

## Research Submission

# A Nationwide Population-Based Study of Tension-Type Headache in Brazil

Luiz P. Queiroz, MD, MSc; Mario F.P. Peres, MD, PhD; Elcio J. Piovesan, MD, MSc;  
Fernando Kowacs, MD, PhD; Marcello C. Ciciarelli, MD, PhD; Jano A. Souza, MD, PhD;  
Elivora Zukerman, MD

**Objectives.**—To estimate the 1-year prevalence of tension-type headache (TTH) and the degree of the association of TTH with some sociodemographic characteristics of a representative sample of the adult population of Brazil.

**Methods.**—This was an observational, cross-sectional, population-based study. We conducted telephone interviews on 3848 people, aged 18-79 years, randomly selected from the 27 states of Brazil. Trained lay interviewers administered the structured questionnaire. It included questions about the sociodemographic characteristics of the population, as well as questions about headache. The degree of the association was calculated through prevalence ratios, adjusted with Poisson regression by gender, age, years of education, marital status, household income, job status, body mass index (BMI), and physical exercise.

**Results.**—The estimated 1-year gender- and age-adjusted prevalence of TTH was 13.0% (95% CI: 11.8-14.2%); 15.4% in males and 9.5% in females. The prevalence of probable TTH was 22.6% (95% CI: 21.1-24.1%). Most (86.2%) subjects reported episodic TTH; 6.4% had chronic TTH. The prevalence was higher at 18-29 years of age (16.2%). TTH was 1.6 times more prevalent in men, and 1.54 times more in subjects with more than 11 years of education. There was no significant association of TTH with marital or job status, household income, BMI, and physical activity.

**Conclusion.**—This is the first nationwide epidemiological study of TTH in Brazil. The overall prevalence of TTH in Brazil is low, at 13%. TTH is significantly more prevalent in males and subjects with higher education level.

**Key words:** associated factor, epidemiology, headache, prevalence, tension-type headache

**Abbreviations:** BMI body mass index, BMW Brazilian minimum wages, ICHD-2 International Classification of Headache Disorders – Second Edition, TTH tension-type headache, 95% CI 95% confidence interval

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From the Universidade Federal de Santa Catarina—Neurology Department, Florianópolis, Brazil (L. Queiroz); Universidade Federal de São Paulo—Neurology Department, São Paulo, Brazil (M. Peres); Universidade Federal do Paraná—Neurology Department, Curitiba, Brazil (E.J. Piovesan); Fundação Faculdade Federal de Ciências Médicas—Neurology Department, Porto Alegre, Brazil (F. Kowacs); Universidade de São Paulo—Neurology Department, São Paulo, Brazil (M. Ciciarelli); Universidade Federal Fluminense—Neurology Department, Niterói, Brazil (J. Souza); Hospital Israelita Albert Einstein—Neurology Department, São Paulo, Brazil (E. Zukerman).

Address all correspondence to L.P. Queiroz, Universidade Federal de Santa Catarina—Neurology Department, Rua Presidente Coutinho, 464-88015-231 Florianópolis, SC, Brazil.

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## INTRODUCTION

Headache is one of the most common and disabling disorders in medical practice. Although tension-type headache (TTH) is generally considered the most frequent type of primary headache, there are not many epidemiological studies about it. In a recent review of 107 publications on the epidemiology of headache,<sup>1</sup> only 12 were about TTH. In these studies, the mean prevalence in adults was 42%, ranging from 12.9% in Singapore<sup>2</sup> to 86.5% in Denmark.<sup>3</sup> The only nationwide studies of TTH were conducted in

*Conflict of Interest:* None

Canada,<sup>4</sup> Germany,<sup>5</sup> and Korea.<sup>6</sup> Two of them<sup>4,6</sup> were done by telephone interview.

In Brazil, which is a very large country with different cultures and socioeconomic status in its 5 geographical regions, the prevalence of TTH has been reported only in some cities of the South and Southeast regions.<sup>7-9</sup> To date, there have been no nationwide studies of TTH in our country.

The association of TTH with sociodemographic factors, such as degree of education, marital status, household income, and job status, has been described in some studies.<sup>5,10-15</sup> The association of severe episodic TTH with the body mass index (BMI) was studied by Bigal et al,<sup>16</sup> and with physical activity by Rasmussen.<sup>17</sup>

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

## METHODS

This is an observational, cross-sectional, population-based study. From September 2006 to January 2007, we conducted telephone interviews on 3848 subjects (2307 females and 1541 males), aged 18-79 years, from the 27 states of Brazil, in its 5 geographical regions, in proportion to the population of each state/region. According to the 2000 Brazilian Census,<sup>18</sup> Brazil had 169,799,170 inhabitants (107,042,030 from 18 to 79 years of age).

The sample size was calculated with the Epi Info 6.04b software, for an expected TTH prevalence of  $20 \pm 2\%$ , and a 95% confidence interval (95% CI). We have chosen the 20% expected rate because this is close to the estimated 1-year prevalence in a previous Brazilian study.<sup>8</sup> The calculated number of required respondents was 1537. We have added a design effect of 2.5, in order to have a good number of participants, even in less populated States/regions, totaling 3843 subjects to be interviewed.

Six trained lay interviewers, at the Execução Contact Center (Florianópolis, 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-dial software made telephone calls, until the number of responders was accomplished. We have made 3 attempts to call any selected telephone number, in different times of the day, before giving up. In Brazil, according to the 2006 National Survey of Households Sample,<sup>19</sup> 97.9% of the households with an income of  $\geq 5$  Brazilian minimum wages (BMW) have a fixed telephone. In households of an income of less than 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. Fifty percent of the people contacted agreed to participate. We could not get any sociodemographic information from those who refused to collaborate. As we anticipated that more women would answer the phone calls, whenever 60% of the total number of interviews, in each state, was achieved with females, from that time on we would interview only males.

All the interviews, including the verbal informed consent, which was read to the subjects who agreed to participate, were recorded. Some of them were reviewed at random by the senior author (L.P.Q.), to assure that the interviews were of good quality. The questionnaire had not been validated, but it was based on one previously used in a local study<sup>8</sup> and had been tested satisfactorily in 50 telephone calls with headache subjects. It included questions about the sociodemographic characteristics of the population, as well as questions about headache, based on the second edition of the International Classification of Headache Disorders (ICHD-2).<sup>20</sup> In order to minimize recall bias, the complete interview was done only with subjects who reported headaches within the last year. TTH was diagnosed when all ICHD-2 criteria were fulfilled. The diagnosis of probable TTH was given when all criteria were fulfilled except one. Chronic TTH was diagnosed when respondents who fulfilled all ICHD-2 criteria for TTH reported 15 or more days of headache per month. We did not differentiate between frequent and infrequent TTH. Subjects 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.

Age was divided into 6 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 in: single, married, divorced, and widowed. Household income, by BMW: <5, 5-9.9, and  $\geq 10$ . Five job conditions were defined: working, retired, unemployed, housewife, and student. BMI was calculated based on the subject's self-reported weight and height (weight/height<sup>2</sup>), at the time of the interview. It was stratified into 3 groups: <25 (normal/underweight), 25-29.9 (overweight), and  $\geq 30$  (obese). Self-reported weight and height were found to constitute reliable data in a previous Brazilian study.<sup>21</sup> 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.<sup>18</sup> 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 analyze the data.

The project of 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 picked up the telephone agree to participate. The response rate was 49.9% (51.9% for women, and 46.5% for men). In 227, the survey was not completed; some were excluded because respondents were not eligible, and others because they did not complete the interview. Therefore, we had the questionnaire filled out in 3848 households.

In Table 1 we show the distribution of the survey participants, by gender and age, as well as the geo-

**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

†Instituto Brasileiro de Geografia e Estatística. 2000 Brazilian Census.<sup>18</sup>

graphical regions where they live, and we compare it with the Brazilian national population census.<sup>18</sup> We have interviewed more females (60%) and more subjects with 18-39 years of age than the estimated Brazilian population. The mean age was  $42.2 \pm 14.8$  years. Some other sociodemographic characteristics of the respondents are shown in Table 2.

Headache within the previous 12 months was reported by 2790 subjects. The estimated 1-year crude and gender- and age-adjusted prevalence of TTH and other types of headache are presented in Table 3. If we grouped together TTH and probable TTH, the prevalence would be 35.6%. The prevalence of TTH was 15.4% in males and 9.5% in females, with a 1.6 male/female ratio. The prevalence peaked at the ages of 18-29 years, overall (16.2%, gender-adjusted) and in females (14.5%); and of 30-39 years in males (18.2%) (Fig.). Prevalence rates of TTH in the 5 geographical regions of Brazil were 14.1% in the South, 14.0% in the Southeast, 10.3% in the Northeast, 6.8% in the North, and 6.1% in the Central-West. In Table 4, we can see that most (86.2%) subjects with

**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

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

TTH have an episodic subtype. The estimated nationwide prevalence of episodic TTH was 10.2% and of chronic TTH was 0.8%.

Table 5 shows the association of TTH with some sociodemographic characteristics of the population, crude and adjusted. Subjects with more than 11 years of education reported 1.54 times more TTH than those with less than 8 years. There was no significant relationship between TTH prevalence with marital or job status, household income, BMI, or physical activity.

## DISCUSSION

This is the first nationwide epidemiological study of TTH in Brazil. We have interviewed subjects from its 5 geographical regions, in all 27 Brazilian states. As we contacted more women than men, 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. 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.

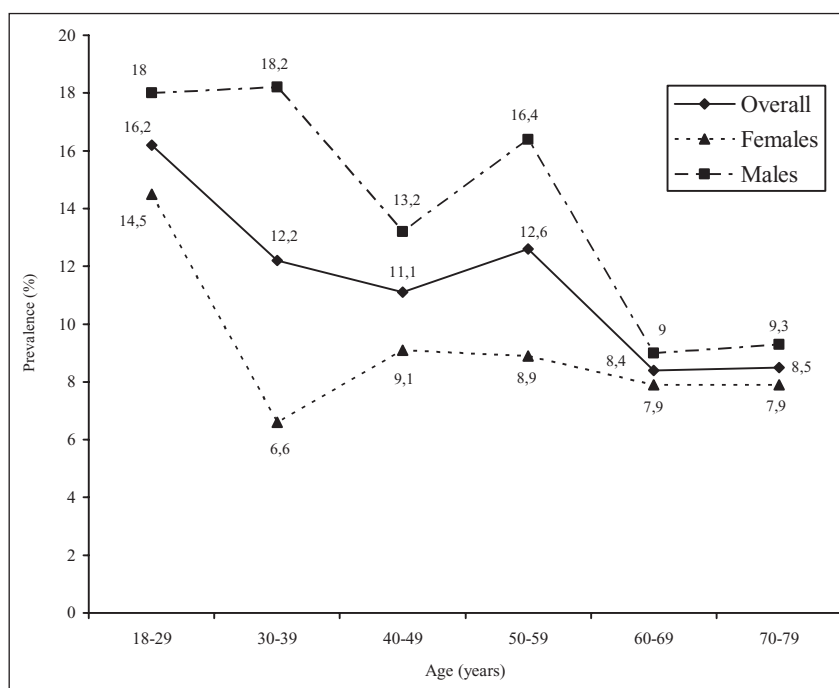
Because this is a telephone-interview survey, many (1070) subjects refused to state their income. However, most (2778) of them did. We believe the non-respondents may be distributed equally among the 3 household income categories, because there is

**Table 3.—Estimated 1-Year Crude and Gender- and-Age-Adjusted Prevalence of Tension-Type Headache and Other Types of Headache, With 95% CI**

Diagnosis	Crude prevalence		Adjusted prevalence†	
	n	%	%	95% CI
Tension-type headache	457	11.9	13.0	11.8-14.2
Probable tension-type headache	857	22.3	22.6	21.1-24.1
Non-tensional headache	1476	38.3	36.6	34.7-38.5
No headache	1058	27.5	27.8	26.1-29.5
Total	3848	100.0	100.0	—

†Adjusted for gender and age.

CI = confidence interval.



**Figure.—Estimated 1-year prevalence of tension-type headache, by age. Overall (gender-adjusted), females, and males.**

no reason why they would be in one specific group. We have shown in a previous article<sup>8</sup> that the answer to this question is reliable, because we have compared the declared income with the electricity consumption, and the results were comparable. In Brazil, not all households with income of less than 5 BMW have a fixed telephone. This is particularly true in the North and Northeast regions, where only 50% of the households have one. In order to increase the number of participants in this group, we have added to the sample number a design effect of 2.5. We chose to make a telephone-interview study because it would be too expensive to make a door-to-door survey in

such a large country. We believe that we would have had a low response rate in a mailed questionnaire survey, 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 TTH was 13%. This is similar to the 12.9% described by Ho and Ong<sup>2</sup> in Singapore. This rate ranges widely in the literature, though. Wong et al<sup>22</sup> reported only 2%, in Hong Kong, and Lyngberg et al,<sup>3</sup> in Denmark, as much as 86.5%. In the 3 nationwide studies, the prevalence of TTH was 36% in Canada,<sup>4</sup> 38.3% in Germany,<sup>5</sup> and 16.2% in Korea.<sup>6</sup> In the previous

**Table 4.—Proportion and Estimated Crude 1-Year Prevalence of the Subtypes of Tension-Type Headache (TTH), With 95% CI**

Diagnosis	Proportion (n = 457)		Crude prevalence (n = 3848)	
	n	%	%	95% CI
Episodic TTH	394	86.2	10.2	9.2-11.2
Chronic TTH	29	6.4	0.8	0.5-1.1
Frequency not declared	34	7.4	0.9	0.6-1.2

**Table 5.—Distribution of Overall 1-Year Crude Prevalence of Tension-Type Headache, and Crude and Adjusted Prevalence Ratios, With 95% CI, by Education Level, Marital Status, Household Income, Job Status, BMI, and Physical Activity (n = 457)**

	Crude prevalence		Prevalence ratio	
	n	%	Crude PR (95% CI)	Adjusted† PR (95% CI)
Education level (years of school)				
<8	65	8.2	1.00	1.00
8-11	237	11.7	1.42 (1.10-1.85)	1.26 (0.90-1.75)
>11	155	15.1	1.84 (1.40-2.42)	1.54 (1.07-2.21)
Marital status				
Single	161	14.5	1.00	1.00
Married	246	11.0	0.76 (0.63-0.91)	0.85 (0.65-1.11)
Divorced	25	9.4	0.65 (0.43-0.97)	0.89 (0.54-1.45)
Widowed	25	10.7	0.74 (0.50-1.10)	1.07 (0.63-1.80)
Household income (BMW)				
<5	191	11.7	1.00	1.00
5-9.9	80	11.4	0.97 (0.76-1.24)	0.86 (0.67-1.10)
≥10	60	13.5	1.15 (0.88-1.51)	0.97 (0.73-1.29)
Job status				
Working	275	12.8	1.00	1.00
Retired	54	10.7	0.84 (0.64-1.10)	1.33 (0.88-2.01)
Unemployed	41	10.8	0.84 (0.62-1.15)	0.82 (0.57-1.20)
Housewife	51	8.5	0.67 (0.50-0.88)	1.22 (0.84-1.76)
Student	36	16.8	1.31 (0.96-1.80)	1.03 (0.66-1.62)
BMI				
<25	260	12.3	1.00	1.00
25-29.9	128	11.2	0.91 (0.74-1.11)	0.90 (0.71-1.15)
≥30	64	13.2	1.08 (0.83-1.39)	1.11 (0.82-1.51)
Physical activity (days per week)				
None	245	11.2	1.00	1.00
1-2	61	13.3	1.18 (0.91-1.53)	1.12 (0.82-1.52)
3-7	151	12.5	1.12 (0.92-1.35)	1.14 (0.91-1.43)

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

Brazilian surveys, the estimated prevalence rates were 16.8% in Ribeirão Preto,<sup>9</sup> 22.9% in Florianópolis,<sup>8</sup> and 66.2% in Porto Alegre.<sup>7</sup> This great variation of the TTH prevalence in these 3 studies may reflect real dissimilarities between populations, but also may be due to some methodological differences among them. In the present study, the different prevalence rates among Brazilian regions are possibly due to different socioeconomic and cultural status between them. The great majority (86.2%) of subjects with TTH reported episodic headaches, which is also described by some authors.<sup>2,3,9,12-15</sup>

We have found a higher prevalence of TTH in the age group of 18-29 years, with decreasing prevalences with increasing age. The same pattern was noted in

our previous study in Florianópolis,<sup>8</sup> and also by Rasmussen,<sup>15</sup> Cheung,<sup>10</sup> and Alders et al.<sup>23</sup> In our sample, TTH was 1.6 times more prevalent in men. The preponderance of TTH in males was also reported by some authors,<sup>6,8</sup> but a female preponderance was described by many others.<sup>3,4,7,10,11,13-15,22-25</sup>

We have noted that TTH was 1.54 times more prevalent in subjects with more than 11 years of education than in those with less than 8 years of school. This was also described by Schwartz et al,<sup>13</sup> in the USA, and by Köseoglu et al,<sup>12</sup> in Turkey. Cheung,<sup>10</sup> Göbel et al,<sup>5</sup> Merikangas et al,<sup>11</sup> and Rasmussen<sup>15</sup> did not find any relationship between educational level and TTH. Lavados and Tenhamm<sup>14</sup> reported that there was no variation in TTH prevalence by socio-



economic status. Bigal et al<sup>16</sup> described no significant association between severe episodic TTH and the BMI. Rasmussen<sup>17</sup> noted a significantly higher prevalence of TTH in men with low physical activity, which was not detected in our study.

In conclusion, the overall prevalence of TTH in Brazil is low, at 13%. TTH is significantly more prevalent in males and in subjects with higher education level.

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