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# Prevalence and Sociodemographic Correlates of Primary Headache Disorders: Results of a Population-based Survey from Bangalore, India

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## Abstract

**Background:** Headache disorders are common and burdensome throughout the world, placing high demand on health care services. Good information on their prevalence and distribution through sectors of the population are a prerequisite for planning interventions and organizing services, but unavailable for India. **Objectives:** To find out the prevalence of headache disorders in Karnataka State and establish important sociodemographic associations. **Materials and Methods:** Using a door to door survey technique, amongst 2997 households, 2329 individuals were interviewed with a validated structured questionnaire by randomly sampling one adult member (aged 18-65 years) from eligible households in urban ( $n = 1226$ ) and rural ( $n = 1103$ ) areas of Bangalore, during the period April 2009 and January 2010. **Statistical Analysis Used:** Chi-square, odds ratio (OR), and logistic regression. **Results:** The 1-year prevalence of headache was 63.9% (62.0% when adjusted for age, gender and habitation) and 1-day prevalence (headache on the day prior to the survey) was 5.9%. Prevalence was higher in the age groups of 18-45 years, among females (OR = 2.3; 95% confidence interval: 1.9-2.7) and those in rural areas. Prevalence was higher in rural (71.2 [68.4-73.8]) than in urban areas (57.3 [54.5-60.1]) even after adjusting for gender. The proportion of days lost to headache from paid work was 1.1%, while overall productivity loss (from both paid and household work) was 2.8%. **Conclusions:** Headache disorders are a major health problem in India with significant burden. It requires systematic efforts to organize effective services to be able to reach a large number of people in urban and rural India. Education of physicians and other health-care workers, and the public should be a pillar of such efforts.

**Keywords:** Epidemiology, Global campaign against headache, Headache disorders, India, Prevalence

## Introduction


Primary headache disorders, particularly migraine and tension-type headache (TTH), are among the most common

and burdensome health problems in all parts of the world,<sup>1,2</sup> affecting both genders and all socioeconomic levels and encountered in all health-care settings.<sup>3</sup> The recent Global Burden of Disease Study 2010 identified TTH and migraine as the second and third most prevalent disorders worldwide,<sup>4,5</sup> and migraine as the seventh leading specific cause of disability. In addition to these two disorders, which are usually episodic, there are a number of headache disorders characterized by headache occurring on 15 or more days/month. Importantly, this includes medication-overuse headache, a disorder usually developing as a consequence of mismanagement of migraine or TTH.

WHO's Atlas of Headache Disorders pointed not only to this global burden of ill health and disability, but also to the failure of health services everywhere to develop an adequate response to it.<sup>2</sup> The commentary observed that large geographical gaps remained in our knowledge of the

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burden of headache. It drew attention, as has the global campaign against headache,<sup>6-8</sup> to the absolute need for good national population-based studies, conducted with the specific objective of estimating the scope and scale of this burden in order to inform health policy.

In India, previous neuroepidemiological surveys have identified headache disorders as among the most common neurological conditions, but estimates of prevalence have been wide-ranging: From as low as 0.2% to a high of 58%.<sup>9-12</sup> Methodological differences and inconsistencies between studies have contributed to this wide variation, which is so great as to be wholly uninformative.

Supported by Lifting the Burden,<sup>6-8</sup> a population-based survey was undertaken in Southern India (Karnataka State), using a standardized and validated methodology, as a project within the global campaign against headache and as a first step in estimating the burden of headache in India. The objectives of the study were to find out the prevalence, document sociodemographic correlates of headache disorders, and lost productivity attributable to them. The emphasis is on the implications of this burden for organizing services in both clinical and population based settings for effective public health interventions, especially in low and middle income countries (LMICs).

## Materials and Methods

The research protocol was approved by the Institutional Ethics Committee of National Institute of Mental Health and Neurosciences. Informed consent was obtained from all participants and also, where appropriate, from local community leaders.

The details of the methods, including validation of the diagnostic instrument, have been published elsewhere,<sup>13,14</sup> and salient points are highlighted below.

A cross-sectional survey was conducted in geographically-defined populations in urban and rural Bangalore, during the period April 2009 and January 2010. Assuming an expected prevalence of headache of 35%,<sup>1,9-12</sup> based on review of previous studies, and with 95% confidence interval (CI) and 10% relative error margins, the minimum sample requirement was 1000 biologically unrelated individuals from each (urban and rural) stratum.

The urban population of one of the municipal wards (an administrative unit) was selected through a simple

random method. For the rural sample, two large villages (each with 500-800 households) from one taluka were selected through a simple random method. Further, the adult population (aged 18-65 years) was randomly selected from each household after enlisting. Six field-research officers trained in data collection visited the study areas prior to the survey and listed all residential households, excluding commercial establishments, vacant and abandoned buildings and households with a period of stay of more than 6 months. From these listed households, the respondents were sampled randomly on "cold-calling" visits (visiting unannounced). At each visit, when there was a response (i.e., the door was opened, and consent was given), all resident adult members were listed and one was selected randomly. To obtain maximum participation, whenever there was no response at the initial visit to a household, or the selected participant was not at home, two further visits at different times and/or on different days were undertaken.

The participant was interviewed face-to-face. A structured questionnaire developed specifically for this survey had been validated in a pilot study of 224 community respondents.<sup>13,14</sup> This instrument contained sociodemographic questions, screener questions for headache prevalence, questions to arrive at a diagnosis of headache, etc., The 1-year prevalence of headache and also the 1-day prevalence (headache yesterday) were estimated, and this confirmed to the headache definitions of International Classification of Head Disorders II.<sup>15</sup>

All data were entered into a secured database, after scrutiny for completeness, accuracy and coverage, using EPI INFO windows version 3.5.<sup>16</sup> Statistical analyses were performed using EPI INFO and SPSS version 15.0.<sup>16,17</sup> Chi-square was used to test the significance of the difference between proportions. Multivariate logistic regression analysis was undertaken with presence of headache as the dependent variable.

Burden was estimated as lost productivity, calculating the proportion of days lost from paid work and overall (paid and household work), using the Halt index.<sup>18</sup> We multiplied reported days lost in the last 3 months by 4 to estimate days lost per year. We calculated per capita lost productivity as total working days lost in the sample per year divided by  $(2329 * 240)$ , where 2329 was the total number of persons interviewed (denominator) and 240 the accepted number of working days/year.

## Results

A total of 12,253 individuals from 2997 households (1419 rural and 1578 urban) were enumerated. Of whom 2514 (1160 rural and 1354 urban) were eligible to participate and 2329 (1103 rural, 1226 urban; 1141 male, 1188 female) took part in the survey (participation rate 92.6%). Most were aged 21-55 years (urban 83.2%, rural 78.9%), while the age-gender distribution of the enumerated population was similar to that of the population of Karnataka. The majority belonged to lower-income households, and the mean per capita monthly income was approximately USD 150 (INR 6933 at the time of the survey). Differences in income were observed between rural (nearly 97.2% below USD 250 [INR 11,272] per month) and urban participants (72.3%) [Table 1]. Educational level differed similarly; over half the rural population were

illiterate, with only 5% educated beyond graduate levels, while in urban areas 18.9% were educated beyond graduate levels. Table 1 shows these and other sociodemographic characteristics of the sample in more detail.

At least one episode of headache in the past year was reported by 1488 participants. The crude 1-year prevalence of headache in the study population was therefore 63.9%; adjusted for age, gender and habitation, it was 62.0%. The mean number of reported headache-affected days in the previous 3 months was 8.3 (33.3/year). Headache yesterday was reported by 5.9% of participants, an observation in very close agreement with the estimated point prevalence of 5.8% calculated from 1-year prevalence and the reported headache frequency ( $(1488 \times 33.3)/(2329 \times 365)$ ), despite that the latter depended upon accurate recall.

**Table 1: Select sociodemographic characteristics of persons with and without headaches**

Socio demographic variables	Urban habitation				Rural habitation				All			
	Headache		No		Headache		No		Headache		No	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No		
<i>n</i>	704	524	784	317	1488	841						
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Education												
Not literate	93	13.21	85	16.22	441	56.25	158	49.84	534	35.89	243	28.89
Primary school	45	6.39	35	6.68	77	9.82	30	9.46	122	8.20	65	7.73
Middle school	52	7.39	33	6.30	86	10.97	33	10.41	138	9.27	66	7.85
High school	268	38.07	184	35.11	100	12.76	43	13.56	368	24.73	227	26.99
Preuniversity	113	16.05	71	13.55	52	6.63	34	10.73	165	11.09	105	12.49
Graduate or postgraduate	125	17.76	112	21.37	25	3.19	18	5.68	150	10.08	130	15.46
Professional	8	1.14	4	0.76	3	0.38	1	0.32	11	0.74	5	0.59
	2=6.86, P>0.05				2=10.36, P>0.05				2=24.34, P<0.001			
Occupation												
Professional group	19	2.70	10	1.91	2	0.26	7	2.21	21	1.41	17	2.02
Semi-professional	39	5.54	33	6.30	15	1.91	8	2.52	54	3.63	41	4.88
Clerical, shop owner, farmer	125	17.76	121	23.09	256	32.65	156	49.21	381	25.60	277	32.94
Skilled worker	348	49.43	197	37.60	369	47.07	92	29.02	717	48.19	289	34.36
Semi-skilled worker	107	15.20	76	14.50	76	9.69	26	8.20	183	12.30	102	12.13
Unskilled worker	10	1.42	19	3.63	14	1.79	5	1.58	24	1.61	24	2.85
Unemployed	56	7.95	68	12.98	52	6.63	23	7.26	108	7.26	91	10.82
	2=28.63, P<0.001				2=45.76, P<0.001				2=49.27, P<0.001			
Income (INR/month)												
>22,545 (>USD 501)	43	6.11	33	6.30	3	0.38		0.00	46	3.09	33	3.92
11,273-22,544 (USD 251-500)	143	20.31	120	22.90	12	1.53	16	5.05	155	10.42	136	16.17

(Continued)

**Table 1: (Continued)**

Socio demographic variables	Urban habitation				Rural habitation				All			
	Headache				Headache				Headache			
	Yes		No		Yes		No		Yes		No	
	704		524		784		317		1488		841	
<i>n</i>	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
8434-11,272 (USD 187-250)	125	17.76	85	16.22	21	2.68	14	4.42	146	9.81	99	11.77
5636-8433 (USD 126-186)	194	27.56	124	23.66	43	5.48	26	8.20	237	15.93	150	17.84
3382-5635 (USD 76-125)	166	23.58	123	23.47	83	10.59	54	17.03	249	16.73	177	21.05
1129-3381 (USD 25-75)	32	4.55	37	7.06	420	53.57	146	46.06	452	30.38	183	21.76
<1128 (<USD 25)	1	0.14	2	0.38	202	25.77	61	19.24	203	13.64	63	7.49
	2=7.22, <i>P</i> >0.05				2=31.04, <i>P</i> <0.001				2=56.38, <i>P</i> <0.001			
Marital status												
Single	146	20.74	104	19.85	92	11.73	54	17.03	238	15.99	158	18.79
Married	491	69.74	370	70.61	582	74.23	228	71.92	1073	72.11	598	71.11
Widowed	55	7.81	46	8.78	101	12.88	27	8.52	156	10.48	73	8.68
Separated or divorced	12	1.70	4	0.76	9	1.15	8	2.52	21	1.41	12	1.43
	2=2.53, <i>P</i> >0.05				2=11.41, <i>P</i> <0.001				2=4.32, <i>P</i> >0.05			

**Table 2: One-year prevalence of headache according to age, gender, and habitation**

Age group (years)	Number (prevalence %) (95% CI)								
	Urban habitation			Rural habitation			Total		
	Male ( <i>n</i> = 611)	Female ( <i>n</i> = 615)	Total ( <i>n</i> = 1226)	Male ( <i>n</i> = 530)	Female ( <i>n</i> = 573)	Total ( <i>n</i> = 1103)	Male ( <i>n</i> = 1141)	Female ( <i>n</i> = 1188)	Total ( <i>n</i> = 2329)
18-25 ( <i>n</i> =451)	71 (54.2) (45.7-62.5)	81 (65.3) (56.6-73.1)	152 (59.6) (53.5-65.4)	52 (61.9) (51.2-71.5)	90 (80.3) (72.0-86.6)	142 (72.4) (65.8-78.2)	123 (57.2) (50.5-63.6)	171 (72.5) (66.4-77.8)	294 (65.2) (60.7-69.4)
26-35 ( <i>n</i> =675)	89 (52.0) (44.6-59.4)	145 (68.4) (61.9-74.3)	234 (61.1) (56.1-65.8)	83 (61.0) (52.6-68.8)	130 (83.3) (76.7-88.3)	213 (72.9) (67.6-77.7)	172 (56.0) (50.4-61.5)	275 (74.7) (70.1-78.9)	447 (66.2) (62.6-70.0)
36-45 ( <i>n</i> =596)	84 (51.2) (43.6-58.7)	109 (76.2) (68.6-82.5)	193 (62.9) (57.3-68.1)	102 (63.7) (56.1-70.8)	105 (81.4) (73.8-87.2)	207 (71.6) (66.6-76.5)	186 (57.4) (52.0-62.7)	214 (78.7) (73.4-83.1)	400 (67.1) (63.2-70.7)
46-55 ( <i>n</i> =339)	40 (41.7) (32.3-51.6)	41 (59.4) (47.6-70.2)	81 (49.1) (41.6-56.6)	39 (52.0) (40.9-62.9)	80 (80.8) (71.9-87.3)	119 (68.4) (61.1-74.8)	79 (46.2) (38.9-53.7)	121 (72.0) (64.8-78.3)	200 (59.0) (53.7-64.1)
56-65 ( <i>n</i> =268)	13 (26.5) (16.2-40.3)	30 (44.8) (33.5-56.6)	43 (37.1) (28.8-46.1)	48 (64.0) (52.7-73.9)	56 (72.7) (61.9-81.4)	104 (68.4) (60.6-75.3)	61 (49.2) (40.6-57.9)	86 (59.7) (51.6-67.4)	147 (54.8) (48.9-60.7)
All ages ( <i>n</i> =2329)	297 (48.6) (44.7-52.6)	406 (66.0) (62.2-69.6)	703 (57.3) (54.5-60.1)	785 (61.1) (56.9-65.2)	297 (80.4) (77.0-83.5)	406 (71.2) (68.4-73.8)	621 (54.4) (51.5-57.3)	867 (73.0) (70.4-75.4)	1488 (63.9) (61.9-65.8)

Table 2 and Figure 1 show 1-year prevalence according to age, gender and habitation (urban vs. rural). Prevalence declined after age 45 years in both genders, a trend that was more marked among urban dwellers. The prevalence peak of 67.1% in the age group 36-45 years was mostly attributable to urban females. In all age groups, headache was more prevalent among females (overall 73.0%) than among males (54.4%). In both genders and all age groups, headache was more prevalent in rural (overall 71.2%) than urban dwellers (57.3%).

Those with headache were more likely to be illiterate and less likely to be highly educated, although this was largely driven by the rural population. While the distribution of occupational classes differed highly significantly

(*P* < 0.001) between those with and those without headache, there was no obvious pattern to this. Skilled workers appeared to be especially prone to headache and the group constituting clerical workers, shop-owners and farmers protected against it; these associations were apparent in both urban and rural populations, but more marked in the latter. Marital status had no obvious impact.

Bivariate analysis was used to test these associations further. Being female or living in rural area increased the risk of headache 2-fold (unadjusted odds ratio [OR] = 2.3; 95% CI: 1.9-2.7 and unadjusted OR = 1.8; 95% CI: 1.6-2.2, respectively). Age, gender, habitation and marital status were entered into a logistic regression model in a enter manner. This analysis [Table 3a] revealed

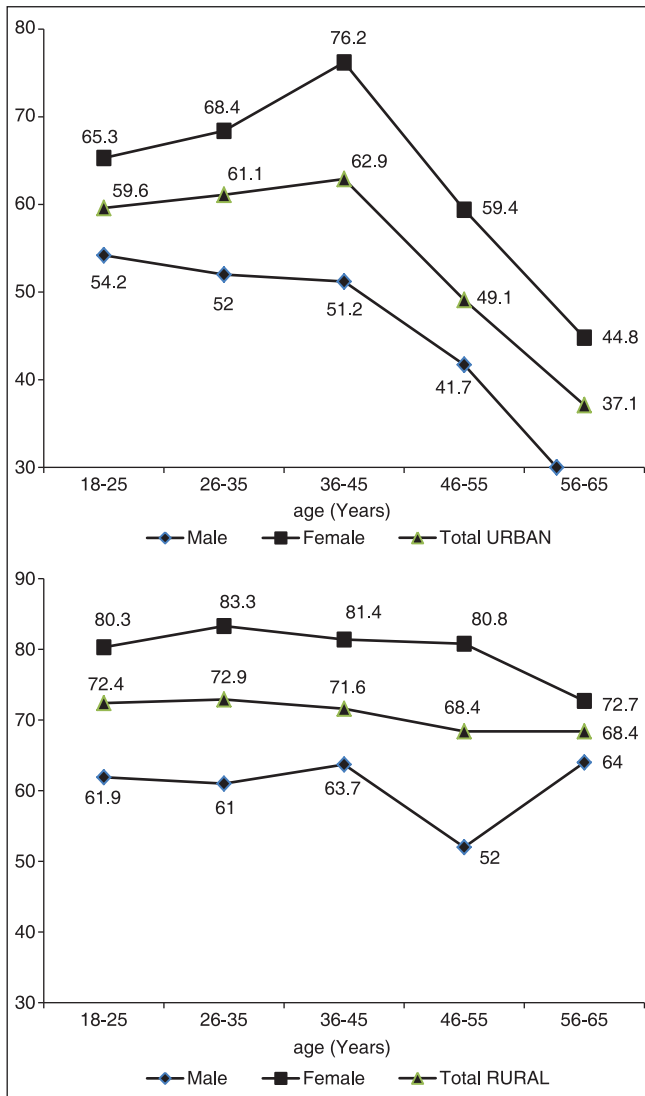


Figure 1: One-year prevalence (%) of headache according to age, gender, and habitation

Table 3a: Logistic regression analysis

Variables	B	SE	Wald	df	Significant	Exp (B)	95% CI for exp (B)	
							Lower	Upper
Place of residence	0.658	0.091	52.359	1	0.0001	1.931	1.616	2.308
Age	-0.015	0.004	17.183	1	0.0001	0.985	0.978	0.992
Gender	-0.827	0.090	84.868	1	0.0001	2.286	1.917	2.726
Marital status	-0.123	0.101	1.485	1	0.223	0.884	0.726	1.078
Constant	0.481	0.159	9.163	1	0.002	1.618		

SE - Standard error, CI - Confidence interval

Table 3b: Logistic regression analysis: Urban areas

Variables	B	SE	Wald	df	Significant	Exp (B)	95% CI for exp (B)	
							Lower	Upper
Age	-0.022	0.005	19.423	1	0.0001	0.979	0.969	0.988
Gender	0.726	0.119	37.529	1	0.0001	2.067	1.639	2.608
Marital status	-0.053	0.132	0.161	1	0.688	0.949	0.733	1.227
Constant	0.755	0.209	12.992	1	0.0001	2.127		

SE - Standard error, CI - Confidence interval

that rural habitation (OR = 1.9; 95% CI: 1.6-2.3) and female gender (OR = 2.3; 95% CI: 1.9-2.7) were the significant variables in the final model and correctly classified 64% of the sample. Even though the number of individuals with headache was relatively high in the age groups of 18-45 years and was statistically significant, the adjusted OR (OR 0.985; 95% CI 0.978-0.992) did not provide an unequivocal confirmation.

Multivariate logistic regression models undertaken separately for urban [Table 3b] and rural [Table 3c] areas revealed that gender continued to be the significant variable in both areas (OR urban = 2.1; 95% CI: 1.6-2.6; OR rural = 2.7; 95% CI: 2.0-3.5). This model correctly classified 72% of the rural sample and 61% of the urban sample.

Burden estimation revealed that the proportion of days lost from paid work because of headache was 1.11% (average loss of 4.0 days/year, for the 1488 participants reporting at least one episode of headache in the past year (see method of calculation above). Similarly, overall lost productivity (from paid and household work) was 2.8% (average loss of 10.4 days/year, for the 1488 participants reporting headache). This was corroborated by those reporting headache yesterday (5.9%), of whom half (50.0%) could do nothing or did less than half of their expected work, a loss of 2.95% (50.0% \* 5.9%).

## Discussion

This present study was supported by Lifting the Burden as a project within the global campaign against headache.<sup>6-8</sup>

**Table 3c: Logistic regression analysis: Rural areas**

Variables	B	SE	Wald	df	Significant	Exp (B)	95 CI for exp (B)	
							Lower	Upper
Age	-0.007	0.005	1.783	1	0.182	0.993	0.983	1.003
Gender	0.985	0.139	49.946	1	0.0001	2.679	2.038	3.521
Marital status	-0.257	0.158	2.650	1	0.104	0.774	0.568	1.054
Constant	0.796	0.241	10.863	1	0.001	2.216		

SE - Standard error, CI - Confidence interval

It is the first of its kind on headache disorders from the Indian subcontinent. Headache disorders have ranked highly in all neuroepidemiological surveys of India,<sup>9-12</sup> but reported prevalence has varied greatly, presumably because of methodological differences. Among these, Saha *et al.*,<sup>10</sup> in a population survey of 20,842 residents in West Bengal, reported a prevalence of only 0.9%, while Gourie-Devi *et al.* reported a not dissimilar 1.1% from a survey of 102,542 individuals from urban and rural Bangalore.<sup>9</sup> These numbers are very different from our 1-year prevalence of almost two-thirds (62%) reporting a headache in the last 1 year.

The possible explanations for this huge variation are that the earlier studies were general neuroepidemiological studies, in which headache was not the main object of the enquiry but only one among many disorders in the neurological morbidity spectrum. Methodological variations — in selection of populations, sampling methods, sample size, participation bias, case definition, screening questions, diagnosis, and statistical interpretations — are factors of considerable importance in estimating prevalence of a disorder;<sup>19</sup> many of these are disorder-specific, and they cannot all be optimized in a study with multiple objects of enquiry. Equally, adequate enquiry into each disorder takes more time than can be allocated, when there are multiple enquiries. The limitations of earlier studies were overcome by focusing on headache disorders, sampling both urban and rural populations, repeating visits when necessary to improve participation rate, adapting the criteria of International Classification of Impairments, Disabilities and Handicaps-2 and using a validated survey instrument. By this, the hugely underestimated prevalence of headache disorders in the Indian subcontinent has been recognized. This is substantially higher than the global estimate of 47% but quite similar to measures of prevalence in high income Germany (60-71%) and low and middle income,<sup>1,20,21</sup> Russia (63%),<sup>22</sup> Brazil (65%),<sup>23</sup> and Georgia (57.6%).<sup>24</sup>

As in all countries, prevalence of headache was higher among females,<sup>1,22,24-26</sup> which is explained by biological and socio-cultural influences.<sup>27-29</sup> The higher prevalence of headache among the young and middle-aged adult population was also observed, however, there is no clear explanation for the apparent absence of this association among rural dwellers. This highlights the importance of research to uncover the factors related to rural habitation that might affect the occurrence (and/or reporting) of headache. A higher prevalence was documented among rural dwellers than urban, and among those living in low-income households. The urban — rural difference has been observed by others and<sup>24,30</sup> as in our study, is confounded by the strong association between rural dwelling and relative poverty: nearly 95% of rural dwellers (and 98.1% of those with headache), but 70.6% of urban dwellers (73.6% of those with headache) belonged to households with incomes of <INR 11,000 (about USD 250 at the time of the survey) per month, while socioeconomic status and low income stood out as significant factors for rural dwellers in the multivariate logistic regression model. The association of headache disorders with relative poverty has also been reported in other epidemiological studies and has been seen even in high-income countries.<sup>22,24,31,32</sup>

In addition to highlighting the huge numbers in Karnataka, who experience headache and suffer the symptom burden, the present study has demonstrated enormous productivity and socioeconomic burden: losses in the workplace of 1.1% and overall of 2.8%. The net per capita state gross domestic product for 2011/2012 was INR 68,374 (USD 1139),<sup>33</sup> consequently, the losses to the Karnataka State economy would have been INR 114.5 billion (USD 1.9 billion). Lost workplace productivity alone would have contributed INR 44.96 billion (USD 749.35 million).

#### *Implications for management and service delivery*

An active headache disorder is defined by the occurrence of at least one episode of headache in the previous year.<sup>15</sup>

The adjusted 1-year prevalence of 62.0% shows that headache disorders are common, but this number may include individuals with very infrequent headache and may not represent a prioritized health-care need. Thus, the enquiry into headache yesterday is more informative, as what happened yesterday is more definitive and is likely to happen every day. This enquiry revealed that 5.9% of respondents had headache yesterday. Extrapolating to the population of Karnataka, it gives an estimate of nearly 3.27 million people with headache on each day. Karnataka is only one state in India, but extrapolations beyond it need to be made and interpreted with considerable caution. Even so, a clear message is that headache results in a large daily health-care need in Karnataka, and it is certain that this is almost the same throughout the country. These observations indicate the huge burden and the significant load in hospital settings for those who present with the problem (from tertiary neurological centers to primary health care settings) and a large majority who may not seek care.

There are effective treatments for managing headache disorders,<sup>3,4</sup> but they need to be available. In addition, both health-care professionals and the public need to be made aware of it, and also understand their correct use. Incorrect use and mismanagement can both lead to new problems. If these effective treatments are not made available through the public health/primary health care, people should also be able to afford them.

The association of headache with rural habitation and low income aggravates the problem in a number of ways. Firstly, low-income households have limited access to health care, more so in rural areas as health care is relatively deficient in these places. Secondly, people with headache disorders may not be fully productive, and hence would have lower earning potentials. Thirdly, as low income is also associated with low education, these families tend to neglect the problem through lack of awareness. Fourthly, lack of access to professional health care encourages people to resort to home remedies or traditional therapies, which may not be appropriate. Fifthly, even when people with headache do contact a health-care provider, inadequate professional education may lead to inappropriate management, ineffective treatment and improper (and wasteful) referrals.<sup>2</sup>

These problems are not unique to India. Globally, and within every country, headache disorders are among the most prevalent and the most highly neglected health

problems.<sup>1,2,4</sup> Indian society like other LMICs is no exception to this phenomenon. Our study demonstrates the crucial need to develop and put in place systematic provision of health-care programs, with trained professional health-care providers, in both rural and urban areas. There is also an urgent requirement for similar studies to be undertaken elsewhere in India and especially in other LMICs, and these are likely to demonstrate the same need.

## Conclusion

Our study has clearly demonstrated the high prevalence of headache disorders in the community through a population survey in Karnataka State, well above the global average. Further, it has demonstrated the health-care need attributable to this, with more than one in every 20 people experiencing headache on any particular day. The necessity for delivering health-care services to these people requires planning and organization. Education of physicians and other health-care workers, and the public, should form the bedrock of the health care delivery system, along with adequate investment of resources. Given the high cost of failure to treat headache, such investment is likely to be cost-saving.<sup>2</sup>

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