

The implications of the COVID-19 pandemic on the mental and physical health of students of the Medicine Course of a University in the Metropolitan Region of Espírito Santo

As implicações da pandemia de COVID-19 na saúde mental e física dos estudantes do Curso de Medicina de uma Universidade da Região Metropolitana do Espírito Santo

Las implicaciones de la pandemia de COVID-19 en la salud mental y física de los estudiantes del Curso de Medicina de una Universidad de la Región Metropolitana de Espírito Santo

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ABSTRACT

Introduction: The first reported case of infection by the new coronavirus occurred in China, in December 2019. Due to the spread of the disease, changes in lifestyle occurred, which, associated with the period of uncertainty, generated impacts on the health of the population. **Objective:** To understand the implications of the COVID-19 pandemic on the mental and physical health of medical students at a university in Espírito Santo. **Methods:** Cross-sectional study from August 2020 to January 2021, with a quantitative and qualitative approach, with medical students enrolled in all periods. Data collection was carried out with an electronic questionnaire, encompassing sociodemographic, economic, individual, and family characteristics about the period prior to and during the pandemic. Excel 2020 and OPENEPI programs were used for analyses. The study was approved by the Human Research Ethics Committee, under number 4.224.502. **Results:** 779 students were evaluated, mostly females (61.6%), between 20 and 24 years old (64.0%), in the first two years of the course (46.5%), residing in urban areas (98.1%) with 1 to 3 people in their household (65.0%), and unemployed (93.2%). Sample characteristics during the pandemic: need to pause enrollment (3.9%), constant concern with the family (73.9%), difficulty in adapting to distance education (76.0%), continuous family life (84.5%), changes in sleep (54.9%), physical activity (60.3%), and weight (71.0%), participation in household chores (77.9%), psychological pressure (47.6%), food (69.6 %). The variables that underwent significant changes between the previous period and during the pandemic were lower income ($p=0.005$), increased use of medication ($p=0.0009$), and self-perceived stress level ($p\leq 0.0000001$). Regarding the development of pain during the pandemic period, the following had an impact: female ($p\leq 0.0000001$), second year of the course ($p=0.001$), constant concern for the family ($p=0.000002$), difficulty in adapting to distance education ($p=0.002$), changes in sleep ($p=0.000003$), physical activity ($p=0.001$), weight ($p=0.00007$), and diet ($p=0.01$). For the development of mental disorders during the pandemic, the most significant were gender ($p=0.004$), constant concern for the family ($p=0.005$), sleep ($p=0.006$), and diet ($p=0.003$). **Conclusions:** Changes in living standards resulting from the pandemic had a negative impact on physical and mental health, making it essential for educational institutions to provide student with health care actions.

Keywords: Coronavirus; Mental health; Exercise; Students, Medical.

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RESUMO

Introdução: O primeiro caso reportado da infecção pelo novo coronavírus ocorreu na China, em dezembro de 2019. Dado o alastramento da doença, ocorreram modificações no estilo de vida, que associadas ao período de incertezas geraram impactos na saúde da população. **Objetivo:** Compreender as implicações da pandemia de COVID-19 na saúde mental e física dos estudantes do Curso de Medicina de uma universidade do Espírito Santo. **Métodos:** Estudo transversal de agosto de 2020 a janeiro de 2021, com abordagem quantitativa e qualitativa, com estudantes de Medicina de todos os períodos. Coleta de dados feita com questionário eletrônico, englobando dados sociodemográficos, econômicos, características individuais e familiares sobre o período prévio e concorrente à pandemia. Os programas Excel 2020 e OPENEPI foram utilizados para as análises. O estudo foi aprovado pelo Comitê de Ética em Pesquisa com Seres Humanos, sob o número 4.224.502. **Resultados:** Foram avaliados 779 acadêmicos, a maioria do sexo feminino (61,6%), entre 20 e 24 anos (64,0%), nos dois primeiros anos do curso (46,5%), residentes em área urbana (98,1%), com uma a três pessoas em seu domicílio (65,0%) e sem vínculo empregatício (93,2%). Características da amostra durante a pandemia: necessidade de trancar matrícula (3,9%), preocupação constante com a família (73,9%), dificuldade de adaptação à educação a distância (76,0%), convívio familiar contínuo (84,5%), alterações do sono (54,9%), da prática de atividade física (60,3%) e do peso (71,0%), participação nos afazeres domésticos (77,9%), pressão psicológica (47,6%), alimentação (69,6%). As variáveis que sofreram modificações significativas entre os períodos prévio e concorrente à pandemia foram diminuição de renda ($p=0,005$), aumento do uso de medicamentos ($p=0,0009$) e do nível de estresse autopercebido ($p\leq 0,0000001$). Com relação ao desenvolvimento de dores no período da pandemia, apresentaram impacto: sexo feminino ($p\leq 0,0000001$), segundo ano do curso ($p=0,001$), preocupação constante com a família ($p=0,000002$), dificuldade de adaptação ao ensino a distância ($p=0,002$), alterações no sono ($p=0,000003$), atividade física ($p=0,001$), mudanças no peso ($p=0,00007$) e na alimentação ($p=0,01$). Para o desenvolvimento de distúrbios psíquicos durante a pandemia, as com maior significância foram sexo ($p=0,004$), preocupação constante com a família ($p=0,005$), sono ($p=0,006$) e alimentação ($p=0,003$). **Conclusões:** Modificações dos padrões de vida decorrentes da pandemia impactaram negativamente a saúde física e mental, tornando essencial que as instituições de ensino proporcionem ações de cuidado à saúde de estudantes.

Palavras-chave: Coronavírus; Saúde mental; Exercício físico; Estudantes de Medicina.

RESUMEN

Introducción: El primer caso reportado de contagio por el nuevo coronavirus ocurrió en China, en diciembre de 2019. Debido a la propagación de la enfermedad, se produjeron cambios en el estilo de vida, que, asociados al período de incertidumbre, generaron impactos en la salud de la población. **Objetivo:** Comprender las implicaciones de la pandemia COVID-19 en la salud física y mental de los estudiantes de medicina de una universidad de Espírito Santo. **Métodos:** Estudio transversal de agosto de 2020 a enero de 2021, cuantitativo y cualitativo, con estudiantes de medicina matriculados en todos los períodos. La recopilación de datos se realizó con un cuestionario electrónico, que abarcó características sociodemográficas, económicas, individuales y familiares sobre el período previo y durante la pandemia. Para los análisis se utilizaron los programas Excel 2020 y OPENEPI. El estudio fue aprobado por el Comité de Ética en Investigación con Seres Humanos, bajo el número 4.224.502. **Resultados:** Fueron evaluados 779 estudiantes, mayoría mujeres (61,6%), entre 20 y 24 años (64,0%), en los dos primeros años del curso (46,5%), residentes en áreas urbanas (98,1%), con 1 a 3 personas en su hogar (65,0%) y sin empleo (93,2%). Características de la muestra durante la pandemia: necesidad de cerrar matrícula (3,9%), preocupación constante por la familia (73,9%), dificultad de adaptación a la educación a distancia (76,0%), convivencia familiar continua (84,5%), trastornos del sueño (54,9%), actividad física (60,3%) y peso (71,0%), participación en las tareas del hogar (77,9%), presión psicológica (47,6%), alimentación (69,6%). Las variables que sufrieron cambios significativos entre el período anterior y durante la pandemia fueron la disminución de ingresos ($p=0,005$), el aumento del uso de medicamentos ($p=0,0009$) y el nivel de estrés autopercebido ($p\leq 0,0000001$). En cuanto al desarrollo del dolor durante el período de la pandemia, incidieron: sexo femenino ($p\leq 0,0000001$), segundo año de carrera ($p=0,001$), preocupación constante por la familia ($p=0,000002$), dificultad de adaptación a la educación a distancia ($p=0,002$), cambios en el sueño ($p=0,000003$), actividad física ($p=0,001$), cambios en el peso ($p=0,00007$) y dieta ($p=0,01$). Para el desarrollo de los trastornos mentales durante la pandemia, los más significativos fueron el sexo ($p=0,004$), la preocupación constante por la familia ($p=0,005$), el sueño ($p=0,006$) y la alimentación ($p=0,003$). **Conclusiones:** Los cambios en los niveles de vida derivados de la pandemia impactaron negativamente en la salud física y mental, por lo que es fundamental que las instituciones educativas brinden acciones de atención a la salud de los estudiantes.

Palabras clave: Coronavirus; Salud mental; Ejercicio físico; Estudiantes de Medicina.

INTRODUCTION

At first glance, it is noteworthy that the first case of infection with the new coronavirus was reported in China, in early December 2019.¹ COVID-19, as it is a highly transmissible disease,² has rapidly escalated worldwide, causing the World Health Organization to consider it a pandemic.

This rapid rise, observed around the world, is mainly derived from the effectiveness of transmission of the virus that causes COVID-19. As a respiratory disease, transmission is associated with inhalation

or contact with infected droplets from patients with or without apparent clinical symptoms, spread out by coughing or sneezing and which can reach 1 to 2 meters.³

The world population experienced the absence of a vaccine for COVID-19 for many months, making other public health measures necessary, called non-pharmaceutical interventions, aimed at reducing contact between people and, consequently, the transmission of the virus.⁴ Among these measures, the one that has proved most effective is social distancing, whether forced or voluntary, from individuals. Sometimes, however, this measure is an unpleasant experience for the population, as isolation, loss of freedom, uncertainties about health status, and boredom can have devastating effects.⁵

This reality is related to fear, doubts and, mainly, changes in the daily patterns of individuals.⁶ In this context, the approach to the mental and physical health of the population is highlighted, mainly because it deals with impacts that will extend beyond the health/disease sphere and the current moment of the global scenario, in addition to causing numerous socio-behavioral changes in societies, including changes in lifestyle that are related to the increase in family life and changes in the routine of physical activity practices and consumption of foods.⁷

Thus, assessing the mental health of individuals is essential, given the possibility of psychological impacts directly related to COVID-19, due to the risk of contracting respiratory syndrome and psychological pressure, as well as those derived from measures to contain the disease.¹ Studies have shown that the quarantine was the most predictive factor of symptoms of acute stress,⁸ with disorders related to anxiety, depression, and post-traumatic stress being the main manifestations.⁹

In addition to the implications for mental health, it should be noted that the new coronavirus pandemic has an alarming impact on the population's lifestyle, including: changes in the routine of physical activities,¹⁰ essential for the promotion of physical and mental health;¹¹ in diet,¹² vital in quality of life and disease prevention;¹³ in sleep quality,¹⁴ and in leisure activities,¹⁵ both factors that provide extensive physical and mental well-being.¹⁶

All the uncertainties related to the current global scenario, as well as all the consequences of the mechanisms to prevent the spread of the disease, also fall on students. This is mainly due to the need to close schools and universities, avoiding social contact and reducing the transmission of the disease.¹⁷ This drastic change in students' routine and lifestyle has an effect on their mental and physical health.

Following this line of analysis, it should be noted that, when specifically looking at the Medicine course, students have an essentially active role in their training through practical learning.¹⁸ This context was suddenly changed due to current events, which began to privilege remote activities.

In this way, students, in a short period, had to adapt to a set of resources that support the use of distance learning methodologies so that the teaching and learning processes could continue to occur.¹⁹ This rapid change, associated with other uncertainties of the period, corroborate the need to assess the physical and mental health of medical students.

Therefore, this article aimed to evaluate the implications of the COVID-19 pandemic on the mental and physical health of medical students at a university in the metropolitan region of Espírito Santo, Brazil, relating relevant variables to the homeostasis of body and mind — such as the need to pause enrollment, concern and living with the family, distance learning method, sleep quality, physical activity, diet, medication use, financial condition, and stress level.

METHODS

This is a cross-sectional study with a quantitative and qualitative approach, carried out with medical students from a university in the metropolitan region of Espírito Santo, Brazil, from August 2020 to December 2020.

The Medicine course at the university in question had 972 students regularly enrolled from the first to the 12th periods, in the first semester of 2020, distributed as follows: 103 students in the first period, 91 in the second, 96 in the third, 92 in the fourth, 89 in the fifth, 86 in the sixth, 71 in the seventh, 112 in the eighth, 50 in the ninth, 59 in the tenth, 63 in the 11th, and 60 in the 12th.

The sample was calculated on the universe of 972 students, with an expected prevalence of 40%, in line with the literature consulted, and a sampling error of 5%, with 370 being the representative sample of the total universe, with a confidence interval (CI) of 95 %. Stratifying the sample calculation by period, the representative sample from the first to the 12th period was 36, 37, 37, 35, 33, 28, 47, 23, 20, 23, 25, 24, respectively. The definition of the students participating in the study by period was by simple random selection.

Data collection was carried out through the application of a single directed questionnaire, in a virtual electronic environment, through the Google Forms platform, which was sent via the social network WhatsApp. The single instrument addressed the period before and during the pandemic and consisted of sociodemographic aspects and 55 open and closed questions, which evaluated the variables selected for the study.

Open-ended questions were used especially to assess the characteristics of physical and mental conditions that research subjects had before the pandemic and which ones they developed, as well as which drugs were already in use and which ones started to be used; reason for pausing enrollments; how the concern for the family affected the quality of life; to which individuals attributed their weight change; and a space for suggestions on what could be proposed to contribute to the improvement of students' mental and physical health in the post-pandemic period.

To assess the implications for the mental and physical health of medical students, the following variables were used: distance learning (*ensino a distância* – EAD), continuous family life, psychological disorders, medication use, physical activity, diet, absence of leisure activities and social interaction, household chores, health concerns, number of hours and quality of sleep. In addition, the following were considered as influencing factors: gender, age, work, place of residence, family income, previous use of medication, and preexisting diseases. The need to withdraw from the course for financial reasons or mental health status was also analyzed.

The variables presented to research subjects were answered according to their experience in the previous and concurrent periods of the pandemic, being self-reported in the face of personal perception about issues such as sleep quality, physical condition, presence or not of physical activity, level of stress and psychological pressure.

Data entry was in the Excel 2020 program, with double typing and automatic consistency and amplitude checking. Subsequently, the data were transferred to the OPENEPI program for statistical analysis.

During this stage, the variables that were analyzed through open questions were standardized to be later analyzed qualitatively. The conditions developed and their relationship with the consequences brought by the constant concern with the family were evaluated, as well as with the most used drug classes. In this phase, it was also possible to assess the need to implement measures regarding the contribution of educational institutions in improving the health of their students, corroborating the conclusion of the present study.

First, the descriptive analysis of the sample was performed. Then, the chi-square test was applied to identify differences between the groups (individual characteristics before and after the pandemic; presence of pain; psychic disorder), which was considered when the p value was less than 0.05.

The study met the ethical criteria for research with human beings according to Resolution 466/2012 of the National Research Ethics Commission of the National Health Council. It was submitted to the University's Human Research Ethics Committee and approved under number 4.224.502, on August 19th, 2020. In addition, authorization from the higher education institution was requested to carry out the study and an Informed Consent was sent to every subject after the research.

RESULTS

The sample consisted of 779 medical students, 299 (38.4%) males and 480 (61.6%) females, the majority between 20 and 24 years of age (64.0%) and attending the first two years of university (46.5%). Most of the students included in the study did not work (93.2%), lived in urban areas (98.1%), and lived with one to three people (65%) (Table 1). Only 30 (3.9%) students felt the need to withdraw from the course during the pandemic period, but the majority felt great difficulty in adapting to distance learning (76%), despite recognizing that the modality contributed to their studies (51%) (Table 2).

Table 1. Sociodemographic characteristics of medical students at a university in the metropolitan region of Espírito Santo, Brazil, 2020.

Characteristics	Sample n=779 n (%)
Gender	
Male	299 (38.4)
Female	480 (61.6)
Age	
<20	155 (19.9)
20–24	498 (64.0)
>24	126 (16.1)
Year of the course	
1	176 (22.6)
2	186 (23.9)
3	162 (20.8)
4	167 (21.4)
5	48 (6.2)
6	40 (5.1)
Working	
Yes	53 (6.8)
No	726 (93.2)
Type of household	
Urban	764 (98.1)
Rural	15 (1.9)
Inhabitants at the household	
Alone	89 (11.4)
1–3	506 (65.0)
4+	184 (23.6)

Table 2. Individual and family characteristics during the pandemic in medical students at a university in the metropolitan region of Espírito Santo, Brazil, 2020.

Characteristics	Sample n=779 n (%)
Need to pause the course	
Yes	30 (3.9)
No	749 (96.1)
Concern with the family	
Yes	576 (73.9)
No	203 (26.1)
EAD helped in studies	
Contributed	397 (51.0)
Hindered	382 (49.0)
Difficulty adapting to EAD	
Yes	592 (76.0)
No	187 (24.0)
Continuous family life	
Yes	658 (84.5)
No	121 (15.5)
Quality of continuous family life*	
Good	483 (73.4)
Bad	147 (22.4)
Indifferent	10 (1.5)
Mixed	18 (2.7)
Sleep during the pandemic (hours)	
<6	123 (15.8)
6–7	580 (74.4)
>7	76 (9.8)
Sleep quality	
Quality sleep	428 (54.9)
Poor quality sleep	351 (45.1)
Physical condition	
Very good	87 (11.2)
Good	291 (37.3)
Poor	104 (13.4)
Fair	275 (35.3)
Very poor	22 (2.8)
Physical activity	
Yes	470 (60.3)
No	309 (39.7)
Time spent on physical activity (minutes)†	
<20	19 (4.1)
20–40	167 (35.5)
>40	284 (60.4)
Change in weight	
Decrease	194 (24.9)
Increase	359 (46.1)
No change	226 (29.0)
Performs household chores	
Yes	607 (77.9)
No	172 (22.1)
Psychological pressure	
Present	371 (47.6)
Absent	408 (52.4)
Diet	
Improved	183 (23.5)
Worsened	359 (46.1)
No change	237 (30.4)

EAD: distance learning/education (*ensino a distância*). * Only people who answered “yes” to the previous question were considered (n=658); †Only people who answered “yes” to the previous question were considered (n=470).

Among the participants, it was also found that the majority suffered from constant concern for the family (73.9%) due to the pandemic and had continuous family life (84.5%), predominantly beneficial (73.4%) (Table 2).

Questions related to the mental and physical health of the students in the sample were investigated, demonstrating that the largest number of students had about six to seven hours of sleep, (74.4%) with quality, (54.9%) per night during the pandemic, in addition to most of them practicing physical activities in the period (60.3%), for more than 40 minutes (60.4%). A predominance of those students who reported not having suffered psychological pressure (52.4%) and who observed weight gain (46.1%) and a worsening in the eating pattern (46.1%) during the pandemic period was also observed. Most considered their physical condition to be good (37.3%) and performed household chores (77.9%) (Table 2).

We compared the economic and individual characteristics of study participants in the periods before the pandemic and during its course; family income ($p=0.005$), medication use ($p=0.0009$), and stress level ($p\leq 0.0000001$) changed with statistical significance (Table 3). In the comparative analysis between the individual and social characteristics of students with the development of pain and psychic disorders in the period prior to and concurrent with the pandemic, the variables that presented statistical significance for the development of pain were: female gender ($p<0.0000001$), second year of the course ($p=0.001$), constant concern for the family ($p=0.000002$), difficulty adapting to distance learning ($p=0.002$), poor sleep quality ($p=0.000003$), presence of physical activity ($p=0.001$), changes in weight ($p=0.00007$), and changes in diet ($p=0.01$) (Table 4). In turn, the variables that showed statistical significance for the development of psychic disorders were: female gender ($p=0.004$), constant concern for the family ($p=0.005$), poor sleep quality ($p=0.006$) and changes in diet ($p=0.003$) (Table 4).

Table 3. Economic and individual characteristics before and during the pandemic in medical students at a university in the metropolitan region of Espírito Santo, Brazil, 2020.

Characteristics	Sample n=779		
	Before	During	p-value
Family income			
<3,000	33 (4.2)	52 (6.7)	
3,000 to <5,000	58 (7.5)	78 (10.0)	
5,000 to <10,000	175 (22.5)	200 (25.7)	0.005
10,000 to <20,000	264 (33.8)	257 (33.0)	
20,000 to <100,000	242 (31.1)	185 (23.7)	
$\geq 100,000$	7 (0.9)	7 (0.9)	
Medication use			
At least one drug	157 (20.2)	108 (13.9)	0.0009
No drugs	622 (79.8)	671 (86.1)	
Stress level			
Very low	41 (5.3)	16 (2.0)	
Low	171 (21.9)	60 (7.7)	
Reasonable	383 (49.2)	215 (27.6)	<0.0000001
High	158 (20.3)	313 (40.2)	
Very high	26 (3.3)	175 (22.5)	

Table 4. Relationship of individual and social characteristics with pain and psychic disorder during the pandemic in medical students at a university in the metropolitan region of Espírito Santo, Brazil, 2020.

Characteristics	Development of pain during the pandemic			Development of psychic disorder during the pandemic		
	Yes (%)	No (%)	p-value	Yes (%)	No (%)	p-value
Gender						
Female	205 (26.3)	274 (35.2)	<0.0000001	103 (13.2)	377 (48.4)	0.004
Male	53 (6.8)	247 (31.7)		40 (5.1)	259 (33.3)	
Year of the course						
1	66 (8.5)	110 (14.1)	0.001	32 (4.1)	144 (18.5)	0.44
2	77 (9.9)	109 (14.0)		42 (5.4)	144 (18.5)	
3	46 (5.9)	116 (14.9)		27 (3.5)	135 (17.3)	
4	52 (6.7)	115 (14.8)		24 (3.1)	143 (18.3)	
5	11 (1.4)	37 (4.7)		9 (1.1)	39 (5.1)	
6	5 (0.6)	35 (4.5)		9 (1.1)	31 (4.0)	
Living alone						
Yes	26 (3.3)	63 (8.1)	0.42	22 (2.8)	67 (8.6)	0.09
No	231 (29.6)	459 (59.0)		121 (15.5)	569 (73.1)	
Constant concern for the family						
Yes	217 (27.8)	359 (46.1)	0.000002	119 (15.3)	457 (58.7)	0.005
No	40 (5.1)	163 (21.0)		24 (3.0)	179 (23.0)	
Difficulty adapting to EAD						
Yes	212 (27.2)	380 (48.8)	0.002	112 (14.4)	480 (61.6)	0.47
No	45 (5.8)	142 (18.2)		31 (4.0)	156 (20.0)	
Continuous family life						
Yes	225 (28.9)	433 (55.6)	0.09	116 (14.9)	542 (69.5)	0.22
No	32 (4.1)	89 (11.4)		27 (3.5)	94 (12.1)	
Sleep quality						
Quality sleep	111 (14.3)	317 (40.7)	0.000003	64 (8.2)	364 (46.7)	0.006
Poor quality sleep	146 (18.7)	205 (26.3)		79 (10.1)	272 (35.0)	
Practice of physical activity						
Yes	135 (17.3)	337 (43.3)	0.001	85 (11.0)	385 (49.4)	0.8
No	122 (15.7)	185 (23.7)		58 (7.4)	251 (32.2)	
Changes in weight						
Increase/decrease	206 (26.5)	347 (44.5)	0.000007	108 (13.9)	445 (57.1)	0.18
Unchanged weight	51 (6.5)	175 (22.5)		35 (4.5)	191 (24.5)	
Changes in diet						
Improvement/worsening	194 (24.9)	348 (44.7)	0.01	114 (14.6)	428 (55.0)	0.003
No change in dietary pattern	63 (8.1)	174 (22.3)		29 (3.7)	208 (26.7)	

DISCUSSION

The sample of the present study had female predominance (61.6%), between 20 and 24 years of age (64%), and residing in an urban environment (98.1), in agreement with the literature regarding the context of the university student population.²⁰

With the course of the COVID-19 pandemic, changes in the individuals' life routine were instituted, such as social isolation and suspension of in-person student activities, aiming to contain the disease.²¹ In this context, undergraduates of the Medicine course had to experience a new dynamic of life, which had visible effects on the mental and physical health of the entire population.

The impossibility of attending the university in person due to social distancing led to the prioritization of remote activities. Thus, it was observed that, although most of the evaluated students considered that distance learning helped them in their studies (51%), most of them had difficulties adapting to this teaching method (76%). However, the number of students who chose to or had to withdraw their enrollment was not very expressive (3.9%).

When observing the context of distance learning assistance with regard to student learning, it is understood from the sample that most students showed good use of their remote academic activities. This finding is confirmed by recent research — including one carried out with 656 medical students from different regions of Brazil, which showed that of the participants who had their academic activities continued through virtual platforms, only 39.2% reported not learning this way.²²

With regard to students' poor adaptation to distance learning, the finding of the present research is based on the same study mentioned above, demonstrating that 80.9% of students who reported continuity of academic obligations found it difficult to adapt to remote learning.²²

The difficulty of adapting to distance learning presented by the studied sample derives from the process of knowledge construction in medical education, which has the sphere of practical activities as one of its pillars.²³ According to recent studies on the impact of the pandemic on the course of Medicine, it can be observed that there are extensive limitations and impossibilities for some subjects to migrate to distance learning, especially in what is related to the clinical experience of the student.²⁴

Furthermore, the medical students in the present study reported that the rapid transition presented difficulties in adapting (76%). This difficulty can be justified, since for the competent and specialized use of teaching instruments, time is needed for familiarization and adaptation to the new digital environment, and the speed of implementation of these technological adaptations resulting from the pandemic can cause difficulties, as presented by the review of scope, which addressed medical education in the period of the pandemic.²⁵

Another important finding was the increase in continuous family life (84.5%) and concern for the family (73.5%). This is due to the fact that a large part of the families of the medical students at the university studied reside in other cities in the countryside of the state or in neighboring states. In addition, the actual workload of the face-to-face course reverted to the distance modality reflected in a longer stay of students in their homes with their families.

This finding corroborates recent studies carried out with university students in China, in which about 70% of the students in the sample claimed to feel significantly more worried during the pandemic period compared to normal, regarding their family members contracting the viral infection.²⁶

In addition to the level of stress related to the aforementioned concerns, it can be noted that poor quality of sleep hours, in addition to generating adverse consequences in the lives of individuals, has a close relationship with the mental and physical health of students, since sleep represents a fundamental biological function.²⁷ In the presented sample, it is observed that most students (45.1%) reported poor sleep quality. When comparing these data with recent studies carried out in the university population of Spain and Italy, it is observed that, although students increased their hours of sleep, the general quality

of sleep was impaired, a worsening that correlates with negative effects of social and economic nature brought about by the pandemic.²⁸

Another extremely important factor for the mental and physical health of students and the general population is the practice of physical activity, since several studies show that people with some routine of physical activity practice are less likely to be affected by mental disorders and physical diseases, especially cardiovascular ones, than sedentary ones.²⁹ When the results found in the present study are observed, in which most of the sample claimed to have practiced physical activities during the pandemic period (60.5%), it is clear that this goes against the data collected at the national level. This is because a study with 277 adults in the southern region of the country, which sought to relate the practice of physical activity in the midst of the pandemic and the level of education of the sample, showed that only 24.4% of people practiced physical activities in the midst of the pandemic.³⁰

This divergence between the results of the present study and the results presented by the research reported above can be justified by the coexistence environment of individuals from both samples, since university students in general have extensive support, mainly from academic athletic associations linked to their course for the practice of regular physical activities and the promotion of quality of life. This factor is especially important with regard to medical students, as evidenced by a survey carried out with 276 medical students, of whom 34.7% practiced activities through the Medical Athletic Association.³¹

It can also be highlighted that the study carried out with adults in the southern region of the country showed a higher prevalence of physical activity in individuals with incomplete higher education, as is the case of students who make up the population of the present study, with this prevalence being only lower than that of the sample composed of individuals with higher education.³¹

It is also noteworthy that 47.6% of the students reported suffering from psychological pressure, and the stressors related to the pandemic can be translated as an exacerbation of the level of stress presented daily by the students evaluated. 26.6% of the sample were at “high” and “very high” stress levels in the period prior to the pandemic, while 62.7% are included in these same levels during the pandemic period ($p \leq 0.0000001$).

In line with this data, a study carried out in China with 1,120 higher education students that aimed to assess the mental health of university students during the pandemic found that 75.5% of the sample analyzed using the Impact Event Scale – Revised had impacts resulting from the COVID-19 pandemic on their psychological health that ranged from moderate to severe levels.²⁶

When evaluating the eating behavior of these students, it should be borne in mind that food choices, quantities, and frequency of meals depend on biopsychosocial and cultural factors, which are greatly affected by the individual’s emotional states, especially anxiety.³² It is clear that the eating behavior of the students in the sample suffered negative changes, given that 46.1% showed a worsening in their diet.

These transformations also contributed to the weight change, and most of the sample showed weight gain (46.1%). Similar results were found in a study of 1,097 adults in Poland, in which 52% of participants reported that their food quality had worsened and 30% said they had gained weight during the pandemic period.³³

It is also clear that 80.4% of the sample studied claimed not to have developed pain during the pandemic period, including muscle pain and migraines. The reduction in this prevalence during the pandemic period can be explained by the fact that the participants of this study reported greater participation in household chores (77.9%) and the already highlighted habit of practicing physical activities.

Possibly, this can be attributed to the fact that participation in household chores, such as helping with cleaning the house and taking care of domestic animals, is a way to generate greater strengthening of family relationships, to promote greater emotional stability in the family environment and to keep an active body.²¹ This finding is similar to data found in research in African countries, such as Ethiopia,³⁴ as well as in Latin American countries, such as Brazil,³⁵⁻³⁷ in which family and friends are considered as points of support, being of great social importance.

It can also be highlighted that the physical effort required to perform the aforementioned household chores can contribute to the maintenance of the physical condition of the students,³⁸ given that 48.5% of the sample reports that they fit in the physical conditions “good” and “very good”.

Another factor evaluated in the study was family income. Economic difficulties may have been aggravated by the world scenario, as social isolation policies have led to a brutal drop in economic activity, also contributing to situations of stress and greater vulnerability to psychic alterations.³⁹ In the literature, it is already shown that individuals who have middle and low income are more likely to compose the group that presents excessive levels of stress.⁴⁰

This drastic change can be observed in the income level of the population. In the sample studied, in the period prior to the pandemic, 64.9% of students declared income between R\$10,000 and R\$100,000; during the pandemic, this number dropped to 56.7% of students. Those who declared income between R\$3,000 and an amount lower than R\$10,000 rose from 34.2% of students in the period before the pandemic to 42.4% during the pandemic ($p=0.005$).

It is possible to base this finding on recent research on the income of the Brazilian population in the periods before the pandemic and during its course. One of them, carried out with 228 people in Rio de Janeiro, showed that among the participants, in addition to the reduction in working hours, 60.0% experienced a reduction in family income and 7.5% experienced a complete lack of income.⁴¹

In view of the findings of the present study, it was found that some variables obtained greater statistical significance with regard to the impairment of mental and physical health of medical students. Among them, it can be observed that the individual's gender ($p\leq 0.004$) was highly significant in terms of mental health, with the sample composed, for the most part, of female subjects. A recent study in China with 1,120 higher education students, which aimed to assess the consequences of the pandemic on the mental health of university students, showed that the female gender was strongly associated with a greater impact on the mental health of students and higher levels of anxiety and stress.²⁶

In this context, another study is worthy of mention. It was carried out with 272 medical students from a university in Portugal and indicated female students as the population with lower psychological well-being and with higher levels of anxiety and depression.⁴²

It is also noteworthy that the individual's gender strongly reflected on physical health, given that most students who reported the development of pain during the pandemic are female ($p\leq 0.0000001$). This finding is supported by another study carried out with 51 people, reinforcing the fact that the stress caused by the uncertainties experienced during the pandemic and the female overload can result in body fatigue and the development of pain.⁴³

Another finding that was significantly reflected in the development of pain by the students evaluated was the year of the course ($p=0.001$). It is demonstrated in the literature that psychological stress, reflected in the sample through muscle pain, increases during the course, especially after the second year of university.⁴⁴

Another variable that proved to be significant for the development of psychic disorders during the pandemic was the constant concern for the family ($p=0.005$). Similarities were found in recent studies, notably a research in China that showed that high levels of concern for close relatives were significantly associated with higher levels of stress.²⁶

This variable also had an effect on the development of pain ($p=0.000002$) among the research participants and may be related to the psychic stress suffered. A study conducted with health professionals from a hospital in São Paulo reports that the social and environmental stressors suffered by professionals can result in physical stress, which was manifested in 85.7% of the sample through tension headaches or muscle pain.⁴⁵

The difficulty found by students in adapting to distance learning also contributed to the development of pain ($p=0.002$). It is noteworthy that the rapid transition to the online environment led to the immediate need to adapt the home environment to the reality of remote learning, which resulted in poor ergonomic conditions and habituation to staying more hours daily in the sitting position, leading to musculoskeletal impairment. A research carried out in the Northeast region of Brazil can be used as a base, which stated that the experimental group composed of individuals who worked or studied at home suffered more musculoskeletal pain than the control group.⁴⁶

It is also demonstrated that the quality of sleep of students was significant for the development of psychic disorders ($p=0.006$) and muscle pain ($p=0.000003$) among the individuals in the sample. This result is closely related to findings in the literature that demonstrate that quality sleep is essential for achieving adequate quality of life and good health in the psychic and physical spheres.²⁷ This finding is similar to that of a study carried out with 435 individuals in Austria, Germany, and Switzerland during more severe periods of movement restrictions, which shows that there was a decrease in the population's sleep quality accompanied by a drop in physical and mental well-being.⁴⁷

Still with regard to the development of pain, it is observed that the change in weight was significant ($p=0.00007$), given that the increase in body weight is one of the factors that contribute to the increase in mechanical compression of the joints, associating it with greater demand of muscular force for the support of the body mass.²⁷

Negative changes in eating patterns are closely related to increased body weight and, consequently, have an effect on the development of pain ($p=0.01$), in addition to having effects on the development of psychic disorders ($p=0.003$). This is because eating healthy and adequately is positively associated with mental health indicators, such as better body image and lower levels of depression.^{48,49} However, it is worth noting that, as this is a cross-sectional study, it is impossible to verify the criterion of temporality of the events, and this association can only occur in a reverse way and it is not possible to affirm a cause and effect relationship. This limitation extends to the other variables analyzed with a cause and effect relationship.

This study has some limitations. It can be noted that some questions addressed in the form are subjective, such as sleep quality and stress level. As the questionnaire only considered the presence of pain or psychic disorder in the period prior to the pandemic or the development of these conditions during the pandemic context through dichotomous variables, there was an inability to identify possible remissions or worsening of pain or psychic disorders prior to the pandemic.

It should also be noted that the questionnaire used as a research instrument was self-administered, and respondents may have difficulties in filling it out. In addition, it was applied to the evaluation of variables related to the periods prior to and concurrent to the pandemic in a single moment, which may generate memory bias.

CONCLUSION

In view of the above, it is concluded that the new coronavirus pandemic has had negative impacts on the mental and physical health of medical students, when analyzing the development of psychic disorders and pain during the pandemic period.

It is observed that the factors that contributed the most to psychic alterations were: female gender, constant concern for the family, poor sleep quality, and changes in diet. In turn, the variables that favored the development of pain during the pandemic were: female gender, higher year of the course, constant concern for the family, difficulty adapting to distance learning, poor sleep quality, non-practice of physical activity, changes in weight, and changes in diet.

Thus, it is essential that educational institutions, government agents, and families pay attention to the problem exposed. In addition, it is recommended to implement measures aimed at reducing the psychological and physical suffering generated to students by the pandemic.

CONFLICT OF INTERESTS

Nothing to declare.

AUTHORS' CONTRIBUTIONS

JBM: Formal analysis, Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Investigation, Methodology. **SSCB:** Formal analysis, Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Investigation, Methodology. **MBG:** Formal analysis, Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Investigation, Methodology. **CHBG:** Project administration, Formal analysis, Conceptualization, Data curation, Writing – review & editing, Methodology, Supervision, Validation, Visualization. **ARMS:** Project administration, Formal analysis, Conceptualization, Data curation, Writing – review & editing, Methodology, Supervision, Validation, Visualization.

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