



The perceptions of Brazilian postgraduate students about the impact of COVID-19 on their well-being and academic performance

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ABSTRACT

This study aimed at identifying the perceptions of Brazilian postgraduate students from all over the country on the impacts of the COVID-19 pandemic on their academic trajectories. Data from 5985 postgraduate students were collected in the end of 2020, through a 37-item questionnaire, including multiple-choice questions, through Google Forms. The questions were divided into blocks with different proposals: personal profile, academic profile, issues related to COVID-19 infection, and issues related to mental health. Our analysis showed that 51.43% were master's degree students; 43.02% were doctorate and 5.55% were specialization students, mostly attending Biological, Health, and Human Sciences post-graduation courses (18.13%, 17.91%, and 17.38%, respectively) of different Brazilian educational institutions, including public (e.g., UFRJ) and private (e.g., PUC) federal universities as well as research institutions (e.g., Fiocruz) from all five regions of Brazil (north, south, southeast, northeast, and center Midwest). Most of them were academically impacted by the COVID-19 pandemic, which also involved psychological aspects such as high levels of anxiety and depression. The results showed readjustments of research projects, and academic activities, which in some particular research fields led to the successful completion through the remote activities. However, efforts are still needed by graduate programs in order to allow greater flexibility in academic activities to fulfill all previous planning and chronograms, in addition to implementing ongoing projects to support students' mental health.

1. Introduction

On March 11th, 2021, the World Health Organization declared a pandemic caused by the etiological agent SARS-CoV-2 as individuals may or may not develop clinical symptoms which may aggravate and lead to death (CDC, 2021a; Shen et al., 2021; WHO, 2022a). Vaccination is the most effective measure to contain the spread of the virus combined with social distancing and the use of protective masks, especially in public transport and closed places with insufficient ventilation (CDC, 2021b; Si et al., 2021; WHO, 2022a).

Equitable distribution of vaccines did not happen worldwide and until August 9th, only 4.46 million doses were administered in low-

income countries, 3.65 billion in middle- and high-income countries, with a total of 12.6 million doses administered worldwide in 2021 (WHO, 2022b). In this worrisome scenario, although Brazil is no longer the COVID-19 epicenter, there are records of deaths and high rates of people infected with SARS-CoV-2 (WHO, 2022b).

Within the academic context, the crisis resulting from the COVID-19 pandemic, according to the United Nations Organization for Education, Science, and Culture, led to the suspension of classroom activities in schools, universities, and educational institutions, affecting around 90% of students around the world, with partial or total closure of educational institutions (UNESCO, 2020). According to some reports, this pandemic context impacted postgraduate students' lives in personal, academic,

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and psychological aspects. Some Italian studies on the impact of distance education on students and professors focused on the emotional and cognitive correlates of distance education (EAD) during the Covid 19 lockdown (Casacchia et al., 2021; Giusti et al., 2020, 2021). They investigated potential predictors of psychological distress and difficulties in academic performance in the student population and identified the “all or nothing” style of thinking as the strongest predictor of traumatic suffering (Giusti et al., 2020). Also changes in the study habits and the commitment to life, and learning concentration were the strongest predictors of difficulties in their academic performance (Giusti et al., 2021). Professors, as well as the students, complained about the lack of “face-to-face” eye contact, which it involves the difficulty of assessing students’ attention and establishing relationships with students in the classroom (Casacchia et al., 2021).

Distance education (EAD) has replaced traditional face-to-face teaching, requiring great flexibility from university students. In addition, home confinement compromised the possibility of fully experiencing university life, influencing academic study (e.g., uncertainties regarding cancelation, delays in activities, and use of the digital platform) (Giusti et al., 2021). However, more studies about how these social changes related to the COVID-19 outbreak impacted the academic context at the level of post-graduate students are still in need.

There is a scientific relevance in the educational area of mapping COVID-19 impacts on the personal and academic trajectory of post-graduate students across Brazil, which was one of the most affected countries in the world with more than 600 K deaths to date. In this context, our study aimed at identifying the perception of Brazilian postgraduate students on the impacts of the COVID-19 pandemic on their academic trajectories, allowing a more in-depth reflection on the part of graduate programs, thus promoting the necessary adjustments to improve student’s quality of life and academic success.

2. Materials and methods

2.1. Ethics approval and public enrolled

This research is a qualitative-quantitative investigation approved by the Research Ethics Committee of Instituto Oswaldo Cruz - CEP FIOCRUZ / IOC under the CAAE: 3498540.0000.5248 number and all the 5985 respondents signed the Informed Consent Form before participating. All participants were Brazilian students enrolled in Lato Sensu (specialization) and Stricto Sensu (Masters and/or Doctorate) programs of public or private educational institutions and research facilities in all five regions of Brazil from all research areas (Table 2 and Fig. 1).

2.2. Data collection instrument

The data were collected by Google Forms, a free online tool on the Google platform that allows the creation of multiple-choice questionnaires and opened and/or in-scale format questions. In addition, the questionnaire link was sent to participants by email and/or by WhatsApp® or other social networks. The inclusion criteria were to be enrolled in Lato Sensu and Stricto Sensu programs of Brazilian institutions.

The questionnaire comprised 37 items. Out of these, 35 items were compulsory and 2 optional items, being 21 multiple choice questions, 11 multiple selection questions, 2 Likert-scale questions (1–5 points), and 3 open questions. The questionnaire was divided into four blocks: a) personal profile; b) academic aspects; c) Sars-CoV-2 infection aspects and risk factors for COVID-19 development; d) Mental health aspects.

The instrument was validated by a focus group composed of seven graduate students from Fundação Oswaldo Cruz remotely with the mediation of a moderator. This technique allows the individual and collective approach of different social subjects, who may be affected by certain situations through information about reality and express opinions, without letting the individual influence the collective (Minayo,

2014). The group analysis provided important feedback about the clearness of the instrument questions. The link to the reviewed questionnaire was then shared with those who dealt with education/teaching. It was sent both individually and to groups through social media programs, such as WhatsApp®, Facebook®, or Instagram®, as well as it was sent by email to public and private institutions holding Lato and Stricto Sensu postgraduate courses. The questionnaire was available from October 5th, 2020, to December 31st, 2020.

Although the survey was not designed to follow strictly representative numbers of postgraduate students, it reached all five Brazilian geographic regions. The final set of data was obtained after excluding duplicate responses via email confirmation ($n = 210$), resulting in 5985 responses to be analysed.

Our study is a qualitative-quantitative investigation that examined the participants’ answers on a Google Forms® model which was then exported to Microsoft Excel®. During the analysis, the percentage of responses from the participants that attended the inclusion criteria was calculated, while the qualitative analysis was performed as described by Palma et al. (2018).

3. Results

The results of our research involved the participation of 5985 students, who answered questions about gender, ethnicity, age and family income, which allowed us to identify the general profile of the group. The percentage of female students was higher, around 70%, thus representing twice the percentage of male students, 29.4%. The percentage of individuals who did not declare themselves or even fit into other gender categories, the percentages were 0.3% and 0.08%, respectively.

The age-related data clearly showed that most Brazilian graduate students are younger, with ages ranging from 18 to 30 years, representing 50.3% of the total analysed, followed by 32.5% from 31 to 40 years, the which also represents a very relevant percentage. Nevertheless, the groups aged 41 to 50 and 41 to 60 years, representing 12.1% and 4.5%, respectively, despite having low percentages when compared to the youngest, are still much higher when compared to the elderly ($> = 60$ years). In the age group over 60 years, the percentage is noticeably low, covering only 0.8% of students.

As for the academic profile of the participants in our research, 51.43% were master’s students; 43.02% doctorate and 5.55% were specialization students. Regarding the ethnic data of the study, individuals who declared themselves to be of European origin constitute the majority of postgraduate students, around 61.37%. Pardos of Afro origin then represented 27.6% of the population studied, representing less than half of white students of European origin, followed by blacks of Afro origin, who accounted for 9.1% of the population.

The data presented in Table 1 also show how the monthly income of the students’ families varied among the interviewees. Most incomes are concentrated in the \$260 to \$500 and \$500 to \$1500 range, respectively. For this analysis, we used the value of the minimum wage in Brazil, which corresponds to 198 dollars. Regarding the income range of Brazilian graduate students, according to the survey, we can suggest that 62.1% of students earn wages above the average of the general population, which earns up to one minimum wage.

Our data showed that most graduate students who participated in the research are enrolled in institutions located in the southeaster region of Brazil. Representing 42.84% of the total, followed by the southern region, with 21.90%, northeast, 18.55%, central-west, 11.13% and northern region, 5.58%.

According to our results, most graduate students are enrolled in public institutions. Regarding the financial assistance received by the students in our research, the data in Table 2 showed that 53.93% are scholarship holders, while 46.07% do not receive any financial assistance.

Our analysis of the research projects of the students participating in our research showed that about 72.0% made changes to their projects,

ALBERT EINSTEIN HOSPITAL	-FMUP	PRESBYTERIAN UNIVERSITY	-UFFS	-UNILA
-AMAZON STATE UNIVERSITY	-FOB-USP	-PRODUCTION ENGINEERING - USP	-UFG	-UNILAB
-ANCLIVEPA-SP	-FSP - USP	-PUC - RS	-UFGD	-UNIMES
-ANHANGUERA	-FUCAPE	-PUC GO	-UFJ	-UNINORTE ACRE
-AUSTRAL UNIVERSITY OF CHILE	-FUMEC	-PUC SP	-UFJF	-UNINTER
-BRAZILIAN EDUCATION	-FURB	-PUCMINAS	-UFLA	-UNIOESTE
-CANDIDO MENDES UNIVERSITY	-FURG	-PUCPR	-UFLA	-UNIOESTE FOZ
-CBPF	-GRAPE	-PUCRJ	-UFMA	-UNIP
-CEFET	-GREASE	-PUC-SP	-UFMG	-UNIPAMPA
-CEFET-MG	-HEY	-SENAC	-UFMS	-UNIPAR
-CENSUPEG	-IAC	-SOUZA MARQUES COLLEGES	-UFMT	-UNIQUE COLLEGE.
-CRUZEIRO DO SUL UNIVERSITY	-IBGE	-STATE UNIVERSITY OF LONDRINA	-UFOPA	-UNIR
-DOM ALBERTO	-IEAPM/UFF	-SUPERIOR SCHOOL OF WAR ESG	-UFOPA	-UNIRIO
-EDU	-IEMAR	-SYRIAN LEBANESE HOSPITAL	-UFPA	-UNISINOS
-EIF	-IF - BAHIA	-UCAM	-FPB	-UNISO
-EMU	-IFBAIANO	-UCDB	-FPE	-UNISUAM
-EN	-IFC	-UDE - IIES	-FPPEL	-UNISUAM
-ENBT/JBRJ	-IFCE	-UEDES	-FPI	-UNIT
-ENCE	-IFES	-UEDESC	-FPR	-UNITAU
-ENTB-JBRJ	-IFG	-UEA	-FRGS	-UNIVASF
-EREREBÁ	-IFMG	-UEFS	-FRJ	-UNEMAT
-ESALQ USP	-IFRJ	-UEG	-FRN	-UNIWEST
-ESAMAZ	-IFRN	-UEL - STATE UNIVERSITY OF LONDRINA	-FRPE	-UNOCHAPECO
-ESDHC	-IFSC	-UEJ	-FRR	-UNOESC
-ESIPP	-IFSP	-UEJ - STATE UNIVERSITY OF LONDRINA	-FRRJ	-UNOPAR
-ESTÁCIO DE SÁ	-IFSUDESTEMG	-UENF	-FS	-UNYLEYA COLLEGE
-FACE	-IFTM	-UEPA	-FSB	-UPE
-FACULTY TO INSPIRE CURITIBA	-IGTI	-UEPG	-FSC	-URISAN
-FAMART	-IIES UDE	-UERGS	-FSCAR	-USCS
-FAMEC	-IJF	-UERGS-RS	-FSJ	-USJT
-FAMEESP - METROPOLITAN FACULTY OF SÃO PAULO	-IMED SOUTHERN COLLEGE	-UERJ	-FSM	-USP
-FAMERP	-INPA	-UERJ - FFP	-FT	-USP ESALQ
-FAVENI	-INPE	-UERR	-FTM	-USP ESALQ. - PECEGE
-FCE	-INTERVAL	-UESB	-FU	-USU
-FDV	-IPMG	-UESPI	-FV	-UTFPR
-FEDERAL UNIVERSITY OF THE STATE OF RIO DE JANEIRO	-IPOG	-UEZO	-UMC	-VERA CRUZ INSTITUTE
-FEEVALE UNIVERSITY	-IS/SES-SP HEALTH INSTITUTE	-UFABC	-UNAMA	
-FESL	-LONDON COLLEGES	-UFAL	-UNAP	
-FFP/UERJ	-MADALENA SOFIA EDUCATIONAL GROUP	-UFAM	-UNB	
-FGV	-UNILASALLE	-UFBA	-UNEB	
-FIA	-NEUROPP	-UFCA	-UNESA	
-FIOCROZ	-PEDRO II - IMPA	-UFCE	-UNESP	
-FISEPE	-PGG ESA	-UFCE	-UNIAN	
FJP	-PHARES	-UFCE	-UNIASSELVI	
-FMB	-PIUS XII FOUNDATION	-UFCE	-UNIASSELVI BLUMENAU	
	-PONTIFICAL CATHOLIC UNIVERSITY OF RIO DE JANEIRO	-UFCE	-UNIATHENE	
	-POSTGRADUATE IN LINGUISTICS	-UFCE	-UNICAMP	
	-PPG-DD UPM - MACKENZIE	-UFCE	-UNICESUMAR	
		-UFCE	-UNICEUB	
		-UFCE	-UNIFAL-MG	
		-UFCE	-UNIFEI	
		-UFCE	-UNIFEJ	
		-UFCE	-UNIFESP	
		-UFCE	-UNIFESSPA	
		-UFCE	-UNIFRAN	
		-UFCE	-UNIGRANRIO	

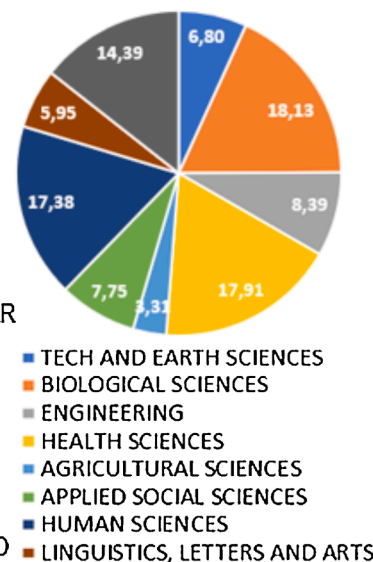


Fig. 1. List of institutions from which the participant students were. The inset shows the distribution of the post-graduate programs through research areas based on the classification of the Brazilian Coordination of Superior Level Staff Improvement (CAPES).

Table 1
Personal profile of Brazilian postgraduate students. (n = 5985).

Gender	Survey	
	n	%
	5985	100%
Female	4200	70.1
Male	1757	29.4
Other	5	0,08
Age (years)		
18–30	3008	50.3
31–40	1943	32.5
41–50	722	12.1
51–60	267	4.5
>60	45	0.8
Ethnicity		
White (European-derived)	3673	61.37
Black (African-derived)	546	9.1
Brown (African-derived)	1654	27.6
Yellow (Asiatic)	92	1.5
Indigenous	20	0.3
Non identified	0	0
Household monthly income (USD¹)		
< 52 USD	40	0.7
> 52–260 USD	271	4.5
>260–500 USD	2324	38.8
>500–1500 USD	1908	31.9
>1500 USD	1442	24.1

¹ - average USD to BR exchange rate in September 2021US\$ 1 = R\$ 5,47.

from small changes, which represented 37.53% to 35.27% who reported having made significant changes.

Among the academic activities carried out remotely by students, 82.47% reported reading articles; 71.66% also stated that they held meetings with their tutors; 69.49% carried out literature reviews; 61.72% took courses; 54.79% wrote parts of their research; 46.45% attended educational lives.

According to our results, 58.75% of students declared not being infected by SARS-CoV-2, while 8.87% became infected at some point during the pandemic. Worryingly, 32.38% could not say whether they were infected or not, thus reinforcing the fact that Brazil did not act in relation to mass testing of the population.

A percentage of 76.44% of the students declared not belonging to risk groups, almost one in four of the interviewees and 23.56% of the participants classified themselves as belonging to risk groups. These data show a relevant difference between the two groups, although the questionnaire used in the research does not present a clear definition of the comorbidities to potentiate the symptoms of COVID-19.

Another aspect addressed in our study included the number of people who lived in the same house with the student. Most participants, 55.76%, responded that they live with 1 to 2 people; 29.44% lived with 3 to 4 people; 4.68% lived with more than 5 people and 10.13% of the students answered that they lived alone (data not shown in Table 3). The findings show that most students shared the same residential environment, suggesting an environment that led to a greater concern with the transmission of diseases. Coincidentally, the percentage of uninfected individuals, about 8.87% of the populations studied, is quite high. similar to that of individuals who live alone, about 10.13%.

As for the emotional state of the students, namely the state of stress, 81.95% of the students felt unmotivated; 78.65% had difficulty concentrating; 61.77% had anxiety attacks; 61.59% had difficulty sleeping. It is important to emphasize that 43.64% of the students answered that they did not feel safe to leave the place where they lived; 33.35% needed to seek psychological care; 16.91% needed medication for anxiety and antidepressants; It is important to highlight that the percentages mentioned above exceeded 100%, considering that the same respondent could report one or more stressful conditions. Our data also included the percentages of students who were diagnosed with mental health issues. Among the percentages obtained, while 47.20% of

Table 2
Academic profile of Brazilian postgraduate students (n = 5985).

Educational information	n respondents	%
what is your educational level?		
Specialization	332	5,55
Master's degree	3078	51,43
Doctorate degree	2575	43,02
Where is your university located?	n	%
	respondents	
Southeast	2564	42,84
South	1311	21,90
Central West	666	11,13
Northeast	1110	18,55
North	334	5,58
What type of institution do you come from?	n	%
	respondents	
Public	5765	96,3
Private	220	3,68
Do you earn any kind of Scholarship?	n	%
	respondents	
Yes	3228	53,93
No	2757	46,07
How much of your project changed?	n	%
	respondents	
Nothing	1223	20,43
Small	2246	37,53
Significant	2111	35,27
Total change	572	9,56
Have you got pending subjects to take?	n	%
	respondents	
No	4019	67,02
Minority	1378	23,00
Majority	546	9,12
Other	42	0,7
What sort of activities have you carried out during the pandemic?	n	%
	respondents	
Reading articles	4936	82,47
Remote meetings with the advisor	4289	71,66
Bibliographic review	4159	69,49
Conducting courses remotely	3694	61,72
Writing of the final paper/dissertation/thesis	3279	54,79
watching lives	2780	46,45
How much of your remote activities have you reported to your tutor?	n	%
	respondents	
All	1007	16,83
Majority	1592	26,60
Some	1753	29,29
None	1633	27,28

Table 3
Aspects of SARS-CoV-2 infection and risk factors in the development of COVID-19 according to Brazilian postgraduate students.

COVID-19 self-reported information	n respondents	%
Sars-CoV-2 infection		
Survey participants	5985	100
Got Infected	531	8,87
Did not get infected	3516	58,75
Do not know	1938	32,38
Are you included any risk group?		%
Yes	1410	23,56
Non	4575	76,44

the students did not receive any official diagnosis, most sought specialized professionals for diagnosis, in which they were classified according to the following clinical conditions: generalized anxiety, 45%; depression, 17.41%; panic, 5.50%; insomnia, 0.99%; other conditions not specified in our survey, 0.80%. The diagnoses for each student included one or more clinical conditions, thus justifying the total sum above 100%.

Regarding the psychological support offered by the postgraduate coordinators to the participants, 68.04% of the students did not receive voluntary support. However, of this percentage, only 5.88% requested

support, although they did not receive it. About 11.33% of the graduate coordinators who participated in this research offered voluntary support to all students through specific programs.

According to our data, several postgraduate courses were available to serve students, but they chose, in most cases, not to ask for help. Although we found a small percentage of students who requested psychological support from coordinators of their respective courses, 56.11% of students preferred to ask friends for help; 15.69% relied on the tutor's help and 14.45% found support on social networks. Lower percentages of psychological support were obtained for the Student Support Commissions, with 1.40%; Relatives, 1.04%; Spiritual help, 0.63% and other types of help not specified in the present study, 0.9%. It is important to highlight that about 19.80% of the participants did not need any psychological assistance, not counting on anyone, (Table 4).

Our findings also included information on students' opinions about returning to face-to-face academic activities. 59.10% of them answered that they would return, but with great fear, while 29.96% said they would not return. Still considering the face-to-face return, 10.19% answered that they would return; 0.23% were still in doubt and 0.75% chose not to respond based on the options presented in the question (Table 4).

Response rates related to face-to-face feedback can be justified by several risk factors, including also the availability of vaccines for all

Table 4
Effect of COVID-19 pandemic on the mental health/stressful situations of Brazilian Postgraduate students who participated in the research. ($n = 5985$).

Answers concerning stress	n respondents	%
Agreement with this statement:	5985	100,00
I had no problem	369	6,17
I had anxiety attacks	3697	61,77
I felt demotivated	4905	81,95
I had the need to seek psychological help	1996	33,35
I used self-medication (anxiolytics and/or antidepressants)	1012	16,91
I don't feel safe leaving the home	2612	43,64
I had difficulty concentrating	4707	78,65
I had difficulty sleeping	3686	61,59
Others	85	1,42
Were you diagnosed with psychological troubles during the pandemics?	n respondents	%
No	2825	47,20
Yes – Depression	1042	17,41
Yes – General anxiety	2744	45,85
Yes – Panic	329	5,50
Yes – insomnia	59	0,99
Others	48	0,80
During the pandemic, who did you seek for emotional support?	n respondents	%
I didn't need support	1185	19,80
I needed support	1669	27,89
Yes, friend	3358	56,11
Yes, Advisor	939	15,69
Yes, Other types of emotional supports	865	14,45
Yes, Social network	417	6,97
Yes, Student Support Committee	84	1,40
Yes, Family	62	1,04
Yes, spirituality	38	0,63
Others	54	0,90
Did you get emotional support from the course's coordination?	n respondents	%
No	4072	68,04
I didn't receive it, despite having asked	352	5,88
The Coordination offered support to all students through specific programmes	678	11,33
Others	578	9,66
If activities returned, would you return?	n respondents	%
No	1793	29,96
I do not know	14	0,23
Yes	610	10,19
Yes, but afraid	3537	59,10
Others	45	0,75

students, regardless of age and any other risk factors, the possibility of diagnostic testing at any time, adequacy of structure of educational institutions in accordance with international Biosafety standards, among other factors.

4. Discussion

According to the research findings (CAPES, 2021b; Serafim & Amaral, 2021), data from the Brazilian Coordination for the Improvement of Higher Education Personnel revealed that from 2013 to 2019, women remained the majority group in Brazilian graduate studies. Data from 2016 regarding the academic master's modality showed that women were responsible for approximately 12 thousand more enrolments than men and about 6 thousand more titles were granted to students in the same year (CAPES, 2019). As for the doctoral modality, the data for 2019 were similar, with female titles increasing from 8315 to 13,419, while the number of men with titles increased from 7336 to 11,013 (CAPES, 2021a). Data from OECD member countries (OECD, 2019) showed that 14.33% of women had a master's degree and 0.84% had a doctorate. There is a lack of data from official sources such as the IBGE on the LGBTQI+ population that do not allow for further discussions. Similar data were observed in our research, with the percentage of female students around 70%, thus representing twice the percentage of male students, 29.4% and 0.3% and 0.08% of individuals who did not declare themselves or even fit into other gender categories, respectively.

According to CAPES data from 2019, women are the majority among graduate students. However, they represent only about 42.9% in teaching and research (CAPES, 2019). Still in relation to this topic, women continue to occupy the same four out of ten undergraduate and graduate teaching positions in the country, especially in the hard sciences, where they represent the minority (Serafim & Amaral, 2021).

The percentage of postgraduates in Brazil is sixteen times lower when compared to the average of all age groups of postgraduates in OECD member countries. Regarding the age group of Brazilian graduate students, data from the OECD (2019) showed a 13% higher percentage compared to the number of masters trained in other countries. In relation to the doctorate modality, the difference between postgraduates in the same age group is 5.5% greater.

The data from our study, despite not showing identical age group averages, still show great similarity with official data from the Brazilian Institute of Geography and Statistics (IBGE, 2011). Data from this institution in this period show percentages of 59.3% for the average age of 18 to 34 years, 22.1% for the age group of 35 to 44 years and 15.5% for 45 to 59 years, while the age group 60 years or older represents 3.0% (IBGE, 2011). These data were not discrepant when compared only with the percentage of *Stricto Sensu* students according to IBGE data.

Data on the academic profile of the participants in our research showed the percentages of 51.43% of masters; of doctors 43.02% and 5.55% specialization students. These data are in accordance with the current academic reality of Brazilian postgraduate courses, according to official Capes data published by the CGEE (2016), there is still a small number of PhD professionals in the country, which can be explained by the demand required to this level of training is lower than for professionals with a master's degree, as well as the need for greater availability of time for completion (Pinzón et al., 2020; Woolston, 2019). Another fact that may justify this reduced number of PhDs is the lower demand in the job market. According to the behavior of the Brazilian market, a professional with such a level of knowledge does not pay to be remunerated despite his investment in dedicating time to a doctoral course (Nature Communications, 2021).

The IBGE data (IBGE, 2011) for ethnicity, a strong correlation with the ethnic profile of the graduate students participating in the research, being 73.2% white of European origin and 24.8% black of Afro origin. According to the IBGE ethnic classification, the sum of blacks and browns of Afro origin was considered black of Afro origin, as well as the group of pardos of Afro origin was considered separately. Thus, we

included in the percentage of browns the average of blacks and browns (IBGE, 2011).

The very low percentage of black students of Afro origin in relation to whites, found in our study, exactly shows the ethnic reality of Brazil (Artes, 2018; Martins et al., 2021). Thus, although blacks of Afro origin represent the majority of the Brazilian population, only 28.9% of this ethnic group are enrolled (IBGE, 2015) in postgraduate courses.

The findings of our research are in agreement with data from the IBGE (2010), which informs that the average family income of students is 76.2% and is basically composed of 2 minimum wages, representing 16.5% of the average salary of students the entire population. Still in relation to IBGE data, about 14.0% of Brazilians have an average income that varies from 1 to 2 salaries, while the total average of the Brazilian population receiving this same income corresponds to 21.3%.

The data related to the income range of the students in our research are in agreement with the discussions found in the literature relating income to schooling (Artes, 2018). Another important fact is the reduced offer of postgraduate scholarships in the country, often making it impossible for individuals to access postgraduate courses or even dedicating themselves exclusively to their courses (Woolston, 2019), given the need to work to support yourself and your family (Woolston, 2019).

The percentages found in our research in relation to the regions where the students were enrolled are proportional to the number of postgraduate institutions in the regions reported in the literature (CGEE, 2016). CAPES data are in agreement with our results, as they show that the Southeast region has the highest number of master's and doctoral students (CAPES, 2019).

Public institutions are superior to private institutions in Brazil, thus justifying the highest percentage found in our study, most participants, 96.32%, are enrolled in public institutions when compared to 3.7% of Brazilian private institutions (INEP, 2018). Our survey data related to financial aid received by students, as described in Table 2, is in agreement with literature data. The difference between students who receive or not a scholarship can be inferred by the reduced number of scholarships offered by educational institutions or even by the fact that part of the enrolled students has some employment relationship. The latter is prohibited under Brazilian law, which does not allow employed graduate students to receive scholarships along with salaries.

Recent studies by Pinzón et al. (2020) and Maués and Bastos (2017) claim the existence of a direct correlation between the small number of scholarship students and the number of quotas offered by graduate programs. These authors mentioned the reality of Brazilian graduate studies being linked to significant cuts in scholarships and student aid, in addition to the interruption of federal spending in the university budget, which directly impacts the quality and permanence of students in their courses.

The data related to the changes made in the projects of the students participating in our research, showed the direct impact of the pandemic on ongoing research and the efforts of graduate students, as well as their tutors, to meet the need for project adjustments in this area stressful scenario. According to research carried out by Pennisi in (2020), tutors were very creative in readjusting field and laboratory work, as many students carried out their research without having to leave home, thus reducing geographic and financial barriers.

The findings on the academic activities carried out by the participants of our research, in addition to other studies of the literature, delineate the academic environment as challenging, as it requires graduate students to carry out a series of mandatory activities. The commitment and effort of students to readjust their projects to the current pandemic reality is clear (Costa & Nebel, 2018; Gewin, 2021; Pinzón et al., 2020).

Regarding our data on SARS-CoV-2 infection of students, we found similar information in the literature. A large number of individuals infected with SARS-CoV-2 have no symptoms, despite being able to spread the virus, and about 80%, including Brazilians, are asymptomatic or have mild symptoms. Therefore, they are not subjected to laboratory

tests (Aquino et al., 2020; CDC, 2021a).

According to studies carried out by Aquino et al. (2020), Si et al. (2021) and Chung & Chan (2021), the lack of laboratory tests and the high transmissibility potential of SARS-CoV-2 increase the number of asymptomatic individuals, who have great potential for the spread of the disease in all environments they live. Also, according to Aquino et al. (2020), the reduced amount of laboratory tests has a direct impact on the notification of infected people, thus suggesting that the real number of infected people in Brazil is up to fifteen times more than what is currently being reported.

Badawi & Royoo (2016) point out that many individuals are unaware of their own comorbidities. Therefore, they do not treat themselves as they should, contributing to aggravating the effects of COVID-19 if they are infected with SARS-CoV-2. Through our research data, we can suggest that the number of individuals who declared themselves or not belonging to risk groups may not reliably portray the Brazilian reality of this group, according to definitions by Badawi & Royoo (2016).

According to research data from Shen et al. (2021), and Si et al. (2021), social isolation as well as other non-pharmacological measures are essential to minimize the spread of the virus. Coincidentally, we found in our research that about 8.87% of the populations studied had not been infected, correlating with the percentage of 10.13% of individuals who lived alone. These data are confirmed by the World Health Organization (WHO, 2020a) which reported that the increase in the number of people diagnosed with mental disorders - mainly anxiety and depression - around the world experienced significant growth during the COVID-19 pandemic.

According to the WHO (2020b), there has been a significant interruption in essential mental health services in about 93% of countries, while the demand for mental health has been increasing, especially in Brazil, a country known for having the highest cases of anxiety and depression in the world, especially among young people. According to Evans et al. (2018), the number of students with mental health problems, mainly anxiety and depression in the United States, is six times greater than the general population. Despite our results expressing a high percentage of individuals without a clinical diagnosis, we inferred that most graduate students had psychological problems, since they did not seek care from specialized professionals and, consequently, did not obtain a diagnosis.

Another study by Eilidh et al. (2020), with three hundred and seventy-six UK postgraduate students, reported having compromised mental health, mainly due to barriers related to self-esteem, but these students also did not seek specialized help. Other studies (Costa & Nebel, 2018; Ribeiro et al., 2021) show that rates of mental illness, such as depression, anxiety, panic attacks, and insomnia, are much more frequent among students enrolled in higher education than in the population general. This is mainly due to the higher degree of demand that a student in an academic environment is expected to meet, often including tight deadlines. It often leads to mental health problems, especially among the most vulnerable people such as women, gender minorities and people with financial difficulties. (Evans et al., 2018; Gewin, 2021). According to Levecque et al. (2017) the prevalence of graduate students with mental health problems predates the COVID-19 pandemic, despite the pandemic context having increased this issue. Studies carried out in the United States by Marris (2020) demonstrate the need for academic planning with strict health surveillance criteria, such as: periodic laboratory tests of the entire academic community, in addition to providing vaccination for all those involved in the process. According to official data from the Brazilian Press Consortium (G1, 2022) on July 11, 2022, only 60,11% of the Brazilian population, the population had completed the vaccination schedule, considering that most students are between 18 and 31 years old. According to the consortium, as this age group has a lower percentage of vaccinated, we still need to complete many steps so that we can have a safe return to postgraduate activities.

5. Conclusion

According to our data, the COVID-19 pandemic impacted Brazilian postgraduate students' mental health, who felt demotivated, with difficulty concentrating, had insomnia, as well as to high levels of anxiety and depression. Notwithstanding, students, tutors, and course coordinators made efforts in order to readjust research projects, especially those relating to the field research stage, thus allowing the completion of academic activities even remotely. Many students were not sure if they were infected, which is caused by the need for public investment in mass testing to plan a safe return to educational institutions. Our data reinforce that, despite facing the pandemic adversity and being under continuous stress, students were committed to their academic trajectory, yet the research showed that there is still a need for postgraduate programs to offer more flexible academic activities, as well as the implementation of ongoing projects to support students' mental health. Although it is true that this study resulted in positive findings, future studies are desirable and may include other Brazilian universities and a more significant postgraduate sample of students.

Declaration of Competing Interest

None.

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