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Original

Screening tests for migraine applied to the population of the Bauru campus of the University of São Paulo: a prevalence study

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Introduction
Migraine is a prevalent neurological disorder marked by recurrent and severe headaches that significantly impacts individuals' quality of life. Objective: This study aims to apply migraine screening tools to the population of the Bauru campus of the University of São Paulo (USP) to estimate the prevalence of migraine and assess the impact of pain on daily life.

Methods
A cross-sectional study involved 216 participants, comprising students, faculty, and staff, who completed online questionnaires, including the "ID Migraine," "International Headache Society Migraine Diagnosis," and "Migraine Screen Questionnaire." The impact of migraine on daily activities was assessed using the "Headache Impact Test. The data were analyzed using the Shapiro-Wilk test, Student's t-test, Mann-Whitney test, and Pearson's correlation, adopting a 5% significance level.

Results
Out of 216 respondents, 69 (31.94%) were diagnosed with migraine using the ID Migraine tool. The International Headache Society questionnaire identified 86 participants (39.81%) as having migraine, while the Migraine Screen Questionnaire indicated 94 participants (43.52%). A combined analysis identified 20.83% of participants (n=45) as having migraine across all questionnaires. A total of 113 participants (52.31%) tested positive for migraine in at least one questionnaire. Results also revealed a strong correlation between positive migraine diagnosis and significant limitations in daily activities, as assessed by the Headache Impact Test ($p<0.001$).

Conclusion
Using multiple migraine screening questionnaires enhances sensitivity and specificity in identifying individuals with migraine. The findings reveal a substantial population at the USP campus likely affected by migraines, emphasizing the need for further research and intervention strategies.

Keywords:
Migraine disorders
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Introduction

Migraine is a neurological disorder characterized by recurrent, severe headaches often accompanied by nausea, vomiting, and sensitivity to light and sound (1). It affects millions of people worldwide and is considered one of the most disabling medical conditions (2–4). Clinically, migraines are divided into several phases: the premonitory phase, aura, headache, and postdrome. The premonitory phase can include symptoms like mood changes, food cravings, and neck stiffness. The aura phase, experienced by about 25% of migraine sufferers, involves visual disturbances such as flashing lights or blind spots. The headache phase is characterized by intense, throbbing pain, usually on one side of the head, and can last from a few hours to several days (5). The clinical implications of migraine are significant. It can severely impact a person's quality of life, affecting their ability to perform daily activities. In Brazil, the annual prevalence of migraine is 15.8%, affecting about 22% of women and 9% of men, with a peak prevalence between 30 and 50 years of age (6). Effective management often requires a combination of lifestyle changes, acute treatments, and preventive medications (7–9). Understanding the complex nature of migraine and its clinical implications is essential for developing effective treatments and improving the lives of those affected by this debilitating condition (5). Screening tools for migraines are vital for several reasons: early identification, accurate diagnosis, treatment planning and monitoring progress (10). Using these screening tools can significantly improve the quality of life for migraine sufferers (11–13). The high prevalence, disabling aspects, and possible complications of migraine justify the characterization and identification of a subpopulation (students, faculty, and technical staff at the Bauru campus of the University of São Paulo - USP) with the aim of conducting in-depth studies on individuals with migraine.

Methodology

This cross-sectional study involved the collection of data on migraine, demographic data, and factors associated with the disease from the population of the USP campus in Bauru, which includes the Hospital for Rehabilitation of Craniofacial Anomalies (HRAC). The population is composed of professors, technicians, and undergraduate and graduate students in health-related courses (Medicine, Dentistry, and Speech Therapy). The inclusion criterion was active affiliation with the USP campus in Bauru. There was no exclusion criterion to minimize the risk of selection bias. The study was approved by the Research Ethics Committee of the Bauru School of Dentistry, USP, in December 2023 (approval number 75015723.9.0000.5417). Data was collected between February 23, 2024, and April 1, 2024, from online questionnaires completed by the respondents themselves and made available on the Google Forms platform. The study was disseminated via institutional email and targeted the entire population of the USP Bauru campus and HRAC, comprising approximately 2500 people. All were invited to participate in the research. Three questionnaires were used to assess the prevalence of migraine: the "ID Migraine," "International Headache Society Migraine Diagnosis," and "Migraine Screen Questionnaire," which were translated into Portuguese. One questionnaire assessed the impact of the disease on patients' daily activities ("Headache Impact Test"). Additionally, the following demographic data were collected: sex, age, race, and professional category (undergraduate/graduate student, administrative technician, and professor).

The "ID Migraine" (10,14) is a screening tool consisting of three questions designed to quickly identify individuals who may suffer from migraine. It assesses whether headaches have limited activities, if nausea or vomiting occurs with headaches, and if light sensitivity is experienced during headaches. A positive diagnosis is indicated by answering "yes" to all three questions.

The "International Headache Society Migraine Diagnosis" is a more comprehensive questionnaire that evaluates the presence of migraine based on specific criteria. It requires respondents to confirm having at least five headache episodes lasting from 4 to 72 hours and to identify at least two defining characteristics of these headaches, such as unilateral location, a pulsating quality, moderate to severe intensity, and aggravation by routine physical activity. Additionally, respondents should report experiencing nausea, vomiting, photophobia, or phonophobia during these episodes.

The "Migraine Screen Questionnaire (MS-Q)" (15,16) consists of five questions aimed at identifying migraine symptoms. Respondents score points for each "yes" answer, with a score greater than four indicating a positive diagnosis for migraine. The questions focus on the frequency and intensity of headaches, their duration, associated nausea, and sensitivity to light or noise, as well as the impact on physical or intellectual activities.

To assess the impact of migraine on patients' daily activities, the "Headache Impact Test" (17) questionnaire from the Brazilian Headache Society was used. The "Headache Impact Test" (17) is a questionnaire that assesses the impact of headaches on daily life. It evaluates how often headaches are severe, how much they limit daily activities, and how they affect overall well-being, including mood and concentration. Responses are scored on a scale that allows for the quantification of the headache's impact, helping to determine the extent to which migraines interfere with a person's quality of life.

Comparative analyses were performed to evaluate the impact of migraine using different methodologies. Individuals were classified based on whether they were diagnosed with migraine (yes or no) according to three screening methods. Separate comparisons were made:

1. For individuals who tested positive according to Method 1, Method 2, or Method 3 independently.
2. For individuals who tested positive in at least one of the three methods.
3. For individuals who tested positive across all three methods.

The impact on daily activities, assessed by the Headache Impact Test, was compared between individuals with and without migraine using either the Student's t-test or the Mann-Whitney test, depending on the distribution of the data. Normality was evaluated using the Shapiro-Wilk test.

Additionally, chi-square tests were used to assess associations between the presence or absence of migraine and specific responses to each method. These associations were tested:

1. For individuals who answered "yes" or "no" for all three methods.
2. For individuals who answered "yes" across some but not all methods, such as Method 2 and Method 3 specifically.

All statistical analyses were conducted using Statistica 10.0 software (StatSoft Inc., Tulsa, OK, USA), with the significance level set at $p < 0.05$.

Results

A total of 216 respondents agreed to participate in the research. The 216 questionnaires were included in the study analysis as they did not show any filling deviations. The study population (n=216) is predominantly female (n=170, 78.7%), aged between 20 and 29 years (n=77, 35.6%), of white ethnicity (n=180, 83.3%), and belong to undergraduate group (n=81, 37.5%), as shown in Table 1.

Table 1. Participant Profile

Variable	Total	Frequency
Sex		
Female	170	78.7%
Male	46	21.3%
Age		
17 - 19	26	12.0%
20 - 29	77	35.6%
30 - 39	31	14.4%
40 - 49	37	17.1%
50 - 59	32	14.8%
60 - 69	13	6.0%
Race		
Yellow	4	1.9%
White	180	83.3%
Indigenous	1	0.5%
Mixed	20	9.2%
Black	11	5.1%
Groups		
Undergraduate	81	37.5%
Graduate	47	21.8%
Technical/ Administrative	62	28.7%
Faculty	26	12.0%
Total	216	100%

For the ID Migraine, the first questionnaire, n=69 participants (31.94%) were diagnosed with migraine, of which 68 were women. The average age of these participants was 32.23 years (SD±12.83), ranging from 18 to 63 years, and most of the sample, 69.57%, comprised students (n=24 undergraduate and n=24 graduate). The white race was the most prevalent.

The prevalence of migraine found with the help of the second questionnaire, Migraine Diagnosis by the International Headache Society, was 39.81% (n=86 participants), of which 77 were female (89.53%). The respondents had an average age of 33.30 years (SD±13), ranging from 17 to 63 years, including 29 undergraduate students, 27 graduate students, and 26 administrative technicians. The white race was also the most prevalent among identified migraine patients (81.39%). In 62.79% of participants in this migraine group, headache crises were associated with nausea and vomiting (n=54) and 96.51% with photophobia or phonophobia (n=83). Moreover, 51 participants presented all the symptoms mentioned during crisis (59.3%).

Finally, the third questionnaire, Migraine Screen Questionnaire, identified the presence of migraine in 94 participants (43.52%). The majority were female (n=87, 92.55%), with an average age of 33.55 years (SD±13.95), ranging from 17 to 68 years. Notably, 32 participants were undergraduate students, 30 were graduate students, and 27 were administrative technicians. The white race was the most common (n=78, 82.98%) among the migraine patients identified by this questionnaire.

Considering the 3 questionnaires together, 45 participants were identified with migraine (20.83%) in the three questionaries, all of whom were women, with an average age of 30.87 years (SD±10.68), ranging from 19 to 60 years. Most participants were of white ethnicity (n=37, 82.22%) and comprised undergraduate (n=15) and graduate (n=18) students. In otherwise, considering the positive result for migraine in at least one questionnaire 113 participants were identified.

A positive result in any questionnaire, in all questionnaires or in one at least questionnaire was related to the limitation of daily activities due to headache crises as demonstrated by using the Headache Impact Test (p<0.001) (table 2).

Table 2. Response to one specific questionnaire and the impact on daily life (Headache Impact Test)

	N	Missing	Median	25%	75%	p
Q1						
yes	69	0	52.000	49.000	53.000	
no	147	0	40.000	34.000	46.000	<0.001
Q2						
yes	86	0	51.000	46.000	53.000	
no	130	0	38.500	34.000	46.000	<0.001
Q3						
yes	94	0	51.000	47.750	53.000	
no	122	0	38.000	34.000	44.250	<0.001

In summary, 216 participants answered the questionnaires, 69 participants answered yes to Questionnaire 1 (68 women). 86 participants answered yes to Questionnaire 2 (77 women). 94 participants answered yes to Questionnaire 3 (87 women). 113 participants answered yes to at least one of the three questionnaires (103 women). 45 participants answered yes to all three questionnaires (45 women).

The difference between affirmative answers to questionnaires 1, 2, and 3 isolated and the affirmative response to all (1, 2, and 3) was significant in all cases. (p<0.001) (Table3).

Table 3. Comparison between answer yes for one specific questionnaire and answer yes for all questionaries

	No for all	Yes for all	total	p
Yes to Q1	24 (34.8%)	45 (65.2%)	69 (100%)	
No to Q1	147 (100%)	0 (0.0%)	147 (100%)	P<0.001
Yes to Q2	41 (47.7%)	45 (52.3%)	86 (100%)	
No to Q2	130 (100%)	0 (0.0%)	130 (100%)	P<0.001
Yes to Q3	49 (52.1%)	45 (47.9%)	94 (100%)	
No to Q3	122 (100%)	0 (0.0%)	122 (100%)	P<0.001
Total	171 (79.2%)	45 (20.8%)	216 (100%)	

Considering the response yes for all questionaries (45) as real positive diagnosis we can say that: 24 participants response yes for the questionnaire 1 as false positive (34.8%), 41 participants response yes for the questionnaire 2 as false positive (47.7%) and 49 participants response yes for the questionnaire 3 as false positive (52.1%).

Considering the response yes for one of the three questionnaires (113) as real positive diagnosis we can say that: 44 participants response no for the questionnaire 1 as false negative (28.9%), 27 participants response no for the questionnaire 2 as false negative (20.7%) and 19 participants response no for the questionnaire 3 as false negative (15.4%).

Regarding the comparative analysis between the questionnaires, as shown in Figure 1, 103 participants were not identified with migraine by any questionnaire. If only Questionnaire 1 were adopted for identifying migraine in the sample, the migraine of 44 respondents would not be diagnosed. For Questionnaire 2, the same would occur with 27 patients. For Questionnaire 3, 19 patients would be underdiagnosed.

In Figure 1 we can observe the positive answer for each questionnaire (Q1, Q2 and Q3) and the overlap of the positive responses for these questionaries. The total of positive answers was 113 and 103 was the total of negative answers.

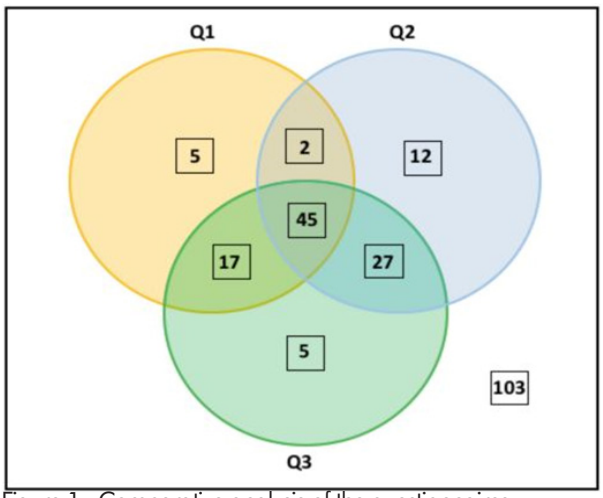

Figure 1. Comparative analysis of the questionnaires.

In Table 4 we present the rate of estimated migraine calculated by using the positive answers in the different questionaries (analyzed separated or together) divided by the total participants that answered the forms and by the total population of the campus.

Table 4. Estimate of prevalence of migraine considering the different questionnaire

Questionnaire	n	n/216 (%)	n/2500 (%)
1 (MID)	69	31.94%	2.76%
2 (HIS)	86	39.81%	3.44%
3 (MS-Q)	94	43.51%	3.76%
1 and 2 and 3	45	20.8%	1.8%
1 or 2 or 3	113	52.31%	4.52%

Discussion

Migraine is a major public health issue and a significant cause of morbidity, imposing a considerable socioeconomic burden on society. Although various studies report the deleterious influence of migraine on patient health, the condition often remains underdiagnosed (4). Prevalence studies contribute to a better understanding of specific populations affected by a given disease, aiding in the determination of more accurate diagnoses for this patient group. The prevalence rates of migraine in the population vary between studies due to the diversity of the sample and diagnostic methods used in the research (18). In a meta-analysis conducted by Woldeamanuel and Cowan (19), the prevalence of migraine in the general population for South American countries is 16.4%.

To estimate the prevalence of migraine in our study, we made two assumptions. One used the total number of study participants as the denominator for the occurrence rate, and the other considered the total campus population as the denominator. We can assume that the participants who responded to the questionnaires were primarily those suffering from migraine, which would explain the high prevalence rate in the study (ranging from 31.94% to 43.51%) when the questionnaires were considered individually and varying from 20.8% to 52.31% when considered combined. If we assume that all individuals suffering from migraine responded to the questionnaires, we can use as denominator to calculate the migraine occurrence rate the total campus population, thus estimating a migraine prevalence between 1.8% and 4.52%. Clearly, this wide range of prevalence estimates makes any conclusion in this regard unreliable, but it allows us to compare the different results from applying the migraine screening tests and at least determine an absolute number of participants who might have migraine.

The migraine occurrence rate varied across the individual tests and showed a statistically significant difference when compared to the combined analysis of all three tests (where a positive diagnosis required all three tests to be positive). A comprehensive analysis of the three questionnaires resulted in higher specificity when a positive diagnosis was identified by all three questionnaires, and higher sensitivity if a positive diagnosis was detected in any of the three questionnaires.

These tests are used to help primary care physicians diagnose migraine more efficiently. They are useful tools for detecting migraine in early stages, allowing patients to be referred for specialized treatment when needed. Screening tests for migraine are important for speeding up the diagnosis and proper treatment of this health condition. Similar studies were applied to adolescents (20) and in University hospital (21) also to validate these kind of questionaries and to differentiate migraine from other kinds of head pain (22).

Applying more than one migraine screening test (23,24) in the same study can be useful to compare the effectiveness and accuracy of different screening instruments. In addition, by using multiple screening tests, it is possible to obtain a more comprehensive and comparative view of the effectiveness of the different instruments available.

The three questionnaires used allowed the identification of the female population as the most affected by migraine. However, several studies have also identified a higher prevalence of migraine in women, around 2:1 (19). It is likely that hormonal variations due to the menstrual cycle justify the higher risk of migraine for females (25). The average age of participants with migraine was similar across the questionnaires used, 32.23 years (SD±12.83) for ID Migraine, 33.30 years (SD±13) for the Migraine Diagnosis by the International Headache Society, and 33.55 years (SD±13.95) for the Migraine Screen Questionnaire. Similar values were reported in

other studies, which associated a higher prevalence of migraine with patients with an average age of 35 years (19) and in the 30 to 39 years age range (26). A positive diagnosis for migraine, in any of the three questionnaires, is related to the impact of headache pain on the execution of daily activities. It was identified with the help of the modified "Headache Impact Test" questionnaire that the group of migraine patients, for the three questionnaires, experienced intense pain that impaired the performance of their daily activities. This finding was consistent with that found in the literature (27).

Some limitations of the study should be discussed: reliance on self-reported questionnaires may introduce bias, as participants might misinterpret questions or provide socially desirable responses, affecting the accuracy of migraine diagnoses. Additionally, the sample size, though 216 individuals participated, represents only a fraction of the total campus population (approximately 2.500), which may not adequately capture the diversity and true prevalence of migraine across different demographics. Probably the individuals that present migraine were more interested in response to the questionnaire than the others individual of the campus.

Conclusion

The combined use of three migraine screening questionnaires enhanced both the sensitivity and specificity of the tests for diagnosing migraine. Although the estimation of migraine in the Bauru campus of USP has been quite imprecise it was possible to identify the population that probably suffered from this disorder and well characterize it. It was also possible to make evident the impact of migraine on the daily life of this group that can receive a further approach posteriorly.

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