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Epidemiological profile of self-medication by university students during the COVID-19 pandemic in Brazil

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ABSTRACT

Introduction: Self-medication is characterized by drug consumption without a medical prescription to alleviate undesirable symptoms. During the COVID-19 pandemic, this practice may have been stimulated by the implementation of remote teaching with an extensive workload, the development of mental health disorders, and the dissemination of false information on social media. **Objective:** To outline the epidemiological profile of self-medication and drugs consumed by university students during the COVID-19 pandemic in Brazil. **Methods:** This is an analytical cross-sectional epidemiological study, in which data were collected through an online questionnaire sent by email to the coordinators of university courses in different regions of Brazil in January 2022. The prevalence of self-medication was calculated, and binomial logistic regression analysis and chi-square tests were applied to determine the influence of some variables on the practice of self-medication. **Results:** A prevalence of 48.43% of self-medication was detected among the 384 participants, the majority of whom were female and studied non-health-related areas. Associations ($p<0.005$) were observed between self-medication and the female sex, the Applied Social Sciences course, and having comorbidities. Furthermore, prevalences of 43.22%, 24.22%, and 16.15%, respectively, of consumption of analgesics, antihistamines and antidepressants were detected. **Conclusion:** In the pandemic context, a set of interconnected factors, such as gender, course, comorbidities, mental suffering, and low-severity symptoms can influence the practice of self-medication by university students.

Keywords: self-medication; students; COVID-19; student health; pandemics; data correlation.

INTRODUCTION

Self-medication, characterized by taking medication without a doctor's or pharmacist's prescription, is motivated by the desire to relieve symptoms or treat illnesses on one's own[1]. In the context of the COVID-19 pandemic, an emerging disease of Chinese origin with rapid global spread[2], this practice may have been facilitated by

the over-the-counter sale of drugs that do not require a doctor's prescription, the reuse of prescriptions or the acquisition of controlled drugs from illicit commercial sources[1].

During this period, self-medication may have been influenced by several factors, such as the implementation of emergency remote teaching in Brazilian higher education institutions[3]. In many universities, this strategy was characterized by an extensive schedule of classes and academic activities, which aimed to mitigate the negative impact of interrupted face-to-face activities on student learning[3].

As a result, self-medication may have been encouraged due to the development of symptoms of stress, tension restlessness, and mental health disorders experienced by university students[4]. This overload, coupled with the lack of face-to-face social interaction and the emotional instability stimulated by the pandemic, including social isolation, may have contributed to an increase in the individual perception of stress and anxiety among many university students, who may have resorted to self-medication for quick relief of these symptoms[4].

In addition, fear of coronavirus infection, incorrect self-diagnosis of diseases underestimation of the severity of symptoms, inaccessibility of health services, and prioritization of health system resources for managing patients with severe COVID-19 were motivators for self-medication[4].

In addition, this practice may have been stimulated by distrust of reliable sources of scientific information and belief in false or distorted information that was disseminated excessively on social media[5], especially about the efficacy of drugs such as azithromycin, hydroxychloroquine, ivermectin, and corticosteroids, popularly known as the "COVID Kit", which were adopted in outpatient procedures and hospitalization protocols at times during the pandemic even without robust scientific evidence[6].

In some cases, especially for treating minor illnesses, self-medication may have been used as an alternative to relieve symptoms and reduce the burden on the health system during the COVID-19 pandemic[7]. However, this behavior represents a significant risk to patient safety, which can lead to adverse effects, undesirable drug interactions, masking serious pathological conditions, deaths from drug poisoning, and the development of microbial resistance[8].

Considering the risks of self-medication and the encouragement of this practice due to mental suffering, changes in university education, and the proliferation and spread of false information, this study aimed to outline the epidemiological profile of self-medication and medicines consumed by university students during the COVID-19 pandemic in Brazil.

METHODS

Study design and ethical aspects

This is a cross-sectional epidemiological study with a descriptive and analytical approach to the practice of self-medication by Brazilian university students during the COVID-19 pandemic in Brazil.

The research question in this study was "Have university students self-medicated during the COVID-19 pandemic?", representing a dichotomous qualitative variable. Once this variable had been determined, the sample of 386 participants was calculated based on the application of calculations developed by population estimates based on qualitative variables for clinical-epidemiological studies that aim to describe the behavior of variables in population groups, such as the practice of self-medication[9].

The registered Certificate of Presentation for Ethical Appraisal Opinion approved this study: 5.162.686 and CAAE: 52526621.7.0000.5152 of the Human Research Ethics Committee of the Federal University of Uberlândia.

Participants

The figure of 8,986,554 individuals enrolled in higher education, reported in the 2021 Higher Education Census[10], was used as a number above 10,000 people, to characterize the population of university students as infinite, to determine the total sample considering a 95% confidence interval[10] and a 5% significance level.

This study included participants who self-medicated between January 2020 and December 2021, who were over the age of 18, and studying at Brazilian public and private colleges. However, those who consumed drugs within a month of accessing the survey instrument were not considered to be practicing self-medication, due to the possibility of a greater number of denials of this practice by the participants, influenced by the information contained in the Ministry of Health's form on the definition and dangers of self-medication.

Instruments

To conduct this research, primary data was collected using an electronic form developed in the Google Forms application, using objective questions to obtain information on age, gender, region of the university, undergraduate or postgraduate course, comorbidities, self-medication, and consumption of medicines derived from previous treatments.

In addition, objective questions were used to analyze the consumption of analgesics, antihistamines, antiemetics, antibiotics, antidepressants, anxiolytics, and stimulants. On the survey form, these classes were added as options, descriptions of these drugs were added to make it easier for participants to identify them, and open questions were added, which allowed the names of the drugs to be filled in.

Procedures

During the period from January 10 to 24, 2022, this form was publicized through social media and sent by email to the higher education course coordinators of at least one university located in each region of Brazil.

To preserve anonymity, the participants' names and e-mail addresses were not asked through the app. The Informed Consent Form (ICF) provided information on risks and benefits.

Data Analysis

Microsoft Excel and Jamovi were then used to analyze the information[11]. Prevalence was calculated by dividing the gross number of students who practiced self-medication by the total number of participants, and the number obtained was converted into a percentage. In addition, prevalence rates were calculated considering demographic information and university courses separated by the areas of knowledge defined by the Brazilian scientific agency *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq).

In addition, the total number of responses for each pharmacological class was counted. It is important to note that, as more than one option was allowed, the total number of drugs was higher than the number of students who self-medicated.

Chi-squared tests were then applied to analyze the association between self-medication and gender, age group, major field of study, and the presence of comorbidities. In addition, a binomial logistic regression was conducted, in which the practice of self-medication and the variables applied in the bivariate association tests were, respectively, included as dependent variables and factors. For this analysis, Nagelkerke's pseudo-R was considered, the "enter" method was applied and the self-medication variables were dichotomized. A 5% significance level was adopted for all statistical analyses.

RESULTS

After collecting the data, 384 responses were received, which revealed a prevalence of 48.44% of cases of self-medication by university students. Among the students who self-medicated, most were female, aged between 20 and 29, studying at universities in the Southeast and in courses not related to the health area (Table 1). Among the participants, 51 (27.41%) had comorbidities or previous illnesses.

Table 2 shows the significant associations found for the practice of self-medication with the variables gender, majoring in Applied Social Sciences, and having comorbidities. We also observed that the variables gender and the presence of comorbidities showed significant associations with self-medication in the binomial logistic regression.

Of the students who self-medicated, 74 (39.78%) used medicines derived from previous treatments. Seven substances mentioned by the students were excluded because they were not considered to be drugs, such as tea and propolis. Table 3 shows that analgesics were the most used by the participants. Furthermore, when considering the category of drugs related to mental suffering (antidepressants, anxiolytics, and stimulants), this group has the third highest prevalence.

The drugs in the other class included muscle relaxants, hair treatment, manipulated medicines, stomach medicines, herbal medicines, vitamins, oral hypoglycemic agents, antifungals, beta-blockers, antacids, and antispasmodics.

In addition to the classes described in Table 3, a total of 452 medicines were filled in by the students on the survey form, of

Table 1: Epidemiological profile of university students who practiced self-medication during the COVID-19 pandemic in Brazil.

Self-medication	Yes	%	Prevalence (%)	No	%	Prevalence (%)
Sex						
Male	51	27.42	13.28	84	42.42	21.88
Female	135	72.58	35.16	114	57.58	29.69
Age						
18 to 19 years	21	11.29	5.47	24	12.12	6.25
20 to 24 years	101	54.3	26.3	96	48.48	25
25 to 29 years	39	20.97	10.16	42	21.21	10.94
30 years and over	25	13.44	6.51	36	18.18	9.375
University Region						
South East	115	61.83	29.95	120	60.6	31.25
South	16	8.6	4.17	12	6.06	3.13
North East	27	14.52	7.03	43	21.71	11.2
North	25	13.44	6.51	19	9.59	4.95
Midwest	3	1.61	0.78	4	0.2	1.04
Courses by area of knowledge (CNPq)						
Health Sciences	67	36.02	17.45	53	26.77	13.8
Applied Social Sciences	61	32.27	15.88	85	42.93	22.13
Engineering	30	16.13	7.81	27	13.64	7.03
Exact and Earth Sciences	10	5.38	2.6	19	9.6	4.95
Other areas	18	9.67	4.68	14	70.7	3.64
Other aspects						
Comorbidities?	32	62.75	8.33	19	32.75	4.94
Total	**186**	**100**	**48.44**	**198**	**100**	**51.56**

Table 2: Associations determined by chi-square tests and odds ratios determined by binomial logistic regression between the practice of self-medication and gender, age group, and major field of knowledge of university students' academic courses.

Variables	Chi-square tests	Binomial Logistic Regression R² = 0.079			
		OR Crude (CI: 95%)	Lower limit	Upper limit	p
Sex					
Male / Female*	0.002	1.876	1.876	1.197	0.006
Age group (years)					
18 to 19 years	0.800	0.903	0.903	0.399	0.807
20 to 24 years	0.254	0.621	0.621	0.334	0.131
25 to 29 years	0.953	0.749	0.749	0.372	0.419
Major field of knowledge of the academic course					
Health Sciences	0.051	0.943	0.943	0.419	0.888
Applied Social Sciences	0.041	1.763	1.763	0.796	0.162
Engineering	0.492	1.132	1.132	0.460	0.787
Exact and Earth Sciences	0.118	1.897	1.897	0.647	0.243
Comorbidities					
Yes / No	0.028	0.477	0.477	0.253	0.023

Note: *Associations were determined for females using the Chi-squared test.

Table 3: Classes of drugs consumed through self-medication by university students during the COVID-19 pandemic in Brazil.

Drug Class	number of answers	% (n=186)	Prevalence (%)
Analgesics and antipyretics	166	89.24	43.22
Antihistamines	93	50.00	24.22
Antiemetics and antinauseants	47	25.26	12.24
Antibiotics	38	20.43	9.90
Antidepressants	20	10.75	5.21
Anxiolytics	28	15.05	7.29
Stimulants	14	7.52	3.65
Others	11	5.91	2.86

which analgesics and antipyretics were the most used for self-medication. Of these, the names of the most frequently mentioned medicines are shown in Table 4.

DISCUSSION

This study identified a 48% prevalence of self-medication among university students during the COVID-19 pandemic in Brazil. This prevalence represents a lower figure than the 58% found in undergraduate students in a survey conducted with undergraduate students in the city of Lahore, Pakistan, in 2020, employed through a data collection instrument built in Microsoft Office Forms[12].

The disparity in prevalence observed in different studies can be attributed to several interconnected factors, such as differences in national contexts regarding national legislation on the availability of and access to medicines and primary health services, which may have influenced the practice of self-medication during the pandemic.

In addition, these variations may also have been influenced by the periods in which the research on self-medication and immunization against COVID-19 was conducted. This temporal discrepancy suggests that self-medication among students may have been more prevalent in the initial stages of the pandemic when access to vaccines was still limited and information about the disease and its treatment was constantly evolving. With the advance of vaccination and the growing availability of reliable information about COVID-19, the practice of self-medication may have decreased.

Furthermore, these discrepancies may also be related to the size and representativeness of the study samples. This study, for example, evaluated students from universities in different regions of Brazil, while other studies may have analyzed smaller and less comprehensive groups, such as students from a single city or region.

Similarly, the results presented here are like those found in the Pakistani study, which found that 55% of women practiced self-medication[12]. Factors potentially influencing these results include an excess of domestic and university activities, concerns about family health, and layoffs from jobs that before the COVID-19 pandemic were conducted in person[13].

In addition, a survey of female university students in southern Spain found that 59.3% of students self-medicated with painkillers to relieve menstrual cramps[14]. This data may be related to the fact that medical prescriptions[15] are not obligatory and to the government's social isolation measures, which advised people to avoid going to the doctor in the case of minor disorders, to reduce the risk of infection by the COVID-19 virus.

Similarly, the findings presented here are like those evidenced in a study conducted with Pakistani students which also found a higher prevalence of self-medication, which was 65.2% among

Table 4: List of the main drugs consumed through self-medication by university students during the COVID-19 pandemic in Brazil.

Indications	Total	%
Analgesics and antipyretics	**218**	**50.35**
Dipyrone monohydrate	84	19.40
Ibuprofen	38	8.78
Acetaminophen	37	8.55
Orphenadrine citrate + Dipyrone monohydrate + Caffeine	22	5.08
Caffeine anhydrous + Dipyrone + Isometheptene hydrochloride + Isometheptene mucate	16	3.70
Other	21	4.85
Anti-inflammatories and antihistamines	**99**	**22.86**
Loratadine	26	6.00
Nimesulide	17	3.93
Dexchlorpheniramine maleate	13	3.00
Prednisolone	6	1.39
Others	37	8.55
Antiemetics and antinauseants	**20**	**4.62**
Dimenhydrinate	9	2.08
Ondansetron	5	1.15
Others	6	1.39
Antibiotics	**19**	**4.39**
Penicillins	6	1.39
Macrolides	6	1.39
Quinolones	4	0.92
Others	3	0.69
Antifungals	**28**	**6.47**
Phenylephrine hydrochloride + Paracetamol + Chlorpheniramine Maleate	13	3.00
Paracetamol + pseudoephedrine hydrochloride.	6	1.39
Others	9	2.08
Antidepressants	**16**	**3.70**
Sertraline Hydrochloride	6	1.39
Escitalopram Oxalate	4	0.92
Others	6	1.39
Anxiolytics	**8**	**1.85**
Benzodiazepines	4	0.92
Non-benzodiazepines	4	0.92
Stimulants	**4**	**0.92**
Methylphenidate	4	0.92
Others	**21**	**4.85**
Total	**433**	

the 21 to 24 age group[12]. However, both studies found no statistically significant bivariate association between age and the practice of self-medication. On the other hand, a study of pharmacy customers in Ethiopia showed a positive association between age and self-medication[16]. Individuals aged between 18 and 24 were nine times more likely to self-medicate than those aged over 45[16]. Youth is a time when individuals tend to experiment with new behaviors and take more risks, which can include self-medication[17].

In line with the results of the present study, the research conducted in Ethiopia also showed that individuals aged between 18 and 24 who were not health students were more likely to practice self-medication than those who were health graduates[17]. This greater tendency is related to the location of non-medical courses, which are far from university hospitals, making access to health services difficult[17].

On the other hand, compared to non-medical students, a survey of university students in Lahore, Pakistan, found that health students were more likely to practice self-medication during the pandemic[12]. On the other hand, compared to students from non-health courses, there was a greater tendency for medical students to practice self-medication during the pandemic[12]. This trend may be correlated with several interconnected factors, such as the proximity of students to the university hospital, greater contact with health services[17], greater medical knowledge, and the number of years of undergraduate study already completed[12].

Despite this trend, a survey of nursing students in Acre showed that self-medication was practiced during short periods of treatment or sporadic use, suggesting that the pharmacological knowledge acquired can reduce the risk of adverse reactions associated with inadequate and prolonged practice or excessive consumption of medicines[18].

Similarly to the findings of this study, in surveys on self-medication carried out with health students, it was observed that 66%, 59% and 44% of students, respectively, consumed analgesics, anti-inflammatories and antipyretics in the state of Paraná[19] and that 30.6%, 16.6% and 12% of students, in this order, consumed analgesics and antipyretics, anti-inflammatories and non-steroidal anti-rheumatic drugs, antihistamines for systemic use, in the state of Paraíba[20]. The use of these drugs may be related to the ease of access in drugstores, the fact that medical prescriptions are not required, the perceived minimal risk of self-medication[20], and the underestimation of health risks.

In addition, self-medication can be associated with the relief of low-severity disorders and diseases that were diagnosed before the pandemic[21], such as the use of anti-inflammatory drugs and corticosteroids to treat osteoarthritis, rheumatoid arthritis, fibromyalgia, hypersensitivity reactions and mild edema triggered by neofropathies[22,23] and the use of antiemetics to relieve nausea and vomiting after surgery or as a result of chemotherapy, pregnancy, vestibular disorders and gastroparesis[24].

This study found that the pharmacological group related to mental suffering was the third most prevalent among university students. Self-medication of this pharmacological class may be influenced by social influence and continuity of treatment, as was detected in a survey of university students in Bahia, where 75% of students already used anxiolytics derived from treatments before the pandemic[25]. In addition, the use of these drugs may be correlated with reduced restful sleep, the development of chronic stress, and difficulty learning online, influenced by the extensive workload and excessive university and the difficulties encountered during quarantine, as observed in a survey of university students in New Jersey, where it was found that 59.3% and 56.8% of participants reported, respectively, difficulty obtaining medication and unemployment and reduced wages[27].

In this study, it was possible to detect variations in the prevalence of self-medication among students at Brazilian universities located in different regions of the country. This heterogeneity may be related to the different periods of adoption and application of the remote teaching system and the replacement of practical face-to-face activities during the pandemic. In addition, these variations may be influenced by vacation breaks, when there is a tendency for self-medication to decrease due to leisure activities[27].

Similarly to the results presented here, a systematic review of the consumption of antibiotics during the pandemic showed self-medication of antimicrobials, such as penicillins, macrolides, quinolones, cephalosporins, and metronidazole, to prevent and treat COVID-19 in 79% of the articles analyzed[28]. In addition, in a survey of students from courses in different areas of knowledge in Brazil, it was found that 14.32% of students self-medicated with the Covid-Kit, of which 29.29% consumed azithromycin[29], due to the influence of false information disseminated on social media[29].

Self-medication of these drugs may be associated with shortages of antibiotics that are essential for treating more serious infections. In addition, self-medication of these drugs may be correlated with an increase in antimicrobial resistance, which can influence mortality from community and hospital infections by making it more difficult to treat these diseases. During the COVID-19 pandemic, increased resistance of Escherichia coli to amoxicillin-clavulanate, ceftriaxone, cefuroxime, levofloxacin, and ciprofloxacin was detected, of Enterococcus faecium to ampicillin, erythromycin and ciprofloxacin and increases in antimicrobial resistance of Staphylococcus aureus of 33.3% and 48.5% was detected, respectively, about clindamycin and oxacillin[30].

Limiting factors in this study were the possible small number of participants who practiced self-medication, due to the inclusion criterion of individuals who self-medicated up to a month before filling in the survey form and the reduction in infodemics during the period when the survey form was published. In addition, the non-inclusion of anti-inflammatory drugs in the survey form may have influenced the number of responses on the consumption of analgesics, antipyretics, and antihistamines.

Despite these limitations, this study fulfilled its objective of determining the epidemiological profile of self-medication by university students during the pandemic period, considering the influence of gender and academic courses, as well as identifying the possible drug classes most consumed through this practice.

Conclusion

The findings of this research reinforce the concern about the risks of undesirable effects on the health and well-being of students, as well as highlighting social problems that encourage the practice of self-medication, such as disorders related to mental suffering in the pandemic period and the risk of developing resistance to antimicrobials. Furthermore, the results of this study contribute to reducing and avoiding negligence on the part of health professionals about the practice of self-medication during pandemic periods.

ACKNOWLEDGMENTS

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