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Primary headache and factors associated in university students: a cross sectional study

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ABSTRACT

Introduction: Primary headaches, defined as disorders in themselves caused by independent pathomechanisms and not by other disorders, are prevalent in university students and considered one important health problems in the world. **Objective:** To investigate the prevalence of primary headaches and analyze associations with sociodemographic characteristics and the use of electronic devices by university students. **Methods:** A cross-sectional observational study analysis was carried out with a sample of 1,143 students of both genders who responded to the questionnaire on demographic, socioeconomic aspects, use of electronic devices, and on the primary headaches. Descriptive analysis, bivariate analysis, and Poisson regression were performed. **Results:** The overall prevalence of primary headache of 60.7%, being that, in relation to the type, 33.2% presented tension-type headache, 54.3% migraine, and 12.3% other types of headache. Regression analysis showed that female gender and income of up to two minimum wages were associated with primary headache and migraine type. The primary headache was associated with subjects of the white race; watching television and playing video games for more than 3 hours per day, for example. The sitting posture, semi-lying down, and distance from the eyes to the mobile phone and tablet longer than 20 cm were associated with primary headache and the three types of headaches. **Conclusion:** The results allow us to conclude that there is a high prevalence of primary headaches in college students and that socioeconomic factors related to the use of electronic devices are associated with the presence of primary headaches.

Keywords: headache; prevalence; risk factors; epidemiology.

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INTRODUCTION

Electronic media such as television, computer, video games, cell phones, and tablets are being used in various daily activities related to work, education, and leisure, by all age groups[1-3].

Among the complaints associated with excessive use of electronic devices, headaches seem to be the most prevalent in adolescents and university students[4]. There are several classifications for headaches, but in this population, the most prevalent are primary headaches, defined as disorders in themselves, caused by independent pathomechanisms

and not by other disorders such as migraines, tension-type headaches, or group headaches[5].

Various international epidemiological studies have investigated the prevalence of headaches among university students. The prevalence of migraines among them was 7.9% in Southeast China[6]; 17.8 in Turkey[7] and 14.0% in Iran[8] and 32.5% in Saudi Arabia[9], 24.0% in Brazil[10]. Data on headaches calculated 68.4% in Saudi Arabia[9], 22.6% in Turkey[7], and 32.0% in Brazil[11].

Brazilian and international literature describes the etiology of primary headaches as multifactorial. The following factors are included: psychosocial (anxiety, nervousness, depression, emotional stress), sociodemographic attributes (gender, age), sleep disorders (insomnia and interrupted sleep), and ergonomic (excessive muscle contraction of the cervical muscles, physical effort, incorrect postures)[12]. Some international literature reflects on the relationship between electronic media and primary headaches in undergraduate students[13,14]. However, no data on this exist on the topic in Brazil.

Studies on the prevalence of risk factors associated with primary headaches are essential since it correlates with comorbidities and school absenteeism among students. It also bears treatment and rehabilitation expenses for the public health system. Primary headaches are responsible for a large share of the consultations in healthcare units and are associated with a high socio-economic impact. It leads to a loss of productivity and decreasing life quality. A study calculated the expenses associated with migraine headaches in the European Union approximately 27 billion pounds sterling and the cost of the remaining types of headaches as measurably higher[15,16].

This study will serve as a reference source for other investigations since the availability of Brazilian data on the association between headaches and sedentary behavior of university students (TV, computer, tablet, and cell phone) is scarce.

The study aims to investigate the prevalence of primary headaches and to analyze the association between sociodemographic characteristics and the use of electronic devices (TV, computer, tablet, and phone) in university students.

METHODS

An investigation with a cross-sectional design was conducted with university students. The study was approved by the Ethics Committee in Research with Human Beings at the University of Sagrado Coração, Bauru, São Paulo, Brazil (no. 1,701,057).

The sample size was calculated using the following parameters: the population equal to 5,941 students, including the bachelor's and teaching degree, the prevalence of the outcome unknown (50%), sampling error equal to 4 percentage points, and a confidence interval of 95% (95% CI). The sample size obtained was multiplied by two because of the effect of the study delineation (*deff*), with 20% of expected losses and 15% for association studies, totaling 1,143 students.

In the selection process, the proportion of students distributed according to courses and classes was considered. Thus, the sample was drawn in two stages, with the raffles performed at random. At first, the sampling unit was the course, and all students were eligible to participate in the study, considering the density of students per course. Second, all classes (smaller sample units) of the courses were considered eligible for the study. A simple random stratified sampling method was used, and the density of classes per period of each course was considered.

The exclusion criteria were: (a) international students in institutional exchanges, (b) in the gestation period, and (c) students with physical limitations (morbid obesity, amputations, and spinal cord trauma).

An authorization letter was requested from the University in approval of the study.

Data collection

The procedures adopted for data collection included: (a) prior contact via e-mail or telephone with professors of each course. The terms of consent and the questionnaire schedule was attached, and (b) training procedures of the evaluators.

Data were collected between March and April 2016 by trained interviewers (theoretical and practical), and a standardized protocol was used to minimize possible intra- and inter-evaluator errors.

The following procedure was performed to collect the data: first, the researchers explained the research objectives, and students were informed about the ethical aspects. Subsequently, they were asked to sign the Free and Informed Consent Form (ICF). The questionnaires were distributed with the receipt of instructions and recommendations for completion, with no deadline. While completing the questionnaires individually, questions by the students were promptly answered by the interviewer.

The coding was performed by the interviewers and reviewed by the fieldwork supervisors. For quality control, a questionnaire with a reduced number of questions was completed by 10% of the university students.

Instruments

University students were classified according to gender, age, marital status (married or consensual union, single, separated, and widowed), skin color (white, black, brown, yellow, and indigenous), and family income (up to two minimum wages, three to five minimum wages, six minimum wages or more).

The questions regarding electronic devices were based on previous studies[17-19] and were as follows: "In a normal week class, do you watch TV?" (yes/no); "How many times a week do you watch TV?" (once or twice, three or four times, five times, more than five times); "How many hours a day do you watch TV?" (less than one, two, three, four, five, and more than five a day); "Do you use your computer/video game?" (yes/no); "What type of computer do you

use?" (Desktop, Laptop); "Do you sit in front of your PC, without getting up, for more than 1.5 hours?" (yes/no); "What is the height of the screen of your PC?" (eyes above the midpoint of the screen, eyes approximately in the middle point of the screen, eyes below the mid-point of the screen); "What is the distance from your eye to the screen while using a PC?" (<20 cm, 20 cm to 25 cm, 25 cm to 30 cm, and >30 cm); "How many times a week do you use your computer or videogame at home?" (once or twice, three or four times, five times, more than five times); "How many hours a day do you use a computer or videogame at home?" (less than one, two, three, four, five, more than five a day); "Do you use your cell phone?" (yes/no); "In what posture do you use your mobile phone?" (Standing, sitting, lying, or semi-lying); "Average daily time using a cell phone?" (<1 h, 2 to 3 h, 3 to 4 h, and >4 h); "What is the eye-to-screen distance during the use of the mobile phone?" (<10 cm, 10 to 15 cm, 15 to 20 cm, and >20 cm); "Do you use a tablet?" (yes/no); "In what posture do you use the tablet?" (standing, sitting, lying, or semi-lying); "Average daily time using the tablet?" (<1 h, 2 to 3 h, 3 to 4 h, and >4 h); "What is the eye-to-screen distance during the use of your tablet?" (<10 cm, 10 to 15 cm, 15 to 20 cm, and >20 cm).

The primary headache variable was assessed using a questionnaire for the initial diagnosis of primary headaches, developed at the Headache Clinic of the Hospital das Clínicas of the Ribeirão Preto Medical School, USP. It was based on the criteria proposed by the International Headache Society, 2nd Edition[20]. This instrument allows the diagnosis of primary headaches, such as migraines, tension-type headaches, stress headaches, and others. It was validated in an epidemiological study of the prevalence of headache in the urban population of the city of Ribeirão Preto-SP. The students were asked about the presence of headaches during the last three months. The criteria established by the International Headache Society[5,21] were used to classify the types of primary headaches. The students were grouped into four categories: 1) migraine; 2) tension-type headache; 3) other types of headaches; 4) without headache[5,21].

The data were analyzed using the SPSS statistical program, version 10.0 (SPSS, Chicago, USA). Descriptive analyses and the calculation of prevalence ratios (PR) were performed, with a 95% confidence interval (CI). Demographic, socioeconomic, and electronic devices were considered independent variables. Independent variables with a significance level of $p<0.20$ in the bivariate analysis were included in a Poisson regression model with robust variance. The assumptions required for Poisson regression to yield a valid result were respected. The prevalence ratios (PR) were calculated, and their respective confidence intervals (CI) at 95%.

RESULTS

A total of 1,143 students were studied, with less than 2.05% refusals. Regarding the sociodemographic aspects, it is noted that 82.9% of men and 90.0% of women are aged between 18 and 25 years, 77.2% of men and 83.3% of women are white, 92.0% of men and 91.8% of women are single, and 78.1% of men and 79.6% of women are middle income.

Regarding the variables related to the use of electronic devices, it was noted that 79.0% of men and 86.9% of women reported watching TV; 43.3% of men and 53.0% of women watched TV for more than three times a week; 94.0% of men and 90.6% of women used computers for more than three times a week; 63.8% of men and 87.6% of women did not use video games; 98.2% of men and 99.6% of women used cell phones; 76.3% of the men and 82.2% of the women used the cell phone in the sitting posture; 51.5% of the men and 66.8% of the women used the cell phone in the semi-lying posture; 60.4% of the men and 76.0% of the women reported to use the cell phone daily for more 3 hours a day; 59.5% of the men and 84.9% of the women reported to use the cell phone at a distance from the eyes smaller than 20 cm; 87.7% of the men and 84.9% of the women did not use the tablet.

In Table 1 the total number of subjects, 60.7% (CI 57.8-63.5%) reported primary headaches, 42.6% (CI 38.0-47.2%) in men and 72.0% (CI 68.5-75.2%) in women.

As shown in Table 1, 40.6% of men and 59.3% of women presented with migraines; 41.1% of men and 30.3% of women reported stress headaches, 27.8% of men and 6.7% of women reported another type of headache.

In the multivariate analysis, the sociodemographic characteristics (Table 2), associated with primary headache were female gender, white race, and income.

Table 3 shows an association between primary headache and the following variables: watching TV for more than 3 hours a day, playing videogames for more than three hours, using a cell phone in a semi-lying posture, using a cell phone at a distance of more than 20 cm, using a tablet, using a tablet in the sitting position, and using a tablet at a distance of more than 20 cm.

The regression analysis by type of headache (Table 4) showed that the variables income, number of hours on TV, semi-lying

Table 1: Distribution of absolute and relative frequencies as the prevalence of primary headache.

Factors	Sex					
	Male (n=439)			Female (n=704)		
	n	%	CI (95%)	n	%	CI (95%)
Primary Headache						
No	252	57.4	52.7-61.9	197	27.9	24.7-31.4
Yes	187	42.6	38.0-47.2	507	72.0	68.5-75.2
Migraine	76	40.6	33.8-7.8	301	59.3	55.0-63.5
Tension-type headache	77	41.1	34.3-48.3	154	30.3	26.5-34.5
Other Types of headache	52	27.8	21.8-34.6	34	6.7	4.8-9.2

CI: Confidence Interval

Table 2: Multivariate analysis for associations of sociodemographic characteristics with the primary headache in university students.

Variables	Total	Primary headache		
		n	%	PR (95% CI)
Sex				
Male	439	153	34.8	1.00
Female	704	455	64.6	3.39 (2.26–4.37)
Age range				
18 to 20	501	276	55.2	1.00
18 to 25	497	264	53.1	0.96 (0.86–1.08)
18 to 30	85	43	50.6	0.92 (0.73–1.15)
31 or over	60	25	41.7	0.76 (0.55–1.03)
Ethnicity				
Asian	26	7	26.9	1.00
White	925	512	55.3	3.16 (1.27–7.87)
Mulatto	150	75	50.0	2.46 (0.95–6.52)
Indigenous	6	1	16.7	0.78 (0.07–8.63)
Black	36	13	36.1	1.99 (0.63–6.29)
Marital Status				
Married	82	40	48.8	1.00
Single	1050	560	53.3	1.09 (0.87–1.37)
Separated	11	8	72.7	1.49 (0.98–2.28)
Income				
Over 5 minimum wage	83	48	57.8	1.00
Until 2 minimum wage *	151	84	55.7	0.94 (0.59–1.57)
From 3 to 5 minimum wage	909	476	54.9	0.80 (0.50–1.26)

CI: Confidence Interval, PR: prevalence ratio

Table 3: Multivariate analysis for associations of electronic devices with the primary headache in university students

Variables	Total	Primary headache		
		n	%	PR (95% CI)
Watch TV				
No	184	83	45.1	1.00
Yes	959	525	54.7	1.21 (1.02–1.44)
How many times TV per week				
Up to 2 times	325	166	51.1	1.00
3 times or more	634	359	56.7	1.11 (0.96–1.26)
Number of hours of TV per day				
Up to 2h	395	199	50.4	1.00
3h or more	564	326	57.8	1.44 (1.14–1.82)
Use of PC				
No	7	2	28.6	1,00
Yes	1136	606	53.3	1.87 (0.58–6.03)
Height of the computer screen				
Above the midpoint	317	171	54.0	1.00
At the midpoint	602	308	51.2	0.95 (0.83–1.06)
Below the midpoint	217	127	58.6	1.06 (0.93–1.26)

Continue...

Table 3: Continuation.

Variables	Total	Primary headache		
		n	%	PR (95% CI)
Distance from the eye to the computer				
Up to 30 cm	636	352	55.3	1.00
30 cm or more	500	254	50.8	0.92 (0.82–1.03)
How many times per week				
Up to 2 times	85	45	52.9	1.00
3 times or more	1051	561	53.4	1.01 (0.82–1.24)
How many hours per day				
Up to 2h	322	174	54.0	1.00
3h or more	814	432	53.1	0.98 (0.87–1.11)
Use of videogame				
No	897	500	55.7	1.00
Yes	246	108	44.0	1.25 (0.92–1.68)
How many times per week				
Up to 2 times	181	80	44.2	1.00
3 times or more	65	28	43.1	0.97 (0.70–1.35)
How many hours per day				
Up to 2h	188	78	41.4	1.00
3h or more	58	30	51.7	1.62 (1.21–2.17)
Use of cell phone				
No	11	5	45.5	1.00
Yes	1132	603	53.3	1.17 (0.61–2.24)
What posture use the cell phone				
Standing	695	378	54.4	1.06 (0.95–1.19)
Sitting	914	493	53.9	1.07 (0.93–1.24)
Lying down	543	303	55.8	1.10 (0.98–1.22)
Semi-lying	696	393	56.4	1.37 (1.07–1.75)
Daily use time				
Up to 2h	332	168	50.6	1.00
3h or more	800	435	54.4	1.07 (0.95–1.22)
Distance from the eye to the computer				
Less than 20 cm	845	466	55.2	1.00
20 cm or more	287	137	47.7	1.31 (1.02–1.72)
Use of Tablet				
No	983	509	51.7	1.00
Yes	160	99	61.9	3.51 (1.64–7.51)
Posture using the tablet				
Standing	34	19	55.9	1.05 (0.78–1.43)
Sitting	119	68	57.1	2.27 (1.01–5.26)
Lying down	77	46	59.7	1.13 (0.94–1.37)
Semi-lying	61	36	53.2	1,12 (0.90–1.39)
Daily use time				
Up to 2h	133	82	61.7	1.00
3h or more	27	17	51.8	1.02 (0.74–1.40)
Distance from the eye to the computer				
Less than 20 cm	42	20	47.6	1.00
20 cm or more	118	79	66.9	2.22 (1.05–4.54)

CI: Confidence Interval, PR: prevalence ratio

Table 4: Multivariate analysis for associations of variables with different types of primary headache in university students.

Tension-Type Headache		
Variables	**Value of p**	**PR adjusted (95% CI)**
Income		
Over 5 minimum wage		1.00
Until 2 minimum wage	0.03	1.92 (1.04–3.57)
From 3 to 5 minimum wage	0.01	1.88 (1.16–3.12)
Number of hours of TV per day		
Up to 2h	0.04	1.00
Above 3h		1.40 (1.06–1.97)
Posture using the cell phone		
Semi-lying		
No	0.04	1.00
Yes		1.10 (1.02–1.82)
Posture using the tablet		
Semi-lying		
No	0.03	1.00
Yes		1.75 (1.05–2.92)
Migraine Headache		
Variables	**Value of p**	**PR adjusted (95% CI)**
Sex		
Male	0.001	1.00
Female		3.56 (2.67–4.76)
How many times TV per week		
Up to 2 times	0.003	1.00
3 times or more		1.42 (1.11–1.84)
Number of hours of game per day		
Up to 2h	0.02	1.00
3h or more		1.51 (1.06–2.15)
What posture use the cell phone		
Semi-lying		
No	0.04	1.00
Yes		1.31 (1.01–1.70)
Distance from the eye to the cell phone		
Less than 20 cm	0.02	1.00
20 cm or more		1.40 (1.06–1.88)
Distance from the eye to the tablet		
Less than 20 cm	0.02	1.00
20 cm or more		2.85 (1.17–7.14)
Other Types of Headache		
Variables	**Value of p**	**PR adjusted (95% CI)**
Posture using the cell phone		
Semi-lying		
No	0.04	1.00
Yes		1.59 (1.02–2.49)

CI: Confidence Interval, PR: prevalence ratio

posture in the use of a cell phone, and semi-lying posture in the use of tablets associated with stress headaches. Whereas migraine proved to be associated with the gender, number of times a week watching television, number of hours a day using a game, posture semi-lying on the use of mobile phones, use cell phones at a distance of more than 20 cm, and use the tablet at a distance more than 20 cm. For all the other types of headaches, it was observed that there was an association only with the semi-lying posture while using a cell phone.

DISCUSSION

The results showed that the prevalence of primary headaches in students was 60.7%, corroborating the studies conducted in Turkey[7] and Saudi Arabia[9]. Concerning the type of headache, as in the literature, stress headaches and migraines occur most frequently among university students, regardless of gender[21-23].

With the multivariate analysis, the variables that remained significantly associated in the final model of the Poisson regression with the primary headache were female, white race, income, watching TV for more than three hours a day, playing videogames for more than three hours, using mobile in semi-lying posture, using a cell phone at a distance more than 20 cm, using a tablet, using a tablet in the sitting position, and using the tablet at a distance more than 20 cm. Regarding the type of headache, it was demonstrated that the variables, income, number of hours on TV, semi-lying posture in the use of cell phones, and semi-lying posture in the use of tablets associated with stress headaches. Whereas migraine proved to associate with gender, number of times a week watching television, number of hours a day using a game, semi-lying posture while using mobile phones, use cell phones at a distance of more than 20 cm, and use the tablet at a distance more than 20 cm. For all the other types of headaches, it was observed that there was an association only with the semi-lying posture in the use of the cell phone.

In the present study, the female gender was associated with primary headache and migraine, similar to other studies[22,24]. Some studies report that this difference in women is related to endocrine aspects and how they respond to stress and factors[22,25]. Concerning migraine, it is due to hormonal variations, mainly related to the menstrual cycle[26,27].

Corroborating other studies[28], the primary headache is associated with subjects of the white race. That is unlike the study of Dawn *et al.*[29], who found no association with black ethnicity. The difference by race is consistent with a higher level of platelets. The conjugating enzyme of tyramine p*henol sulfotransferase in black people* than in white people. High levels of p*henol sulfotransferases* can protect against the primary headache metabolizing suspect triggering dietetic substances, including tyramine[30].

Similar to a study in the United States[29,31], an income level of up to two minimum wages was associated with primary headache and migraine type, while another study found no association[32].

The higher prevalence of migraines in low-income groups is contrary to the common belief that it is associated with a higher socioeconomic status. It might be because the latter have more regular access to specialized professionals[33]. Although migraines may be more common in individuals of higher-income groups, clinical studies in the general population show that the prevalence of migraine increases as income decreases. The higher prevalence of migraines in low-income groups may be explained by the type of diet, stress, lack of access to healthcare services, and occupational and social factors.

Watching television and playing video games for more than three hours a day was associated with primary headaches, migraines, and stress headaches, corroborating another studie[34].

More time spent using these devices may lead to a decrease in free time for leisure activities. Improper postures for prolonged periods and overloading of the visual system due to excessive screen time triggers headaches[2].

The sitting posture, semi-lying posture, and the distance of the eyes to the mobile phone and tablet, more than 20 cm, were associated with three specific types of primary headaches. Several studies[35-38] have demonstrated the relationship between the duration and frequency of use of mobile phones and tablets and headaches. However, there is a shortage of studies on posture, mobile phone usage, and headaches. The combination of these postures and the distance between the equipment and the eyes is the reason for the forward head posture (FHP). This posture promotes an increase in the cervical vertebrae's flexion of the lower and upper thoracic regions and increases the extensions of the upper cervical vertebrae'. It also leads to an extension of the occiput in C1, hyperextension of the cervical spine, flattening of the lower cervical spine, elevation, and protrusion of the shoulders[39,40]. All these changes provoke an isometric muscle contraction in order to support the head, stretching of the supra-hyoid muscles, narrowing of the intervertebral foramina in lordotic areas of the cervical region, and abnormal compression joints in the upper zygoapophyseal joints and posterior portions of the intervertebral discs, resulting in craniofacial pain, headache, pain in the neck and shoulder pain, along with a decrease in the amplitude of the cervical movement, muscle stiffness and sensitivity, and degenerative changes[39].

The limitation of this study is that it is not representative of the whole population, focusing only on students in a private university in Bauru. Also, the questionnaire is based on self-reported responses for all variables, which increases the risk of recall bias. The presence or absence of primary headaches in the last twelve months, which generates nonspecific results, makes it challenging to identify the primary headache. The cross-sectional design of the study and the use of subjective data excluded the associated risk factors' causal link. No data were collected on how headache interfered with the instrumental activities of daily life, the psychosocial factors of university students, regarding dietary habits (coffee, chocolate, pepper, alcoholic beverages, processed foods, and others), and hormonal aspects (use of oral contraceptives, for example).

The main contribution and strength of this study relate to the use of validated questionnaires, the number of individuals interviewed, and the scarcity of data in Brazil.

It is concluded that there is a high prevalence of headaches among college students. The variables, income, number of hours on TV, semi-lying posture during cell phone use, and semi-lying posture when using tablets were associated with stress headaches. Whereas migraine proved to be associated with gender, number of times a week watching television, number of hours a day playing games, posture semi-lying while using mobile phones, use of cell phones at a distance more than 20cm, and using the tablet at a distance more than 20 cm. For all the other types of headaches, it was observed that there was an association only with the semi-lying posture in cell phone use.

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