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Original

Impact of the COVID-19 pandemic on the education and health of university students

Impacto da pandemia da COVID-19 na educação e saúde de universitários

Impacto de la pandemia de la COVID-19 en la educación y la salud de los estudiantes universitarios

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Abstract

Objective: To analyze the impact of the COVID-19 pandemic on the education and health of university students. **Methods:** Cross-sectional study, carried out with 163 university students from different courses, between May and December 2022, in São Paulo, Brazil. Google Forms was used to capture information related to academic dynamics during the COVID-19 pandemic. **Results:** The majority of students were women and in the health field, studying their third year of college. 53.1% of students considered online classes to be bad or terrible, but only 43.6% thought about giving up their studies during the period. Most participants spent between five and nine hours a day studying in front of screens, and 57.7% said they experienced a drop in academic performance. Students had problems sleeping (58.2%, $p<0.001$), increased moments of stress, fatigue, depression, or anxiety (76.7%, $p<0.001$), felt hopeless (71.7%, $p< 0.001$), and showed changes in weight during the period (75.4%, $p<0.001$). **Conclusion:** The COVID-19 pandemic had negative impacts on the majority of those investigated, both in education and health, especially mental health. It is necessary to encourage multimodal curricula and programs that encourage quality of life and mental health in university spaces.

***Descriptors*:** Pandemics; COVID-19; Students; Universities; Health.

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Whats is already known on this?
The COVID-19 pandemic brought different changes to the social determinants of health, affecting different population groups around the world.

What this study adds?
The COVID-19 pandemic changed university dynamics and generated negative impacts on academic performance, social interaction, and the physical/mental health of students, showing the need for urgent interventions.

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Resumo

Objetivo: *Analisar o impacto da pandemia da COVID-19 na educação e na saúde dos estudantes universitários.* ***Métodos:*** *Estudo transversal, realizado com 163 universitários de diferentes cursos, entre maio e dezembro de 2022, em São Paulo, Brasil. O Google forms foi utilizado para capturar as informações relacionadas à dinâmica acadêmica durante a pandemia da COVID-19.* ***Resultados:*** *A maioria dos estudantes eram mulheres e da área da saúde, cursando o terceiro ano da faculdade. 53,1% dos alunos consideraram as aulas on-line ruins ou péssimas, mas apenas 43,6% pensaram em desistir dos estudos no período. A maioria dos participantes passava entre cinco e nove horas por dia estudando em frente às telas, e 57,7% afirmaram ter experimentado queda no desempenho acadêmico. Os estudantes apresentaram problemas para dormir (58,2%, p<0,001), aumentaram momentos de estresse, fadiga, depressão ou ansiedade (76,7%, p<0,001), sentiram-se desesperançados (71,7%, p<0,001), e apresentaram alterações de peso durante o período (75,4%, p<0,001).* ***Conclusão:*** *A pandemia da COVID-19 trouxe impactos negativos para a maioria dos investigados, tanto na educação quanto na saúde, especialmente na saúde mental. É necessário incentivar currículos multimodais e programas que incentivem a qualidade de vida e a saúde mental nos espaços universitários.*

Descritores: *Pandemias; COVID-19; Estudantes; Universidades; Saúde.*

Resumén

Objetivo: *Analizar el impacto de la pandemia COVID-19 en la educación y la salud de los estudiantes universitarios.* ***Métodos:*** *Estudio transversal, realizado con 163 estudiantes universitarios de diferentes carreras, entre mayo y diciembre de 2022, en São Paulo, Brasil. Se utilizaron formularios de Google para capturar información relacionada con la dinámica académica durante la pandemia de COVID-19.* ***Resultados:*** *La mayoría de los estudiantes fueron mujeres y del área de la salud, cursando el tercer año de carrera universitaria. El 53,1% de los estudiantes consideró malas o pésimas las clases online, pero sólo el 43,6% pensó en abandonar sus estudios durante el período. La mayoría de los participantes pasaban entre cinco y nueve horas diarias estudiando frente a las pantallas, y el 57,7% afirmó haber experimentado una caída en el rendimiento académico. Los estudiantes tuvieron problemas para dormir (58,2%, p<0,001), aumentaron los momentos de estrés, fatiga, depresión o ansiedad (76,7%, p<0,001), se sintieron desesperanzados (71,7%, p< 0,001) y mostraron cambios de peso durante el período. (75,4%, p<0,001).* ***Conclusión:*** *La pandemia de COVID-19 tuvo impactos negativos en la mayoría de los investigados, tanto en educación como en salud, especialmente en salud mental. Es necesario fomentar currículos y programas multimodales que fomenten la calidad de vida y la salud mental en los espacios universitarios.*

Descriptores*: Pandemias; COVID-19; Estudiantes; Universidades; Salud.*

INTRODUCTION

The emergence of the SARS-CoV-2 virus, which causes COVID-19, has led the world to an unprecedented public health crisis. Emergency protocols were implemented in an attempt to control the spread of the virus, which resulted in restrictions on all non-essential public movements,[1] such as educational institutions.

With the closure of these institutions, the need arose for a rapid transition from face-to-face learning to the digital sphere, or rather, e-learning,[2] which has been observed as a possible alternative to conventional learning,[3] However, According to the meta-analysis on e-learning, online learning has similar characteristics to conventional learning, being a better alternative for adverse times[4], such as the COVID-19 pandemic.

To improve the e-learning experience, educational institutions were required to comply with the guidelines and recommendations of government bodies, keeping students encouraged to learn remotely in this often adverse and difficult environment.[5] Furthermore, to efficiently conduct the online learning process six guidelines must be implemented, they are: make preparedness plans for emergencies and unexpected problems; divide teaching content into smaller units to help students concentrate; emphasize the use of voice in teaching; work with assistance to difficulties; strengthen students' active learning capacity outside the classroom and; combine online and offline learning effectively.[6]

The rapid and abrupt transition from conventional to online learning ended up influencing students of all age groups with a new form of teaching, especially those with fewer financial resources.[5,7] Furthermore, The reduction in family income, limited access to digital resources, and the high cost of Internet connectivity disrupted the academic lives of students, directly impacting the psychological sphere.[8] Furthermore, changes in the daily routine, including the lack of activity outdoors, disrupted sleeping patterns and social distancing have affected students' mental well-being.[9]

Thus, the biggest challenge of online learning during the pandemic was the requirement for efficient digital infrastructure, and a skill set available from students and teachers – both often unprepared for this scenario, as well as the absenteeism of more than half of students during this period.[9]

In view of this, there is a strong need to record and study the effects of the changes that are being made, especially when it is realized that the literature is not yet robust on the topic at hand. In this sense, the question is: what is the impact of the COVID-19 pandemic on the education and health of university

students? Therefore, the objective was to analyze the impact of the COVID-19 pandemic on the education and health of university students.

METHODS

This is a study with a quantitative approach and cross-sectional design, guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) tool, carried out between May and December 2022, with university students from different courses in the areas of Human Sciences, Health, and Engineering.

The sample consisted of adults, duly enrolled in one of the seven undergraduate courses (Administration, Law, Physical Education, Nursing, Civil Engineering, Physiotherapy, and Medicine), from a private Higher Education institution, located in the city of Guarujá, São Paulo. Of the courses, only Medicine has full-time teaching activities. By the beginning of 2022, a total of 1,354 students were enrolled at the institution. Thus, the sample was calculated according to the formula for the finite population of epidemiological studies, namely: ([z2 x p(1-p)] / e2 / 1 + [z2 x p(1-p)] / e2 x N]), and a total of 209 university students were obtained, but only 163 participated in the research, due to the time allocated to data collection, in compliance with the current project notice.

The following inclusion criteria were adopted: university students, of any gender, over the age of 18, with active enrollment during the data collection period and in face-to-face or hybrid activities. Students who were in the first year of each course were excluded, as they had not gone through the restriction period imposed by the COVID-19 pandemic.

Data was collected from June to August 2022, online, by filling out Google Forms forms. The questionnaire link and the Free and Informed Consent Term (FICT) were sent to students actively enrolled at the educational institution, via email. To this end, first, a formal request for access to students' emails was made to the coordination of the Higher Education institution. Reminders about the research were carried out in classrooms so that the calculated sample could be reached. The snowball method was also applied in an attempt to obtain data.

A data collection instrument, developed based on a review of previous literature, containing socioeconomic questions (gender, age in years, skin color, area of graduation course, school year, marital status, whether they work, family income) and related to academic dynamics during the COVID-19 pandemic, dealing with education and the teaching-learning process, as well as students' health was applied.

The collected data were entered in double entry mode by independent typists into a Microsoft Excel software spreadsheet and JAMOVI 2.4.8 software. Disagreements were reviewed and corrected by the data collection coordinator. A descriptive analysis of the data was carried out based on the calculation of simple absolute and percentage frequencies. The t- and Fisher tests were used for independent samples to analyze data normality. In analyzing the students' health conditions, the binomial test was applied. A significance level of 5% was adopted for the analyses.

This research was approved by the Ethics and Research Committee of the University of Ribeirão Preto (CAAE: 61451922.8.0000.5498), under opinion no. 5,769,985. It is noteworthy that, to conduct this study, the standards contained in National Health Council Resolutions No. 466/2012, No. 510/2016, and No. 580/2018 were respected. And, in order to comply with the ethical precepts of online research involving human beings, the data was deleted from the drive and remains archived in a digital file without online access.

RESULTS

Of the 163 students who made up the sample, the majority were female (69.9%), self-declared white (81.5%), enrolled in the third year of graduation (45.4%), and in one of the courses in the area of health sciences (57.7%). The average age was 25 years (±21 years). The study was dominated by single people (84.0%), who did not perform any work activity (67.5%) and had a family income of more than five minimum wages (40.5%) (Table 1).

Table 1 – Socioeconomic characterization of the 163 university students included in the research. Guarujá, SP, Brazil, 2023.

Variables	n (%)
Sex	
Masculine	49 (30.1)
Feminine	114 (69.9)
Age (years)	**25 (±21)**
Skin color	
White	133 (81.5)
Brown	23 (14.1)
Black	05 (3.0)
Yellow	02 (1.4)
Graduation field	
Human Sciences	36 (22.1)
Health Sciences	94 (57.7)
Engineering	33 (20.2)
School year	
Second year	51 (31.3)
Third year	74 (45.4)
Forth Year	29 (17.8)
Fifth year	09 (5.5)
Marital status	
Single	137 (84.0)
Married	26 (16.0)
Labor activity	
Yes	53 (32.5)
No	110 (67.5)
Family income	
Up to a minimum wage*	53 (32.5)
Between one and five minimum wages	44 (27.0)
More than five minimum wages	66 (40.5)

*The 2022 minimum wage in Brazil was considered (R$ 1,212.00).
Source: research data, 2023.

The majority of participants reported that classes were interrupted during the COVID-19 pandemic (91.4%), they considered it a good measure to prevent the spread of the disease (94.5%), even though the quality of classes was poor, for 36.2% of those investigated, "bad". Most did not pause their studies (89.0%) and did not think about giving up (56.4%). Access to classes was mostly through different electronic devices (49.7%), such as tablets, computers, and cell phones. The average time spent on screens was between five and nine hours a day (44.7%). Problems regarding study interruptions due to family routine or reduced academic performance were present in the majority of research participants (Table 2).

Table 2. Characterization of the impact of COVID-19 on the education of the 163 students included in the research. Guarujá (SP), Brazil, 2023.

Variables	n (%)
Have classes been interrupted during the COVID-19 pandemic?	
Yes	149 (91.4)
No	14 (8.6)
Do you consider interrupting classes a good measure to prevent the spread of COVID-19?	
Yes	154 (94.5)
No	09 (5.5)
Did you take remote classes during the pandemic?	
Yes	160 (98.0)
No	03 (2.0)
How do you consider the quality of classes during the pandemic?	
Very good	18 (11.2)
Good	57 (35.7)
Bad	58 (36.2)
Too bad	27 (16.9)
Did you stop studying during the pandemic because you didn't adapt to the method?	
Yes	18 (11.0)
No	145 (89.0)
Did you think about giving up your studies because you couldn't adapt to the conditions imposed by the COVID-19 pandemic?	
Yes	71 (43.6)
No	92 (56.4)
Which device did you access remote (online) classes on?	
Cell phone only	11 (6.8)
Computer only	71 (43.5)
Cell phone, computer, tablet and others	81 (49.7)
Time in front of screens to study?	
Up to 4 hours a day	56 (34.3)
5 to 9 hours a day	73 (44.7)
More than 10 hours a day	34 (21.0)
Did you suffer many interruptions in your studies due to your family routine?	
Yes	112 (68.8)
No	51 (31.2)
Have you faced problems with Internet access?	
Yes	45 (27.6)
No	118 (72.4)
Do you consider a decrease in learning performance?	
Yes	94 (57.7)
No	69 (42.3)
Do you consider the lack of social interaction with the teacher and classmates a disadvantage?	
Yes	136 (83.4)
No	27 (16.6)
Do you currently attend classes?	
In-person	148 (91.0)
Hybrids	12 (7.0)
Remote (online)	03 (2.0)
Currently, he prefers that classes be	
In-person	106 (65.0)
Hybrids	48 (29.5)
Remote (online)	09 (5.5)
Did you have difficulties returning to in-person classes?	
Yes	117 (71.7)
No	46 (28.3)

Source: research data, 2023.

The impact on participants' health conditions was also investigated. In this research, most students had problems sleeping (58.2%, $p<0.001$), increased moments of stress, fatigue, depression, or anxiety

(76.7%, p<0.001), felt hopeless (71.7%, p<0.001) and showed weight changes during the period (75.4%, p<0.001) (Table 3).

Table 3. Characterization of the impact of the COVID-19 pandemic on the health conditions of 163 university students. Guarujá (SP), Brazil, 2023.

Variables	Yes	No	p-value*
	n (%)	n (%)	
Did you have trouble sleeping during your period?	95 (58.2)	68 (41.8)	< 0.001
Have there been an increase in moments of stress, fatigue, depression, or anxiety due to the teaching-learning process during the pandemic?	125 (76.7)	38 (23.3)	< 0.001
Did you need psychological or psychiatric support during the period?	71 (43.5)	92 (56.5)	< 0.001
Did you feel hopeless?	117 (71.7)	46 (28.3)	< 0.001
Did you have problems concentrating during classes?	128 (78.5)	35 (21.5)	< 0.001
Did you exercise during the period?	36 (22.0)	127 (78.0)	< 0.001
Did you experience weight change during the period?	123 (75.4)	40 (24.6)	< 0.001

*Binomial test.

Source: research data, 2023.

DISCUSSION

The COVID-19 pandemic made everyone rethink the way different activities would take place. In the meantime, in this study, almost all interviewees reported that face-to-face classes were interrupted during the COVID-19 pandemic, causing a negative impact, for example, on school performance. A similar study showed that nine out of ten undergraduate students in Germany had a decrease in learning.[10] Another investigation, this time carried out in a state in northeastern Brazil, highlighted that in addition to the drop in performance, study time during the pandemic fell by more than 40% among students at a public Higher Education institution.[11] And, in the United Kingdom, a survey identified that the COVID-19 pandemic caused 82.0% of students to show up concerned about learning practical skills, and 60.5% about the future of their careers.[12]

However, most university students did not pause or think about giving up their studies due to the SARS-CoV-2 pandemic. Evidence shows that innate factors, such as enthusiasm and self-determination, the satisfaction of achieving and achieving your personal goals, and even religious devotion, can influence these decisions. Furthermore, environments that promote motivation to study, support among peers, and the establishment of goals are fundamental to preventing school dropout.[13]

Dissatisfaction with the quality of classes was reported by most of those investigated in this research. A systematic review on the subject indicated that the main barriers to the application of e-learning during the COVID-19 pandemic were related to Internet connections, the use of inappropriate educational platforms, and the low acquisition of clinical skills.[14] In Brazil, this was reported by both students from public and private institutions.[11,15] Additionally, medical students in Romania highlighted a low perception of self-confidence, motivation, and practical involvement as limiting factors.[16]

An analysis of health courses, before and during the pandemic, showed that e-learning courses can achieve equivalent or better performance compared to face-to-face teaching, indicating the safety of using remote classes in professional training.[17] Associated with this, flexibility in study time and the possibility of participating in educational meetings around the world were some of the advantages of e-learning during the COVID-19 pandemic. However, difficulties in concentrating due to family arrangements, unanswered doubts, and dependence on electronic equipment and the Internet prevailed as major concerns[18], which was also noticed in this investigation.

Dependence on electronic devices was also common among the population investigated, especially because it was through these devices that students were able to continue their studies. Furthermore, it was also identified that almost half of university students spent more than five hours in front of screens during the pandemic period, just for studying. Research conducted in the Middle East observed a significant relationship between screen time and the presence of anxiety disorder, indicating the need for guidance and advice on limiting prolonged exposure.[19] A positive correlation was also found between screen time screen and difficulties sleeping and psychological suffering in Pakistan.[20] On the other hand, moments like these are also important for discovering ways to use technology and digital education.

Also noteworthy here is extensive Japanese research, which revealed that, during the first months of the COVID-19 pandemic, non-coercive confinement led to loneliness, scarce interpersonal relationships, insomnia, and anxiety, increasing psychological suffering, academic and work difficulties, in addition to having deteriorated the local economy.[21]

And, part of these factors was reported by the participants of this research.

Among the problems presented, most students reported problems sleeping ($p<0.001$). Sleep disorders during the COVID-19 lockdown among university students reached values of 21.4% in China[22], 41.0% in Saudi Arabia[23], and 72.0% in Argentina(24), severely impacting, school activities. In the state of Maranhão, university students reported a 36% worsening in sleep quality during the pandemic.[11]

When investigating the self-reported increase in stress, fatigue, depression, or anxiety due to the teaching process during the pandemic, three-quarters of students said they had experienced this ($p<0.001$). A previous study indicated that fear related to the outbreak of the disease in vogue and concern for one's own health and that of family members, difficulty concentrating, interruptions in sleep patterns, decreased social interactions, and increased concerns about academic performance were fundamental factors to changes in mental health.[11,25] Suicidal thoughts were also observed in almost 20.0% of university students in another investigation, indicating that less than half of the students were able to adequately deal with the negative feelings that presented themselves during the pandemic period.[26]

In the United States, in addition to the increase in cases of anxiety and depression, loneliness was also a common feeling presented by university students who were close to graduation. In turn, students in the first years of their undergraduate studies were more likely to pause their studies.[27] In this research, hopelessness was present in more than 70.0% of participants. Among Chinese nursing students, the level of hopelessness was higher among those who feared going to hospitals in the initial months of the spread of COVID-19, and among those whose sleeping and eating patterns were altered.[28]

Along with psychological suffering and low self-esteem, hopelessness can be a risk factor for suicidal ideation, regardless of periods of social isolation.[29] Therefore, data such as the research in question need to be considered and interpreted with caution and attention, in order to support the development of psychological guidance programs and other health care.

Weight change and a sedentary lifestyle were also present in the large proportion of university students in the survey. In Portugal, students' eating habits changed during the pandemic, and the consumption of ultra-processed foods and less-balanced meals became more prevalent. Furthermore, almost 70% of students reported having changes in their Body Mass Index (BMI).[30] A North American survey showed that, during the COVID-19 pandemic, there was a decline in physical activity and an increase in depressive symptoms among university students, indicating the need for greater support for the physical and mental health of this population.[31] This fact is, in part, due to the constant stress faced during the period. In an attempt to reverse problems such as those mentioned above, an American university that created a program of behavioral change and promotion of well-being in the academic environment, showed that students who were part of this program were less affected by the COVID-19 pandemic[32], revealing the power of projects aimed at well-being and quality of life in these spaces.

Even identifying the potential factors that led to educational and health disorders among university students, this study has some limitations. One of them refers to the cross-sectional design, which made it impossible to reliably monitor predictors that influenced the health and education of those investigated. It was also not possible to reach the sample predicted by the calculation performed. Another limitation can be seen in the students' self-report, which can lead to a bias in responses that could be socially accepted.

On the other hand, self-reported data is more accurate when people understand the questions and when there is anonymity. To this end, short and direct questions were asked and student participation was as anonymous as possible. Furthermore, it is possible to say that, if this research had been carried out between the first two years of the COVID-19 pandemic, other variables would have emerged for the analysis.

In view of this, it is possible to see that the COVID-19 pandemic produced significant changes in the education and health of university students. Therefore, the variables investigated (and others) must be taken into consideration when designing interventions that promote appropriate environments to mitigate such changes. On the other hand, it is noteworthy that digital education can play a significant role in the teaching-learning process, and can be as useful as the face-to-face modality, ideally when used together, through multimodal curricula, with video content, use forums and discussion platforms on topics

presented by teachers, lectures, dramatizations, conferences, among others[33], which can expand and unlock different types of educational skills. It should be added that this study can direct Nursing professionals, teachers, and researchers to a better understanding of the difficulties and potential of the period, as well as the construction of spaces for discussion, health promotion, and well-being.

CONCLUSION

The COVID-19 pandemic has had negative repercussions for most university students. It was possible to identify the impact on education as a drop in academic performance and loss in interpersonal relationships. Furthermore, the majority of those surveyed prefer face-to-face classes. Mental health was the center of investigation in this work, and problems such as stress, fatigue, depression, and anxiety gained prominence. Problems with sleep quality, a sedentary lifestyle, and increased weight gain have also been reported.

Therefore, it is recommended that universities pay attention to the creation of programs and measures that encourage multimodal courses, as well as stimulate the quality of life and well-being, especially in mental health, of university students. Longitudinal studies can be useful to understand the aspects related to the analysis of this study in the post-pandemic population.

CONTRIBUITIONS

Contributed to the conception or design of the study/research: Lira Neto JCG. Contributed to data collection: Sáber AJG, da Roza MP, de Freitas MBT. Contributed to the analysis and/or interpretation of data: Lira Neto JCG, Sáber AJG, Grifante L. Contributed to article writing or critical review: Lira Neto JCG, da Penha JC, Fernandes BKC. Final approval of the version to be published: Sáber AJG, da Roza MP, de Freitas MBT, Lira Neto JCG, da Penha JC, Fernandes BKC, Grifante L.

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