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Chronic daily headache in Brazil: a nationwide population-based study

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The objectives of this study were to estimate the 1-year prevalence of chronic daily headache (CDH) and the degree of the association of CDH with some sociodemographic characteristics of the adult population of Brazil. This was a cross-sectional, population-based study. We conducted telephone interviews with 3848 people, aged 18–79 years, randomly selected from the 27 States of Brazil. The degree of the association was calculated through prevalence ratios, adjusted with Poisson regression by gender, age and some sociodemographic factors. The estimated 1-year gender- and age-adjusted prevalence of CDH was 6.9%. CDH was 2.4 times more prevalent in women, 1.72 times more in unemployed, 1.63 times more in subjects with high household income and two times greater in those who did not exercise. The overall prevalence of CDH in Brazil is high. CDH is significantly more prevalent in women, the unemployed, subjects with higher income, and in those who do not exercise. □*Chronic daily headache, chronic migraine, epidemiology, headache, prevalence*

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Introduction

Chronic daily headache (CDH) is an incapacitating medical condition, especially common in tertiary headache centres (1). The term includes a heterogeneous group of headache disorders, with head pain occurring ≥ 15 days per month for at least 3 months. The two most common subtypes of CDH are chronic migraine and chronic tension-type headache (CTTH) (2). In a recent review of 107 publications on the epidemiology of headache (3), only 12 reported on chronic headaches in adults, with a mean prevalence of 3%, ranging from 1.4% in Singapore (4) to 7.3% in Porto Alegre, Brazil (5). The only nationwide study of CDH was done in France (6). In Brazil, the prevalence of CDH has been reported only in some cities of the South and Southeast regions (5, 7, 8). To date, there have been no previous nationwide studies of CDH in our country.

The association of CDH with some sociodemographic factors, such as degree of education, marital status and household income, has been described in some studies (2, 9–13). The relationship between CDH and body mass index (BMI) has been studied by Scher et al. (10) and Bigal and Lipton (14). To our knowledge, the association of CDH with level of physical activity or with job status has not previously been studied.

The objectives of this study were to estimate the 1-year prevalence of CDH and the degree of association of CDH with some sociodemographic characteristics, including BMI and the frequency of physical activity, in a representative sample of the adult population of Brazil.

Methods

This was an observational, cross-sectional and population-based study. From September 2006 to

January 2007 telephone interviews were conducted with 3848 subjects (2307 female, 1541 male), aged 18 to 79 years, living in the 27 States of Brazil, encompassing its five geographical regions. The number of subjects was proportional to the population of each State/region. According to the 2000 Brazilian Census (15), Brazil then had 169 799 170 inhabitants (107 042 030 aged 18–79 years).

The sample size was calculated using Epi Info 6.04b software (Centers for Disease Control, Atlanta, GA, USA), for an expected CDH prevalence of $6 \pm 1.2\%$ and a 95% confidence interval (CI). We have chosen the 6% expected rate because this is close to the estimated 1-year prevalence in previous Brazilian studies (5, 7). The calculated number of required respondents was 1502. We added a design effect of 2.5 in order to have enough participants, even in less populated States/regions, giving 3755 subjects to be interviewed.

Six trained lay interviewers, at the Execução Contact Centre (Florianopolis, Brazil), a national data-gathering firm, administered the structured questionnaire. From a database of all households with fixed telephones, in each State, a random digit dialling software made telephone calls until the number of responders was achieved. In Brazil, according to the 2006 National Survey of Households Sample (16), 97.9% of households with an income of ≥ 5 Brazilian Minimum Wages (BMW) have a fixed telephone. In households of an income of < 5 BMW, 76.9% have a fixed telephone in the South, Southeast and Central-West regions, but only 50.2% in the North and Northeast regions. The interview was conducted with whoever answered the phone, if eligible. An eligible respondent was 18–79 years old, a permanent resident of the household and mentally capable of answering the questions. Of those contacted, 50% agreed to participate. We could not gather any sociodemographic information from those who refused to collaborate. As we anticipated that more women would answer the phone, whenever 60% of the total number of interviews, in each State, was achieved with women, from that time on we would interview only men.

All interviews, including the verbal informed consent, which was read to subjects who agreed to participate, were recorded. Some of them were reviewed at random by the senior author (L.P.Q.) to ensure that the interviews were adequate. The questionnaire was not validated, but it was based on one previously used in a local study (7) and had been tested satisfactorily in 50 telephone interviews with headache subjects. It included questions about sociodemographic population characteristics, as well as about headache, based on the International Classification of Headache Disorders, 2nd edn (ICHD-II) (17). In order to minimize recall bias, the complete interview was done only with subjects who reported headaches within the last year. They were told to answer the questions based on their most frequent type of headache, if they had more than one type. Therefore, we gave only one diagnosis for each participant. The diagnosis of CDH was made when respondents reported headaches for ≥ 15 days per month, including the last 3 months. Migraine-type CDH was diagnosed when subjects fulfilled ICHD-II criteria for migraine with or without aura or probable migraine, and tension-type CDH when they fulfilled ICHD-II criteria for tension-type headache (TTH) or probable TTH.

Age was divided into six categories: 18–29, 30–39, 40–49, 50–59, 60–69 and 70–79 years. Education level was categorized by years of school: < 8 (elementary), 8-11 (high-school) and > 11 (college). Marital status was grouped as: single, married, divorced and widowed. Household income was grouped as: < 5 BMW, 5–9.9 BMW and ≥ 10 BMW. Five job conditions were defined: working, retired, unemployed, housewife and student. BMI was calculated based on the subject's stated weight and height at the time of the interview. It was stratified into three groups: < 25 (normal/underweight), 25–29.9 (overweight) and ≥ 30 (obese). Physical activity was grouped according to the frequency of regular physical exercise, in days per week: none, 1–2 and 3–7.

One-year prevalence rates were calculated, with 95% CI. The overall prevalence was adjusted by gender and age, according to the distribution of the Brazilian population (15). The degree of the association was calculated through prevalence ratios, adjusted with Poisson regression by gender, age, education level, marital status, household income, job status, BMI and physical activity. The Statistical Analysis System (SAS, Cary, NC, USA) software was used to analyse the data.

This study was approved by the Ethics Committee on Research of the Hospital Israelita Albert Einstein, São Paulo, Brazil.

Results

A total of 8168 households were contacted, but only in 4075 did the person who answered the call agree to participate. The response rate was 49.9% (51.9% for women, 46.5% for men). In 227 the survey was not completed; some were excluded because respondents were not eligible, and others because

Table 1 Comparison of demographic characteristics, gender and age, and Brazilian geographic regions among the 3848 respondents with those of the Brazilian census population

	Respondents ($N = 3848$)		Brazilian population* (%)
	n	%	
Gender			
Female	2307	60.0	51.5
Male	1541	40.0	48.8
Age, years			
18–29	911	23.7	34.8
30–39	785	20.4	23.6
40–49	939	24.4	18.0
50–59	692	18.0	11.7
60–69	357	9.3	7.6
70–79	164	4.2	4.3
Regions			
South	568	14.8	14.8
Southeast	1641	42.6	42.6
Central-West	263	6.8	6.9
Northeast	1081	28.1	28.1
North	295	7.7	7.6

*Source: Instituto Brasileiro de Geografia e Estatística. 2000 Brazilian Census.

they did not complete the interview. Therefore, the questionnaire was filled out in 3848 households.

Table 1 shows the distribution of the survey participants by gender and age, as well as the geographical regions where they live, and compares it with the Brazilian national population census (15). Women (60%) and subjects 18–39 years old were overrepresented, in comparison with the estimated Brazilian population. The mean age was 42.2 ± 14.8 years. Some other sociodemographic characteristics of the respondents are shown in Table 2.

Headache within the last year was reported by 2790 subjects. The estimated 1-year crude and gender- and age-adjusted prevalence of CDH, its subtypes and episodic headache is presented in Table 3. Seventy-two per cent of subjects with CDH had the diagnosis of migraine-type CDH, and only 26% had that of tension-type CDH. The prevalence of CDH was 9.5% in women and 4.0% in men, with a 2.4:1 female/male ratio. Prevalence was highest at the ages of 30–39 years and lowest after 70 years of age, overall and in both genders (Fig. 1). The prevalence of CDH in the five geographical regions of Brazil were 6.0% in the South, 6.2% in the Southeast, 7.7% in the Northeast, 10.2% in the North and 11.8% in the Central-West.

Table 4 shows the association of CDH with some sociodemographic characteristics of the population, both crude and adjusted. Subjects with a household income of ≥ 10 BMW had 1.63 times more CDH than those with a family income of < 5 BMW. CDH was 72% more prevalent in unemployed subjects than in those with paid work. Subjects who reported 3–7 days per week of regular physical activity had significantly less CDH than those without any activity. There was no significant relationship between CDH prevalence and educational level, marital status or BMI.

Table 2 Distribution of the respondents, by some sociodemographic characteristics ($N = 3848$)

Sociodemographic characteristic	*n*	%
Education level, years of school		
< 8	792	20.6
8–11	2028	52.7
> 11	1025	26.6
Not stated	3	0.1
Marital status		
Single	1110	28.8
Married	2232	58.0
Divorced	266	6.9
Widowed	234	6.1
Not stated	6	0.2
Household income, BMW		
< 5	1629	42.3
5–9.9	704	18.3
≥ 10	445	11.6
Not stated	1020	27.8
Job status		
Working	2146	55.8
Retired	504	13.1
Unemployed	380	9.9
Housewife	598	15.5
Student	214	5.5
Not stated	6	0.2
BMI		
< 25	2115	55.0
25–29.9	1147	29.8
≥ 30	484	12.6
Not stated	102	2.6
Physical activity, days per week		
None	2182	56.7
1–2	460	12.0
3–7	1204	31.3
Not stated	2	0.0

BMW, Brazilian minimum wages; BMI, body mass index.

Discussion

This is the first nationwide epidemiological study of CDH in Brazil. We have interviewed subjects from its five geographical regions, in all the 27

Table 3 Estimated 1-year crude and gender- and age-adjusted prevalence of chronic daily headache (CDH) and its subtypes, and episodic headache, with 95% CI ($N = 3848$)

		Crude prevalence	Adjusted prevalence*	
Diagnosis	*n*	%	%	95% CI
Chronic daily headache	280	7.3	6.9	6.1,7.7
Migraine-type CDH	206	5.4	5.0	4.3,5.7
Tension-type CDH	66	1.7	1.8	1.4,2.2
Other CDH	8	0.2	0.1	0.0,0.2
Episodic headache	2510	65.2	65.3	62.7,67.9
No headache	1058	27.5	27.8	26.1,29.5

*Adjusted for gender and age. CI, confidence interval.

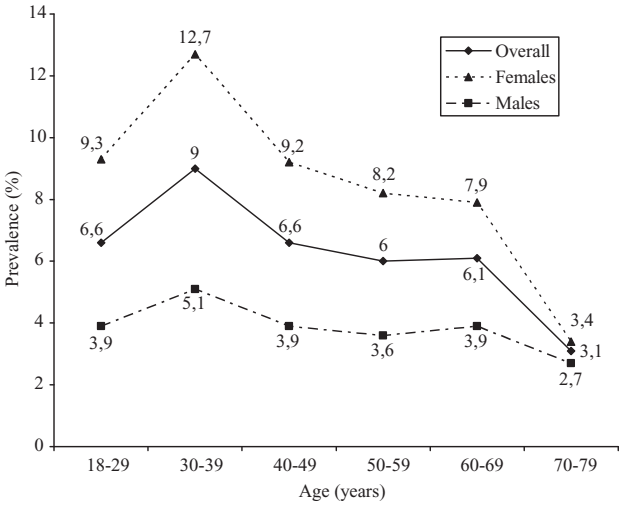

Figure 1 Estimated 1-year prevalence of chronic daily headache, by age. Overall (gender-adjusted), women and men.

Brazilian States. As more women than men were contacted, and the proportion of respondents in each age group was different from the Brazilian population, we have adjusted the overall prevalence of headache types by gender and age. The participation rate was low (50%). Since headache sufferers may be more likely to respond to a headache survey, this might overestimate headache prevalence. To minimize recall bias, we completed the whole questionnaire only with subjects who reported at least one headache within the last year. Although some patients may have had more than one type of headache, in this study we made just one diagnosis, based on their most frequent type of headache. This might overestimate the prevalence of migraine-type CDH, because people tend to remember their more severe headaches, which are usually migraine.

Probably because this was a telephone-interview survey, 1070 subjects refused to state their income. However, the majority (2778) did. We believe that the non-respondents were probably distributed equally among the three household income categories, because there is no reason why they would be concentrated in one specific group. We have previously shown (7) that the answer to this question is reliable, because declared income and electricity household consumption were comparable. In Brazil, not all households with an income of < 5 BMW have a fixed telephone. This is particularly true in the North and Northeast regions, where only 50% of households have one. In order to increase the number of participants in this group, we added to the sample number a design effect of 2.5. We chose to conduct a telephone-interview study because it would be too expensive to make a door-to-door survey in such a large country. Moreover, we believe that a mailed-questionnaire survey would have had a low response rate, because this is not commonly done in Brazil and many subjects might not have completed the questionnaire due to illiteracy.

In our study, the estimated 1-year prevalence of CDH is 6.9%. This is higher than the mean global prevalence (3%) (3), but similar to some rates previously described in Brazil: 7.3% in Porto Alegre (5) and 6.4% in Florianopolis (7). Fernandes (8), however, reported a prevalence of only 2.6% in Ribeirao Preto. Brazil is a very large country, with different cultures and socioeconomic status in its five geographical regions. This fact may explain the dissimilar prevalence rates of CDH among Brazilian regions. In the only previously published nationwide study of CDH, in France (6), the prevalence was 3.0%. Prevalence rates of CDH have also been estimated in specific areas of many other countries: 2.6% in Chile (11), 3.0 and 4.8% in Denmark (18, 19), 1.7% in Ethiopia (20), 2.1% in Japan (21), 3.7% in the Netherlands (9), 2.3% in Norway (22), 1.4% in Singapore (4), 4.7% in Spain (23), 3.2% in Taiwan (24) and 2.2 and 4.1% in the USA (2, 12). The mean prevalence of CDH in all 16 studies, including this one, is 3.4%.

In the current study, most (72%) subjects with CDH described migrainous features. This is similar to our previous finding (80%) in Florianopolis, Brazil (7). This preponderance of migraine-type CDH has also been reported by Lantéri-Minet et al.

Table 4 Distribution of overall 1-year crude prevalence of chronic daily headache, and crude and adjusted prevalence ratios, with 95% CI, by education level, marital status, household income, job status, BMI and physical activity ($N = 280$)

	Crude prevalence		Prevalence ratio	
			Crude	Adjusted*
	n	%	PR (95% CI)	PR (95% CI)
Education level, years of school				
< 8	59	7.5	1.00	1.00
8–11	168	8.3	1.11 (0.84,1.48)	1.43 (0.98,2.10)
> 11	53	5.2	0.69 (0.48,0.99)	0.88 (0.53,1.45)
Marital status				
Single	75	6.8	1.00	1.00
Married	159	7.1	1.05 (0.81,1.37)	0.89 (0.62,1.26)
Divorced	32	12.0	1.78 (1.20,2.63)	1.48 (0.92,2.38)
Widowed	14	6.0	0.89 (0.51,1.54)	0.90 (0.50,1.65)
Household income, BMW				
< 5	131	8.0	1.00	1.00
5–9.9	48	6.8	0.85 (0.62,1.17)	1.00 (0.72,1.39)
≥ 10	43	9.7	1.20 (0.87,1.67)	1.63 (1.13,2.34)
Job status				
Working	136	6.3	1.00	1.00
Retired	22	4.4	0.69 (0.44,1.07)	0.69 (0.39,1.23)
Unemployed	45	11.8	1.87 (1.36,2.57)	1.72 (1.19,2.49)
Housewife	58	9.7	1.53 (1.14,2.05)	1.22 (0.84,1.77)
Student	18	8.4	1.33 (0.83,2.13)	1.52 (0.76,3.05)
BMI				
< 25	156	7.4	1.00	1.00
25–29.9	77	6.7	0.91 (0.70,1.18)	1.02 (0.76,1.37)
≥ 30	36	7.4	1.01 (0.71,1.43)	1.03 (0.68,1.55)
Physical activity, days per week				
None	193	8.9	1.00	1.00
1–2	30	6.5	0.74 (0.51,1.07)	0.79 (0.52,1.21)
3–7	57	4.7	0.54 (0.40,0.71)	0.50 (0.36,0.70)

*Adjusted for gender, age, education level, marital status, household income, job status, BMI and physical activity.
CI, confidence interval; PR, prevalence ratio; BMW, Brazilian minimum wages; BMI, body mass index.

(6), Castillo et al. (23) and Lu et al. (24). Many authors have described only the CTTH prevalence (4, 5, 8, 11, 12, 18–21).

The association of CDH with a lower educational level has been reported in some studies (2, 9, 10, 12, 13). In the present study, we have also noted a tendency of lowest prevalence of CDH in higher educated people. This association was significant in the crude prevalence ratio, but it lost significance with the adjusted model. We have found a significant direct association of CDH prevalence with household income. This association was studied by Lavados and Tenhamm (11), in Santiago, Chile, who did not find any significant relationship. We have noted that unemployed workers had 1.72 times more CDH than paid workers. To our knowledge, this has never been described before. Scher et al. (10) reported that subjects previously married had significantly more CDH than married ones. We have also observed a tendency of more CDH in divorced/separated subjects, in the crude prevalence ratio, but this was not confirmed in the adjusted analysis. Obesity has been associated with CDH in two North American studies (10, 14). Bigal and Lipton (14), however, mentioned that obesity was significantly associated with transformed migraine, but not with CTTH. In our study, we found no significant relationship between BMI and the prevalence of CDH. We have noticed that CDH was significantly less prevalent in subjects who reported 3–7 days of exercise per week (50% less CDH), compared with those who do not exercise regularly, independently of the other sociodemographic factors, including BMI. This association has never been described before. The beneficial effect of regular exercise on migraine has been suggested in

the medical literature (25, 26). As most of our CDH patients reported migrainous features, this fact might in part explain our findings. As we did not study the timing between the start of CDH and the start of physical activity, any inference of causality is precluded.

In conclusion, the overall prevalence of CDH in Brazil is high, at 6.9%. CDH is significantly more prevalent in women, in unemployed workers, in subjects with higher income, and in those who do not exercise regularly, independently of their BMI.

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