

Headache yesterday in China: A new approach to estimating the burden of headache, applied in a general-population survey in China

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Abstract

Background: In order to minimize recall bias in burden estimation, questions about headache yesterday were included in a population-based survey initiated by *Lifting The Burden: The Global Campaign against Headache*.

Methods: Throughout China, nonrelated respondents aged 18–65 years were randomly sampled from the general population by a door-to-door survey. A validated structured questionnaire included inquiry into occurrence and burden of headache on the preceding day (“headache yesterday”).

Results: The participation rate was 94.1%. Of 5041 participants, 286 (5.7%) (male 3.6%, female 7.9%) reported headache yesterday. Age-weighted prevalence of headache yesterday was 4.8% (male 3.0%, female 6.6%). Headache yesterday lasted all day in 36.8%, <1 hour in 14.3% and for a mean of 3.7 ± 3.3 hours in 48.9%. Headache yesterday was moderate to severe in 79.9%; disability such that they could do less than half of what they had expected was reported by 19.9% and such that they could do nothing by a further 7.5% (total 27.4%). Almost three-quarters (71.5%) with headache yesterday took medication to treat it.

Conclusions: Of the adult Chinese population, 1.8% have headache at any one time that is of moderate to severe intensity in 1.4%, and 1.3% lose the equivalent of a whole day to headache-attributed disability every day. In China this means 12.3 million people.

Keywords

China, headache yesterday, burden of illness, disability, Global Campaign against Headache

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Introduction

Headache is a major global public-health problem, although everywhere it is under-recognized as such (1). In 2004, the World Health Organization (WHO) acknowledged migraine as a disorder of global public-health importance, accounting for 1.4% of all years of healthy life lost to disability (YLDs) and ranking 19th in the list of most disabling disorders worldwide (2). The Global Burden of Disease survey 2000 (GBD2000), on which this reckoning was based, included a minimal estimate for China since no reliable data were then available for this country (3), which has the largest population in the world.

As an early project within the Global Campaign against Headache (4), *Lifting The Burden* (a United

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Kingdom (UK)-registered nongovernmental organization working in official relations with WHO) initiated and supported an epidemiological study of headache in China, using door-to-door calling to gather a random population-based sample drawn from all regions. The survey found a one-year prevalence of primary headache disorders in adults of 23.8% (males: 17.1%; females: 30.7%) (5), along with very substantial headache-attributed disability. The latter, for which inquiry into productive time lost covered the preceding three months, was recognized to be subject to recall bias. To counter this, the survey had introduced questions into each interview on the occurrence and impact of headache on the day prior to the survey ("headache yesterday").

The findings of this inquiry into headache yesterday are presented here (the detailed methodology and principal results of the full survey are published elsewhere (5,6)).

We note that headache yesterday is a new concept in *headache epidemiology*, and this is the first report of it to be published in the context of a nationwide survey. While headache yesterday has been introduced into the worldwide series of surveys conducted by *Lifting The Burden* specifically to minimize bias in estimating impact, it cannot estimate *prevalence*. Neither is it possible to conduct a detailed diagnostic inquiry into headache yesterday because the International Classification of Headache Disorders (ICHD-II) (7) does not permit this in the context of a single headache episode.

Methods

Data source

This was an analysis of a data subset from a nationwide epidemiological survey of primary headache disorders in the mainland of China (5).

Ethics

The study protocol was approved by the Chinese Ministry of Health and the ethics committee of the Chinese PLA General Hospital, Beijing.

Sampling and data collection

Throughout all regions of China, nonrelated respondents aged 18–65 years, one per household, were randomly sampled from the general population, visited by unannounced door-to-door calling and surveyed using a structured questionnaire. These methods are fully described elsewhere (5).

Questionnaire

The questionnaire developed by *Lifting The Burden* for population-based burden-of-headache studies was translated into Chinese, adapted according to Chinese culture and validated within the target population (6). Question subsets inquired into demographic characteristics, screened for headache in the last year, applied diagnostic criteria based on ICHD-II (7) to the most bothersome headache type reported by each screen-positive participant and sought to quantify various aspects of impact attributed to it. Further questions on headache yesterday, when it was reported, recorded duration categorically (<1, one to four, five to 12 or >12 hours, or lasting all day) and intensity on an 11-point numerical rating scale (NRS) (0–10). Impact of headache yesterday on usual daily activities (including work or school in those for whom yesterday was a work- or school-day) was recorded, in line with participants' responses, as unaffected ("could do everything as usual"), partially affected or totally affected ("could do nothing"). Functional impairment due to headache yesterday was recorded, again in line with participants' responses, in terms of how much, of that expected to be done, was actually done yesterday ("everything", "more than half", "less than half" or "nothing"). The final question on headache yesterday asked whether patients had taken medication to treat it.

Statistics

Participants' data were processed in EpiData 2.1a (EpiData Association, Odense, Denmark) and transferred into SPSS 16.0 (SPSS Inc, Chicago, IL, USA). Continuous variables were summarized as means and standard deviations, and categorical variables as numbers and percentages. Prevalence is presented as a proportion (%) with 95% confidence intervals (CIs). For this report we validated the sample by comparing it, for age and gender distribution, with national statistics derived from the census of 2010 (8) for the population aged 18–65 years (these statistics were not available at the time of our earlier report (5)). Accordingly, we calculated age-weighted prevalence of headache yesterday, and based estimates of burden on this.

Duration categories were transformed into point values by taking the mid-points of each; these data were then treated as continuous. NRS responses on intensity were categorized as 0=no pain, 1–3=mild pain, 4–7=moderate pain and 8–10=severe pain). Distributions were compared using χ^2 for variables expressed categorically. Odds ratios (ORs) were calculated in most cases after dichotomizing and applying binary logistic regression. In multivariate analyses,

adjusted odds ratios (AORs) were calculated. Statistical significance was set at $p < 0.05$.

Results

The survey was completed by 5041 participants (2561 males, 2480 females) aged 18–65 years (mean 43.6 ± 12.8), with 318 refusals (participation rate 94.1%). Most participants (3456; 68.6%) lived in rural areas; less than one-third (1585; 31.4%) were urban-dwellers. Table 1 shows their demographic and socioeconomic characteristics.

Across China, 286 (5.7%) (male 3.6%, female 7.9%) of the 5041 participants reported headache yesterday. Their demographic and socioeconomic characteristics are also shown in Table 1, together with ORs calculated using the relative references. Age-weighted prevalence of headache yesterday was 4.8% (male 3.0%, female 6.6%). There were clear distinctions between the total sample and those reporting headache yesterday. Through univariate analysis, we found that female gender (OR = 2.3), age ≥ 40 years (OR = 3.7), ethnic minority (non-Han) (OR = 1.9), marital status (ever married) (OR = 4.8), low educational attainment (primary school or less) (OR = 1.9) and low annual household income (<Chinese Yuan (CNY) 9600) (OR = 1.7) were associated with significant differences ($p < 0.01$) in proportions with headache yesterday. In further multivariate analyses, however, only female gender (AOR = 2.1), age ≥ 40 years (AOR = 3.1) and ethnic minority (AOR = 2.0) were still significant ($p < 0.01$) (Table 2).

Among the 266 participants reporting duration, headache yesterday lasted all day in 98 (36.8%), for <1 hour in 38 (14.3%) and for an estimated mean of 3.7 ± 3.3 hours in the remaining 130 (48.9%); 95 (33.2%) reported a duration of one to four hours, 33 (11.5%) a duration of five to 12 hours and two (0.7%) a duration of >12 hours. Among the 268 who reported intensity, headache yesterday was mild in 54 (20.1%), moderate in 173 (64.6%) and severe in 41 (15.3%).

Among the 269 participants reporting impact of headache yesterday on their usual daily activities, work or school, about one-third (86; 32.0%) were unaffected; of the others, 147 (54.6%) were partially affected and 36 (13.4%) could do nothing. Among the 266 respondents who reported on functional impairment yesterday due to headache, 212 (79.7%) were adversely affected to some extent; of these, 53 (19.9%) could do less than half of what they had expected and a further 20 (7.5%) could do nothing (Table 3).

Among the 263 participants who responded to the final question, 188 (71.5%) took medication for headache yesterday, which was 3.7% of the total sample.

Discussion

This is one of the first reports of headache yesterday, derived from the first nationwide population-based study of headache in the mainland of China. *Lifting The Burden* has been introducing questions on headache yesterday into all population-based burden-of-headache studies undertaken within the Global Campaign against Headache. The reason is as given: to avoid recall bias inherent in inquiries covering prolonged periods (typically three months) in the past. Obviously the number of participants with headache yesterday is much smaller than the number with headache in the last three months but, provided that the original sample is large, this loss is an acceptable trade-off for the gain in data quality.

The finding that an estimated 4.8% of adults aged 18–65 years in China had headache yesterday implies that a similar percentage have headache *every* day. The finding should be internally consistent with the approximate estimate obtainable from one-year prevalence and frequency (days with headache per unit of time) in the same population. These data show a mean of 144 headache days per month per 100 of the population (5), from which it can easily be calculated that 4.8% of the population have headache each day. This exact match indicates robustness of the finding.

The purpose of reporting headache yesterday was, however, to focus not on prevalence but on burden. Duration and intensity are dimensions of symptom burden; while they may be misleading because they are reported subject to the effects of any treatments taken, they give rise to the following estimations. If 4.8% of the population had headache yesterday, among whom 36.8% reported headache all day and 48.9% reported headache for a mean of 3.7 hours, then not only do this number have headache every day but also about 1.8% of that population have headache at any one time. If, further, 79.9% experienced moderate-to-severe headache yesterday, we can project that about 3.8% of that population have headache of that intensity every day, and about 1.4% at any moment. In China, this means 13.2 million people (there were 944 million people aged 18–65 years in China according to national data from 2010 (8)).

The impact is enormous—on daily life, work and study. In line with the theory behind the Migraine Disability Assessment (MIDAS) instrument (9), on which our functional impairment questions were based (HALT (Headache-Attributed Lost Time) index (10)), we took “could do less than half” as a lost day, counterbalancing by ignoring the impact of “could do more than half.” This meant the equivalent of 73 days (27.4% of those affected) were lost yesterday to headache within the sample of 5041. We can further project

Table 1. Demographic and socioeconomic characteristics of the entire study sample and of participants with headache yesterday (HY).

	Total (N = 5041) n (%)	HY (N = 286) n (%)	p value (χ^2)	Odds ratio (OR) [CI]	p value (OR)
Gender					
Male	2561 (50.8)	91 (31.8)	0.000	Reference	
Female	2480 (49.2)	195 (68.2)		2.3 [1.8–3.0]	0.000
Age group					
18–29	849 (16.8)	11 (3.8)	0.000	Reference	
30–39	1070 (21.2)	32 (11.1)			
40–49	1307 (25.9)	93 (32.5)		3.7 [2.7–5.1]	0.000
50–59	1136 (22.5)	88 (30.8)			
60–65	679 (13.5)	62 (21.7)			
Ethnicity					
Majority Han	4723 (93.7)	255 (89.2)	0.003	Reference	
Minority	318 (6.3)	31 (10.8)		1.9 [1.3–2.8]	0.001
Marital status					
Single	516 (6.3)	7 (2.4)	0.000	Reference	
Married	4351 (86.3)	255 (89.2)		4.8 [2.2–10.2]	0.000
Divorced	62 (1.2)	6 (2.1)			
Widowed	112 (2.2)	18 (6.3)			
Habitation					
Urban	1585 (31.4)	82 (28.7)	0.326	Reference	
Rural	3456 (68.6)	204 (71.3)		1.2 [0.9–1.5]	0.299
Educational attainment					
Illiteracy	407 (8.1)	46 (16.1)	0.000	1.9 [1.5–2.4]	0.000
Primary school	1245 (24.7)	89 (31.1)			
Secondary school	1895 (37.6)	87 (30.4)		Reference	
High school	954 (18.9)	41 (14.3)			
College level +	540 (10.7)	23 (8.0)			
Occupation					
Unemployed	428 (8.5)	30 (10.5)	0.005	Reference	
Farmer	3003 (59.6)	195 (68.2)		0.9 [0.6–1.4]	0.687
Factory worker	700 (13.9)	27 (9.4)		0.5 [0.3–0.9]	0.021
Student	129 (2.6)	2 (0.7)		0.2 [0.05–0.9]	0.034
Office worker	654 (13.0)	31 (10.8)		0.7 [0.4–1.1]	0.116
Soldier	20 (0.4)	0 (0.0)		0.00	0.998
Other	107 (2.1)	1 (0.3)		0.1 [0.02–0.9]	0.042
Annual household income (CNY)					
<9600	1252 (24.8)	99 (34.6)	0.001	1.7 [1.3–2.1]	0.000
9600–59,999	3360 (66.7)	167 (58.4)		Reference	
60,000 +	305 (6.1)	14 (4.9)			
Unknown	124 (2.5)	6 (2.1)			

CI: 95% confidence interval; CNY: Chinese Yuan.

that, every day, about 1.3% of those aged 18–65 years in China (12.3 million people) lose the day to disability because of headache. Our earlier report (5) indicated that wholly lost days to headache (missed work,

housework and leisure days) were 2.46 billion/year (respectively 1.50 + 0.47 + 0.49 billion); days of “could do less than half” were 3.31 billion/year (2.51 + 0.80). Based on these findings, our estimate of lost days/day is

Table 2. Multivariate adjusted odds ratios (AOR) for participants with headache yesterday.

	AOR [CI]	p value
Gender		
Female vs male	2.1 [1.6–2.8]	0.000
Age		
40–65 vs 18–39 years	3.1 [2.2–4.4]	0.000
Ethnicity		
Minority (non-Han) vs Han	2.0 [1.3–2.9]	0.001
Marital status		
Ever married vs single	2.0 [0.9–4.6]	0.110
Habitation		
Rural vs urban	1.1 [0.8–1.5]	0.673
Educational attainment		
Low (primary school or less) vs higher	1.2 [0.9–1.5]	0.335
Occupation		
Unemployed	Reference	
Farmer	0.8 [0.5–1.3]	0.357
Factory worker	0.6 [0.4–1.1]	0.105
Student	0.8 [0.2–3.6]	0.720
Office worker	0.9 [0.5–1.6]	0.750
Soldier	0.00	0.998
Other	0.1 [0.02–0.9]	0.039
Annual household income		
Low (<CNY 9600) vs higher	1.4 [1.1–1.8]	0.014

CI: 95% confidence interval; CNY: Chinese Yuan.

[(2.46 + 3.31) billion/365] = 15.8 million. In other words, the estimate based on headache yesterday is rather less than that from the main survey, suggesting that recall bias over-estimates headache-attributed disability measured in this way by about 25%.

Whichever is correct, and we prefer the estimate based on headache yesterday for reasons given, it indicates a huge level of population ill health, and once again calls attention to the high-priority need for effective headache services able to reach the large numbers of people with headache who are spread nationwide (1). It should not be overlooked that 71.5% of those with headache yesterday took medication for it. This represents 3.7% of the total sample; therefore, presumably, each day, 3.4% (age-weighted) of the total population aged 18–65 years in China take medication for headache. This is a very large consumption, and much effort should be made to ensure that it is appropriate consumption.

Headache yesterday was more than twice as likely in women as in men (7.9% vs 3.6%) (age-weighted 6.6% vs 3.0%) but, with regard to headache duration and intensity and the measures of functional impairment,

men and women were quite similar. The difference reflects, and is explained by, the higher one-year prevalence of headache in women in China (5), as is seen elsewhere. Other demographic and socioeconomic characteristics also influenced the reporting of headache yesterday. Comparison of the age distributions in the total sample and those with headache yesterday (Table 1) shows, clearly, skewing toward older age groups in the latter. This is not seen in one-year prevalence data: In the main study, prevalences of migraine and tension-type headache both peaked during middle age (40–49 years) (5). However, the one-year prevalence of headache occurring on ≥ 15 days/month, while being only 1.0% overall, increased with age throughout the range of 18–65 years (5). The probability of headache yesterday in any individual with a headache disorder is driven by headache frequency. It was undoubtedly this factor at work here, and this demonstrates the impact at population level of the burden of headache of this small minority. Otherwise, ethnic minority (non-Han) was also associated with a significantly increased likelihood of headache yesterday, which was not found in the one-year headache prevalence study (5). The influence of age seen here reflected a similar influence observed in the main study (5).

The importance of measuring the impact of headache yesterday, and the major strength of this study, lies in the almost complete freedom from recall bias. How much recall bias may affect retrospectively reported headache incidence and impact over a period of time is unknowable; for this reason, it is highly desirable to eliminate it. Provided that the sample is large enough (and here, the CIs were quite narrow), the impact of headache yesterday, we believe, robustly and accurately describes the population impact of headache. It is an important point that participants were visited without prior notice, so no choice of day was possible when responding (when choice is possible, participants who have headache today may defer responding until tomorrow, thereby artificially increasing the probability of headache yesterday). There was a high participation rate of 94.1%. Although a non-responder study was not conducted, participation bias was not likely to have been a significant factor influencing the analysis.

The major limitation of this study is that, although diagnostic questions were included in the methods, the scope for a diagnosis-related analysis is limited. This is mostly because these questions were applied to the subjectively most bothersome headache reported in the last year, not to headache yesterday; as noted earlier, ICHD-II criteria are not applicable to single headache episodes. We did ask whether headache yesterday was of the same type as the most bothersome, and in 89.2% of cases it was; therefore we had no diagnosis in the

Table 3. Prevalence, duration, intensity and impact of headache yesterday (HY) by gender.

	Overall	Males	Females
Prevalence of HY			
n/N of participants	286/5,041	91/2,561	195/2,480
% [CI]	5.7 [5.0-6.3]	3.6 [2.8-4.3]	7.9 [6.8-8.9]
Duration of HY (% [CI])			
<1 hour	38/266	13/85	25/181
	14.3 [10.1-18.5]	15.3 [7.6-22.9]	13.8 [8.8-18.8]
1-4 hours	95/266	33/85	62/181
	35.7 [30.0-41.5]	38.8 [28.5-49.2]	34.3 [27.3-41.2]
5-12 hours	33/266	8/85	25/181
	12.4 [8.4-16.4]	9.4 [3.2-15.6]	13.8 [8.8-18.8]
>12 hours	2/266	1/85	1/181
	0.8 [-0.3-1.8]	1.2 [-1.1-3.5]	0.6 [0-1.6]
all day	98/266	30/85	68/181
	36.8 [31.0-42.6]	35.3 [25.1-45.5]	37.6 [30.5-44.6]
Intensity of HY (% [CI])			
Mild pain	54/268	16/86	38/182
	20.1 [15.3-25.0]	18.6 [10.4-26.8]	20.9 [15.0-26.8]
Moderate pain	173/268	58/86	115/182
	64.6 [58.8-70.3]	67.4 [57.5-77.3]	63.2 [56.2-70.2]
Severe pain	41/268	12/86	29/182
	15.3 [11.0-19.6]	14.0 [6.6-21.3]	15.9 [10.6-21.3]
Impact on daily life, work or school of HY (% [CI])			
Unaffected	86/269	28/86	58/183
	32.0 [26.4-37.5]	32.6 [22.7-42.5]	31.7 [25.0-38.4]
Partially affected	147/269	46/86	101/183
	54.6 [48.7-60.6]	53.5 [42.9-64.0]	55.2 [48.0-62.4]
Could do nothing	36/269	12/86	24/183
	13.4 [9.3-17.5]	14.0 [6.6-21.3]	13.1 [8.2-18.0]
Functional impairment because of HY (% [CI])			
Did everything expected	54/266	21/86	33/180
	20.3 [15.5-25.1]	24.4 [15.3-33.5]	18.3 [12.7-24.0]
Did >50% of expected	139/266	44/86	95/180
	52.3 [46.3-58.3]	51.2 [40.6-61.7]	52.8 [45.5-60.1]
Did <50% of expected	53/266	14/86	39/180
	19.9 [15.1-24.7]	16.3 [8.5-24.1]	21.7 [15.6-27.7]
Did nothing	20/266	7/86	13/180
	7.5 [4.3-10.7]	8.1 [2.4-13.9]	7.2 [3.4-11.0]
Took medication for HY (% [CI])			
	188/263	64/85	124/178
	71.5 [66.0-76.9]	75.3 [66.1-84.5]	69.7 [62.9-76.4]

CI: 95% confidence interval.

remaining 10.8%. In any event, numbers would have been small for such an analysis.

Another limitation to be acknowledged is that headache yesterday in an inquiry conducted over a period of weeks takes no account of seasonal variation. The evidence for seasonal variation in headache prevalence is not very strong (11,12). Terminology needs to be used

carefully here: One-year prevalence should not be subject to seasonal variation, but estimates of it may be. More pertinently, features of headache that drive impact, especially attack frequency, may be subject to seasonal variation. Of course, surveys inquiring into headache over the preceding three months are also susceptible to seasonal variations.

Conclusion

A population-based study of headache yesterday, therefore almost free from recall bias, shows that in China headache affects 4.8% of adults aged 18–65 years on

any day. It causes about 1.3% of all days to be lost to disability (whether from usual daily activities, work or school). There are clear implications for health policy.

Clinical implications

- This population-based study of headache yesterday fills some of the gap in knowledge about the impact of headache disorders in China. Inquiry specifically into headache yesterday avoids recall biases.
- At this and any moment, 4.8% of adults aged 18–65 years in China are suffering with headache. More than 12.3 million people lose the day to disability because of headache.

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Conflicts of interest

None declared.

Authors' contributions to this manuscript

Dr Shengyuan Yu was the principal investigator who was responsible for study design, data analysis and interpretation, and writing of the manuscript. As the corresponding author, Dr Yu had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Dr Mianwang was responsible for reviewing the literature.

Dr Ruozhuo Liu co-organized this survey.

Drs Jiachun Feng, Xiangyang Qiao, Xiaosu Yang, Gang Zhao and Yannan Fang were regional leaders of this survey. Dr Xiutang Cao, an epidemiologist, was responsible for sampling and data statistics.

Dr TJ Steiner, chair of the Lifting the Burden Global Campaign Committee, supervised training of interviewers and design of the study as a scientific adviser, and revised the manuscript.

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