limitations. Due to the context of social distancing, the study sample was selected for convenience and the instrument was self-applied via the Internet, which makes it difficult to clarify some questions that may raise doubts among the participants. Another important limitation is the use of some non-validated questionnaires, which the authors opted to use because they were concerned that the study would not be adhered to if the instrument were too long.

Finally, anxiety and depression scores were associated with sociodemographic, behavioral, and health variables. About the main exposure variable, practicing physical activity regularly reduced the chance of students showing high symptoms of anxiety and depression by 18% and 33%, respectively. These results highlight the importance of implementing management policies for the health care of students in Brazilian schools during their return to face-to-face activities. Intersectoral actions involving psychologists, physical education teachers, nutritionists, and other health professionals can be important in this scenario.

Table 2: Crude and adjusted analysis of the association between sociodemographic, behavioral, and health variables and outcome variables.

Variables	Anxiety		Depression	
	Gross	Adjusted	Gross	Adjusted
	P	P	P	P
	OR 95% CI	OR 95% CI	OR 95% CI	OR 95% CI
Sex	<0.0001	<0.0001	<0.0001	<0.0001
Female	2,86 (2,54; 3,21)	2,62 (2,30; 2,98)	1,53 (1,36; 1,71)	1,33 (1,17; 1,51)
Male	1	1	1	1
Age (years)	0.012	<0.0001		
≤17	1,29 (1,11; 1,50)	1,70 (1,41; 2,06)		
18 a 29	1,56 (1,35; 1,80)	1,62 (1,36; 1,93)		
≥30	1	1		
Income (minimum wage)	<0.0001	0.016	<0.0001	0.015
<1	1,78 (1,44; 2,19	1,23 (0,96; 1,57)	1,73 (1,40; 2,15)	1,24 (0,97; 1,57)
1-29	1,36 (1,15; 1,60)	1,07 (0,89; 1,29)	1,36 (1,15; 1,60)	1,11 (0,92; 1,35)
3-5	1,01 (0,84; 1,23)	0,94 (0,76; 1,16)	1,08 (0,89; 1,30)	0,97 (0,78; 1,20)
>5	1	1	1	1
Marital status			0.024	0.025
Married			1	1
Dating			1,44 (1,20; 1,72)	1,13 (0,92; 1,40)
Single			1,28 (1,10; 1,50)	1,26 (1,05; 1,52)
Separated/Widowed			1,34 (0,90; 1,99)	1,11 (0,70; 1,74)
Leisure screen time (hours)	<0.0001	0.066	<0.0001	0.033
<2	0,75 (0,65; 0,86)	0,92 (0,78; 1,08)	0,75 (0,65; 0,86)	0,90 (0,76; 1,05)
2-4	0,83 (0,73; 0,94)	0,90 (0,78; 1,04)	0,83 (0,73; 0,94)	0,87 (0,75; 1,00)
<4	1	1	1	1
Screen time at work (hours)	<0.0001	<0.0001	<0.0001	0.002
<2	0,65 (0,57; 0,75)	0,71 (0,60; 0,83)	0,76 (0,66; 0,88)	0,83 (0,71; 0,97)
2-4	0,76 (0,67; 0,86)	0,77 (0,66; 0,88)	0,82 (0,72; 0,93)	0,82 (0,71; 0,94)
<4	1	1	1	1
Health perception	<0.0001	<0.0001	<0.0001	<0.0001
Very bad/poor	1	1	1	1
Regular	0,45 (0,37; 0,56)	0,53 (0,42; 0,66)	0,42 (0,34; 0,52)	0,49 (0,39; 0,62)
Good/very good	0,18 (0,15; 0,22)	0,27 (0,21; 0,33)	0,16 (0,13; 0,19)	0,24 (0,19; 0,30)
Unhealthy food intake	<0.0001	<0.0001	<0.0001	<0.0001
Never eaten	0,49 (0,43; 0,56)	0,68 (0,48; 0,95)	0,46 (0,40; 0,53)	0,63 (0,45; 0,89)
Eating less	0,45 (0,39; 0,51)	0,80 (0,68; 0,94)	0,51 (0,45; 0,59)	0,74 (0,63; 0,87)
Eating the same	0,37 (0,28; 0,50)	0,69 (0,59; 0,80	0,42 (0,31;0,55)	0,74 (0,63; 0,86)
Eating more	1	1	1	1
Sleep quality	<0.0001	<0.0001	<0.0001	<0.0001
Sleeping worse	1	1	1	1
Sleeping better	0,36 (0,31; 0,42)	0,40 (0,34; 0,48)	0,48 (0,33; 0,45)	0,48 (0,40; 0,56)
Same thing	0,23 (0,20; 0,27)	0,32 (0,27; 0,36)	0,32 (0,28; 0,37)	0,44 (0,38; 0,50)
Smoke	<0.0001	0.008	<0.0001	0.042
Never smoked	1	1	1	1
Smokes or has smoked	1,57 (1,33; 1,85)	1,36 (1,11; 1,66)	1,46 (1,24; 1,73)	1,24 (1,02; 1,51)
Use of alcohol	<0.0001	<0.0001	<0.0001	0.004
Yes	1,36 (1,22; 1,51)	1,24 (1,08; 1,41)	1,21 (1,09; 1,35)	1,15 (1,02; 1,31)
No	1	1	1	1
Use of medication	<0.0001	<0.0001	<0.0001	<0.0001
Yes	3,53 (3,07; 4,05)	2,50 (2,13; 2,93)	2,27 (1,98; 2,60)	1,80 (1,53; 2,10)
No	1	1	1	1
Death of a friend/family member due to COVID	<0.0001	<0.0001		
Yes	1,32 (1,18; 1,47)	1,20 (1,06; 1,36)		
No	1	1		
BMI			0.001	0.203
Normal			0,76 (0,65; 0,89)	1,13 (0,94; 1,37)
Overweight			0,81 (0,68; 0,97)	1,06 (0,86; 1,31)
Obese			1	1
Physical activity	<0.0001	<0.0001	<0.0001	<0.0001
Yes	0,65 (0,59; 0,73)	0,82 (0,72; 0,93)	0,53 (0,48; 0,60)	0,67 (0,59; 0,76)
No	1	1	1	1

Ordinal logistic regression

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