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Research Submission

The Prevalence of Migraine and Probable Migraine in a Brazilian Favela: Results of a Community Survey

Giancarlo Lucchetti, MD; Mario F. P. Peres, MD, PhD, FACP

Objectives.—The objectives of the present study were to estimate the 1-year prevalence of primary headaches and the role of select socio-demographic aspects in a representative sample of adults living in a Brazilian shanty town.

Background.—Some socio-demographic factors, such as marital status, income, education, and job status have been described in studies with contentious results. Nevertheless, few studies have assessed the prevalence of headache and the role of socio-demographic aspects in very low-income communities.

Methods.—A cross-sectional, population-based study was undertaken. Door-to-door interviews with 383 people were conducted. Individuals were aged greater than 18 years, randomly selected from the "Paraisopolis" shanty town in São Paulo, Brazil. The degree of the association was calculated through prevalence ratios and adjusted with backward logistic regression by gender, age, and some socio-demographic factors, including living conditions.

Results.—The estimated 1-year prevalence of headache, migraine, chronic migraine, and tension-type headache were 47% (CI 95%: 39.5-52.6%), 20.4% (CI 95%: 16.6-24.9%), 8.4% (CI 95%: 6.1-12.0%), and 6.2% (CI 95%: 3.3-9.8%), respectively. Migraine was more prevalent in women and among employed people. No other relationship was found. The overall prevalence of migraine and chronic migraine in this very low-income community were high and migraine was associated with gender and job status.

Conclusion.—The overall prevalence of migraine and chronic migraine in this very low-income community were high and tension-type headache was low. A paradox was noted in the employment status and income association, one would expect higher levels of migraine in a low-income population, but higher numbers were found in those employed vs unemployed. These findings will need to be replicated in other population samples.

Key words: headache, income, migraine, tension-type headache, employment

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Primary headaches are common conditions with several studies demonstrating high prevalence in different populations.[1-4]

According to a review of 107 previously published articles on headache epidemiology, the mean prevalence of migraine in adults was 11% (ranging from 1% to 27.5%) and the mean prevalence of tension-type headache (TTH) was 42% (ranging from 12% to 86.5%).[1]

Some socio-demographic factors, such as marital status, income, education, and job status have been described in previous studies with controversial results.[3,5,6] Nevertheless, few studies have assessed the prevalence of headache in low-income communities, such as those carried out by Bensenor et al that revealed a higher prevalence of migraine among the elderly from a low-income community.[7]

From the Federal University of São Paulo, São Paulo, Brazil (G. Lucchetti, and M.F.P. Peres); Albert Einstein Hospital, São Paulo, Brazil (M.F.P. Peres).

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Address all correspondence to G. Lucchetti, Rua Dona Elisa 150, apto. 153 B, São Paulo 01155030, Brazil. Email: g.lucchetti@yahoo.com.br

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In Brazil, the epidemiology of primary headaches has been recently studied.[3,8,9] Migraine affected 15.2%, TTH 13%, and chronic daily headaches 6.9% of the population. Socio-economic aspects were implicated in the results such as economic, educational status, and geographic regions. Socio-cultural differences are marked in Brazil; 11% of São Paulo habitants live in a very low socio-economic urban agglomeration called "favelas" or shanty towns.[10]

The objectives of the present study were to estimate the 1-year prevalence of primary headaches and establish the role of certain socio-demographic characteristics in a representative sample of adults living in a Brazilian shanty town.

METHODS

An observational, cross-sectional study was undertaken. We conducted door-to-door interviews with 439 subjects aged 18 years or older, from a Brazilian shanty town named Paraisópolis Community, located in the city of São Paulo, Brazil. This informal settlement has approximately 60,000 habitants[11] and 11,223 houses,[12] occupying 85 hectares in the Morumbi district (south-west São Paulo, Brazil). According to a recent publication, at least 52.4% of the population had an income of less than 3 BMW (Brazilian minimum wage) and 24% have a income of less than 1 BMW.[13] The name Paraisopolis means "Paradise City" in Portuguese.

The sample size was calculated with Raosoft sample size calculator (http://www.raosoft.com/samplesize.html). A sample of 245 participants was required to obtain a 95% confidence interval of ±5% around a headache prevalence estimate of 20%. We selected the 20% expected rate because it was close to the estimated 1-year prevalence reported in previous Brazilian studies.[8,14]

We randomly selected households according to the sectors included in the Albert Einstein Family Health Program Number 2. This program had 34 Family Health agents and included approximately 3400 households (100 per agent). Ten agents and 45 households for each agent were then randomly selected (for a response rate of approximately 60% – 270 participants – with the exclusion of non-eligible). Eleven households were not evaluated by the agents, leaving 439 for final analysis.

Trained agents from the Family Health Program presented the study objectives to the household resident and carried out every interview. If eligible, the resident was invited to participate. Only the person that answered the door to the agent was invited to participate. If this person was not eligible we asked for another eligible person in the household (we interviewed only 1 person per household). After the agreement, the volunteer signed a written inform consent. An eligible respondent had to be aged greater than 18 years, a permanent resident of the household, and mentally capable of answering the questions.

The questionnaire was read to the participant by the interviewer. This questionnaire was based on one previously used in other study.[15] A test/retest reliability validation was carried out in 15% of the interviews; diagnoses were also double-checked when the patients came for an office visit performed by a neurologist trained in headache disorders.

The questionnaire included questions about socio-demographic characteristics of the population, as well as, questions about headache based on the Second Edition of the International Classification of Headache Disorders (ICHD-II). Migraine was diagnosed when all ICHD-II criteria were fulfilled and probable migraine diagnosis was made when all criteria but 1 were fulfilled. TTH was diagnosed when all ICHD-II criteria were fulfilled (infrequent episodic tension-type headache: at least 10 episodes occurring on <1 day per month on average [<12 days per year] and frequent episodic tension-type headache: at least 10 episodes occurring on ≥1 but <15 days per month for at least 3 months [≥12 and <180 days per year]) and probable TTH diagnosis was made when all criteria were fulfilled but one. Chronic migraine and chronic TTH were diagnosed when respondents who fulfilled all ICHD-II criteria reported 15 or more days of headache per month.

Subjects were told to answer the questions based on their most frequent type of headache, if they had more than 1 type. Therefore, we gave only 1 diagnosis for each participant.

Statistical Analysis.—One-year prevalence rates were calculated. Separate models were then estimated for gender, race, education, job status, and income. Student's *t*-test and chi-square analysis were used to compare continuous and dichotomous variables. The possible predictors were included in the model analysis, and a backward conditional method (probability of stepwise: removal: 0.10) was used for variable selection by the logistic regression model in categorical outcomes. Backward elimination involves starting with all candidate variables and testing them one-by-one for statistical significance, deleting any that are not significant.

Variables were coded:

- Dependent variable: migraine (yes/no), headache (yes/no), chronic migraine (yes/no), TTH (yes/no).
- Independent variables: gender (male/female), age – years (18-40/41-60/>60), education level – years of school (illiterate/less than 4 years/5-8/8-11/>11), marital status (single/married or cohabitating/divorced/widowed), household income – BMW (≤1/1.1 to 2/2.1 to 4/4.1 to 6/>6), job status (working/retired/unemployed/housewife/other), type of house (brick-made/other), water supply (treated/not treated), physical activity (yes/no) – defined as 30 to 60 minutes of activity at least 3 days a week.

Goodness of fit was evaluated by the Hosmer–Lemeshow test and omnibus tests of models coefficients. $P \leq .05$ (2-tailed) defined statistical significance. Odds ratio (OR) was presented with 95% confidence intervals. All statistical analyses were performed with SPSS version 17.0 software (SPSS Inc.).

The project of this study was approved by the Ethics Committee on Research of the Hospital Israelita Albert Einstein in São Paulo, Brazil.

Table 1.—Distribution of the Respondents, by Some Socio-Demographic Characteristics (n = 383)

Socio-Demographic Characteristic	n (%)
Gender	
Male	98 (25.6)
Female	285 (74.4)
Age (years)	
18-40	222 (57.9)
41-60	130 (34.0)
>60	31 (8.1)
Race	
White	143 (37.3)
Black	43 (11.2)
Mixed	196 (51.2)
Indian	1 (0.3)
Education level, years of school	
Illiterate	39 (10.2)
Less than 4	118 (30.8)
5-8	118 (30.8)
8-11	104 (27.2)
>11	4 (1.0)
Marital status	
Single	133 (34.7)
Married or cohabitating	217 (56.7)
Divorced	24 (6.3)
Widowed	9 (2.3)
Household income, BMW	
≤1	47 (12.7)
1.1-2	127 (34.2)
2.1-4	166 (44.7)
4.1-6	19 (5.1)
>6	12 (3.2)
Job status	
Working	127 (33.2)
Retired	12 (3.1)
Unemployed	114 (29.8)
Housewife	74 (19.3)
Other	56 (14.6)
Type of house	
Brick-made	349 (91.1)
Other	34 (8.9)
Water supply	
Treated	278 (72.6)
Not treated	105 (27.4)
Physical activity	
Yes	59 (15.4)
No	312 (84.1)

BMW, Brazilian minimum wage.

RESULTS

A total of 439 households were contacted. The questionnaire was filled out by 383 (87.2%) of contacted households. In 56 cases the survey was not completed; some were excluded because respondents were not eligible, others because they did not complete the interview or they did not agree to participate.

Table 1 shows the distribution of the survey participants, by their socio-demographic characteristics. We interviewed a preponderance of women (74.4%)

and more subjects aged 18-39 years. The mean age was 41.7 (SD 8.5) years. Almost half of the subjects reported a household income of less than 2 BMW, 51.2% were mixed race and approximately 30% were unemployed. Access to treated water supply was reported by 72.6%.

Occurrence of headache within the last year was reported by 172 subjects. The crude estimated 1-year prevalence of migraine and other types of headache, as well as, the adjusted prevalence by gender, race, education, job status, and income is presented in Table 2. The prevalence of migraine was 20.4% (23.5% in women and 11.2% in men), with a 2.09:1 female/male ratio. Notably, migraine prevalence was higher in Caucasians, with lower education status although employed. Tables 3-5 show the association of migraine, headaches, and chronic migraine with some socio-demographic characteristics of the population.

In this sample, subjects who reported to be employed had significantly more migraine occurrence than unemployed study participants, housewives, retired individuals, or the disabled (Table 3). Migraine was 0.54 times less prevalent in male compared to female subjects. Other socio-demographic conditions such as age, race, education level, marital status, household income, type of house, water supply or physical activity were not included on the backward logistic regression model due to non-significance.

The model including TTH did not reach significance for any aspect and thus, it was not displayed in tables.

DISCUSSION

To the best of our knowledge, this is one of the first headache epidemiological studies performed in a shanty town. The Paraisopolis Community, as stated previously, is one of the largest informal settlements in São Paulo, Brazil. Understanding the epidemiology of primary headaches in this type of setting is important in order to understand how socio-economic factors can influence a very low-income population.

The 1-year prevalence of headache was 47%. A similar finding has also been reported by previous studies while evaluating world and, specifically, European headache prevalence.[1,2] However, a nationwide Brazilian study carried out in 2009 pointed to a 72.2% prevalence of overall headache[3] and a review from Latin America headache studies showed a 62% prevalence.[4]

In our study, the estimated 1-year prevalence of migraine was 20.4%. This is in line with the rates previously reported in some Brazilian cities (22.1% in Florianopolis,[8] 21.4% in Ribeirao Preto)[14] and regions (20.2% found in the south-east region – states of São Paulo, Rio de Janeiro, Minas Gerais),[3] but higher than the 10.7% noted in Pelotas[16] and 15.2% described in the nationwide Brazilian study.[3] Furthermore, in our present study, chronic migraine was recorded with a 6.8% prevalence, higher than the nationwide Brazilian study of 5.0%.[9]

These results seem to vary according to the population setting. A clear example for this is the lower prevalence found in some studies in Africa. In 1995, Tekle Haimanot et al performed a door-to-door interview on a rural area in Ethiopia and found a 4.4% 1-year prevalence of headache,[17] and Dent et al found a 23.1% prevalence in Tanzania.[18]

These epidemiological differences seem to be important in order to analyze various mechanisms of headaches. Thus, many other population settings (eg, Indians,[19] athletes,[20] employees[21]) have been studied in recent publications.

The *raison d'être* of enacting a study in a very low-income community is to contribute new data about the prevalence of primary headaches and how they can be affected by extreme socio-demographic conditions, such as poverty, lack of treated water supply, unemployment.

Few studies have been conducted predominantly on low-income settings. Bensenor et al interviewed 1615 elderly individuals from a low-income area (only 13% lived in shanty towns) in a São Paulo district in Brazil and found a higher prevalence of migraine.[7]

Some authors found an inverse relationship between income and migraine especially in the USA[22,23] and Brazil,[3] but not in Europe[24] and Chile.[25] In our study, the prevalence of migraine was higher

Table 2.—Estimated 1-Year Prevalence of Migraine, Tension-Type and Other Types of Headache Crude and Adjusted for Sex, Race, Education, Job Status, and Income

Diagnosis	n	Crude 1-Year Prevalence, % (CI 95%)	1-Year Prevalence Adjusted by Sex (%)		1-Year Prevalence Adjusted by Race (%)			1-Year Prevalence Adjusted by Education (%)		1-Year Prevalence Adjusted by Job Status (%)		1-Year Prevalence Adjusted by Income (%)	
			Female	Male	Black	Mixed	White	4 or Less Years	More than 4 Years	Working	Not Working	≤2 BMW	>2 BMW
Migraine	78	20.4 (16.6-24.9)	23.5*	11.2	16.3	17.9	25.2	22.9	18.6	26.8*	17.2	20.1	21.3
Probable migraine	26	6.8 (4.6-9.9)	6.7	7.1	11.6	6.6	5.6	5.1	8.0	7.9	6.3	7.5	6.6
IETTH	7	1.8 (0.8-3.9)	1.8	2.0	2.3	2.0	1.4	2.5	1.3	1.6	2.0	1.9	1.5
FETTH	17	4.4 (2.7-7.2)	3.2	8.2	4.7	4.1	4.2	4.5	4.4	6.3	3.5	5.2	4.1
PTTH	14	3.7 (2.1-6.2)	4.4	1.0	0.0	3.1	5.6	3.2	4.0	3.1	3.9	1.1	6.1
Chronic migraine	34	8.9 (6.1-12.0)	10.9*	3.1	11.6	7.7	9.8	8.9	8.8	13.4*	6.6	9.2	9.1
Chronic tension-type headache	4	1.0 (0.3-2.8)	1.1	1.0	0.0	1.0	1.4	1.9	0.4	2.4	0.4	0.0	1.5
No headache	198	51.7 (46.7-56.9)	47.0	65.3**	53.5	56.6	44.8	49.0	53.5	38.5	58.2***	52.9	49.2
Other	5	1.3 (0.5-3.2)	1.4	1.1	0.0	1.0	2.0	2.0	1.0	0.0	1.9	2.1	0.6
Total	383	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Chi square: $*P < .05$, $**P < .01$, $***P < .001$.

FETTH = frequent episodic tension-type headache (at least 10 episodes occurring on ≥1 but <15 days per month for at least 3 months [≥12 and <180 days per year]); IETTH = infrequent episodic tension-type headache (at least 10 episodes occurring on <1 day per month on average [<12 days per year] and frequent episodic tension-type headache); PTTH = probable tension-type headache; chronic migraine (fulfilled all migraine ICHD-II criteria and reported 15 or more days of headache per month).

Table 3.—Multivariate (Backward Conditional Selection†) Logistic Regression Analyses‡ for Presence of Migraine

Health Variable	Adjusted OR	Lower IC 95% OR	Higher IC 95% OR	*P*
Gender				
Female	1.00	–	–	–
Male	0.279	0.143	0.545	<.001
Job status				
Employed	1.00	–	–	–
Unemployed	0.466	0.260	0.835	.010
Housewife	0.491	0.257	0.941	.032
Retired, disabled	0.423	0.200	0.892	.024
Constant	0.922	–	–	.689

†All independent variables (gender, job status, age, education level, marital status, household income, and physical activity) were included in the multivariate analysis, and only those identified by the backward conditional logistic regression model as independently associated with the dependent variable were included in the table.
‡Omnibus tests of models coefficients: chi square: 28.848; $P < .001$. Hosmer and Lemeshow test: chi square: 3.003; d.f.: 5; $P = .699$.
– = not available.

than the general prevalence found in the Brazilian nationwide study (15.2%) but similar to the prevalence adjusted for the south-east region (20.2%).

After controlling for confounding variables, migraine was associated with gender (female) and job status (employment). Regarding gender, female subjects have higher rates of migraine than male subjects, which is widely supported in the literature,[1] and occurs in many different settings.[18-20]

We also found that job status was significantly associated with migraine. This type of association is described in the literature with contradictory results. Some authors reported no associations in the general population.[5] However, recent publications observed relationship between dissatisfaction with work and worry about losing one's job with migraine,[6] as well as, stress at work and migraine in nursing staff.[26] Job status seems to be an important factor related to migraine in this Brazilian shanty town community.

Table 4.—Multivariate (Backward Conditional Selection†) Logistic Regression Analyses‡ for Presence of Headache

Health Variable	OR	Lower IC 95% OR	Higher IC 95% OR	*P*
Gender				
Female	1.00	–	–	–
Male	0.504	0.298	0.855	.011
Job status				
Employed	1.00	–	–	–
Unemployed	0.407	0.237	0.700	.001
Housewife	0.480	0.259	0.889	.020
Retired, disabled	0.351	0.184	0.670	.001
Constant	2.162	–	–	<.001

†All independent variables (gender, job status, age, education level, marital status, household income, and physical activity) were included in the multivariate analysis, and only those identified by the backward conditional logistic regression model as independently associated with the dependent variable were included in the table.
‡Omnibus tests of models coefficients: chi square: 22.539; $P < .001$. Hosmer and Lemeshow test: chi square: 0.217; d.f.: 5; $P = .999$.
– = not available.

Table 5.—Multivariate (Backward Conditional Selection†) Logistic Regression Analyses‡ for Presence of Chronic Migraine

Health Variable	OR	Lower IC 95% OR	Higher IC 95% OR	*P*
Gender				
Female	1.00	–	–	–
Male	0.292	0.086	0.986	.047
Constant	0.049	–	–	.003

†All independent variables (gender, job status, age, education level, marital status, household income, and physical activity) were included in the multivariate analysis, and only those identified by the backward conditional logistic regression model as independently associated with the dependent variable were included in the table.
‡Omnibus tests of models coefficients: chi square: 12.317; $P = .015$. Hosmer and Lemeshow test: chi square: 1.390; d.f.: 4; $P = .846$.
– = not available.

There is a paradox in the employment status and income association, one would expect higher levels of migraine in a low-income population, but higher numbers were found in those employed vs unemployed. Therefore, unemployed people, although generating low income, may be satisfied with their current life, less worried about their future perhaps with an informal income (although this income is likely lower than the employed). It could be speculated that consequently their lives may be less stressful, a trait that may protect them from having migraines.

Another possible explanation for that finding is that, especially in very low-income communities, the fear of losing a job can be associated with a significant stress. Stress is the factor listed most often by migraine sufferers as a trigger for their attacks, but in addition there is evidence that stress can help initiate migraine in those predisposed to the disorder, and may also contribute to migraine chronification.[27]

Other explanations for these findings could be related to indoor environments, particularly at the work place.[28] Commonly reported migraine triggers in indoor environments include bright lights, fluorescent lights, glare, flicker (eg, from a computer screen, driving along a tree-lined street), neon lights, and busy visual patterns).[29] Working at the computer screen precipitated headaches in 14.5% cases and aggravated it in 31.3% in 1 case–control study of chronic headache patients.[30]

The Job Accommodation Network's Searchable Online Accommodation Resource (SOAR), a website maintained by the US Department of Labor, recommends modification of lighting triggers, noise triggers, smell/fragrance triggers, and other aspects of the work site for employees with migraine headaches. Examples include: add fluorescent light filters to existing fluorescent lights to create a more natural lighting, change lighting completely, provide an anti-glare filter for computer monitor, provide a liquid crystal display monitor that has a better refresh rate, move employee to a more private area or away from high-traffic areas, provide sound absorption panels, implement a fragrance-free policy, provide flexible leave when the employee is experiencing a migraine, and provide the employee with a dark, private area to go to when experiencing a migraine.[28]

Furthermore, several studies have pointed to the relation among headaches and economic costs. In a 1999 study,[31] migraine costs American employers about $13 billion a year because of missed workdays and impaired work function; close to $8 billion was directly due to missed workdays. Another study[32] showed that 51.1% of female and 38.1% of male migraineurs experienced 6 or more lost workday equivalents per year.

We did not find an association between migraine and other socio-demographic factors, such as marital status, race, and education level. This lack of relationship is confirmed by some authors, but not for others.[8,33-35]

We also analyzed some habitation conditions such as type of house and water supply. Some studies have evaluated only the relationship between habitation status and anxiety.[36] Thus, investigating these kinds of conditions in migraine is reasonable. In our study, there was no significant association between migraine and habitation status.

Finally, there was a lower 1-year prevalence of TTH compared to the nationwide Brazilian study.[3]

Some authors reported an association among TTH and higher levels of education,[3,34,37] but not with income.[25] We believe that, at least in part, the low level of education of our sample could explain these findings.

Some study limitations must be considered. First, we conducted a cross-sectional study that does not allow for cause–effect conclusions. Second, the prediction models were not the primary focus of the study (the power is based on a different rationale, in this case the prevalence of migraine) and therefore, care is needed in interpreting the effects related to income and job status. Third, "Paraisopolis" shanty town may not represent all low-income communities worldwide, due to some local peculiarities, such as race and habitation status. Furthermore, in the present study we found a female majority, which can be probably justified by: (1) interviews were conducted during the day and some men were working at this time; (2) usually in this type of community, women are responsible for housework; and (3) women usually take care of their children in the home and therefore, were more likely eligible for the interview. Therefore, more studies are necessary in order to replicate these findings in others shanty towns globally. Ideally, this data-driven model should be replicated in other samples.

In conclusion, the overall prevalence of migraine and chronic migraine in this very low-income community were high and TTH was low. Furthermore, gender and job status, but not habitation correlated with migraine.

STATEMENT OF AUTHORSHIP

Category 1

(a) Conception and Design
Giancarlo Lucchetti, Mario Fernando Prieto Peres

(b) Acquisition of Data
Giancarlo Lucchetti, Mario Fernando Prieto Peres

(c) Analysis and Interpretation of Data
Giancarlo Lucchetti, Mario Fernando Prieto Peres

Category 2

(a) Drafting the Manuscript
Giancarlo Lucchetti, Mario Fernando Prieto Peres

(b) Revising It for Intellectual Content
Giancarlo Lucchetti, Mario Fernando Prieto Peres

Category 3

(a) Final Approval of the Completed Manuscript
Giancarlo Lucchetti, Mario Fernando Prieto Peres

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