


# BMJ Open Sleep-related healthcare use prevalence among adults with insomnia symptoms in Hebei, China: a population-based cross-sectional study

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## ABSTRACT

**Objective** This study investigated the prevalence of sleep-related healthcare use and the factors associated with it among adults with different insomnia symptoms.

**Design and setting** This was a population-based study with a cross-sectional design conducted in Hebei province, China.

**Participants** Participants were community residents aged 18 years and above; a total of 21 376 valid questionnaires were analysed.

**Primary and secondary outcome measures** The Athens Insomnia Scale (AIS) was used to evaluate participants' insomnia symptoms. Variables such as sleep-related healthcare use, chronic disease, living alone and sociodemographics were assessed for all the participants.

**Results** Among adults with any insomnia symptoms, only 2.1% used sleep-related healthcare in the past year. Even for adults with insomnia, the prevalence of sleep-related healthcare use was only 6.2%. Furthermore, the prevalence rates of sleep-related healthcare use among adults with sleep induction, night awakenings, earlier awakening, sleep duration, sleep quality, daytime well-being, daytime functioning, and daytime sleepiness were 3.1%, 2.9%, 3.6%, 3.4%, 3.9%, 4.9%, 4.6% and 2.8%, respectively. The following factors were associated with sleep-related healthcare use among adults with insomnia: male (adjusted OR (aOR)=0.52,  $p<0.01$ ), younger age (aOR=1.02,  $p<0.01$ ), rural region (aOR=0.45,  $p<0.001$ ) and AIS score (aOR=1.23,  $p<0.001$ ). The same factors were also associated with sleep-related healthcare use among adults with insomnia symptoms.

**Conclusions** The prevalence of sleep-related healthcare use among adults with insomnia symptoms is very low. Young men from rural areas with insomnia symptoms tend not to use healthcare. As such, it is necessary to form policies and strategies to promote sleep-related healthcare use among rural young men with insomnia symptoms.

## INTRODUCTION

Insomnia is one of the most prevalent sleep problems in the general population. Previous international epidemiological studies show that the prevalence of insomnia varied from 4.7% to 37.2% in different countries because of the varying criteria of insomnia.<sup>1 2</sup> In China, a meta-analysis reported that insomnia

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ All the findings were obtained through a population-based cross-sectional study with a large sample size ( $n > 20\ 000$ ).
- ⇒ Due to the cross-sectional study design, causal relationships cannot be determined among the factors associated with sleep-related healthcare use.
- ⇒ All insomnia symptoms were evaluated based on participants' self-report; therefore, recall bias cannot be ruled out.
- ⇒ Sleep-related healthcare use was evaluated by a single question on healthcare service use among people with sleep problems. Since there are a variety of sleep problems, the prevalence of sleep-related healthcare use in this study may be over-rated.
- ⇒ Finally, although there are numerous factors associated with sleep-related healthcare use, this study identified and analysed only a few of them.

was prevalent in approximately 15% of the general population.<sup>3</sup> Additionally, the long-term negative impacts of insomnia comprise a multitude of emotional, social and physical problems such as depression,<sup>4</sup> hypertension,<sup>5</sup> suicidal behaviours<sup>6</sup> and so on.<sup>7 8</sup> As such, insomnia is an important public health problem in China and various other countries.<sup>9 10</sup>

Although it is hard for us to accurately evaluate the effect of professional sleep-related healthcare use on insomnia in the general population, professional sleep-related healthcare use is one of the best ways of dealing with insomnia problems. One of the reasons is that a variety of treatments are used for insomnia, including medicine, herbal, psychological interventions, behaviour therapy, and so on.<sup>11</sup> However, healthcare use is the best and the most professional method to select an appropriate treatment. Moreover, it is crucial to grasp the prevalence of sleep-related healthcare use's prevalence among adults with

insomnia symptoms to understand the insomnia situation. Healthcare use is one of the most important public health aspects of insomnia. Finally, analysing the factors associated with sleep-related healthcare use can inform us of the target populations for intervention and help us manage insomnia problems.

In the past few decades, the impact of insomnia on healthcare use and health has been identified in several countries.<sup>12 13</sup> However, the prevalence of sleep-related healthcare use among people with insomnia symptoms has been relatively less reported, especially in population-based studies. Previous telephone or postal surveys in Canada and Australia reported that approximately 13% of people with insomnia symptoms used medical care consultation.<sup>14–16</sup> A secondary analysis of the primary care records or health insurance records in the UK and Chinese Taiwan reported that insomnia's health-seeking prevalence rates were 4.2% and 19%, respectively.<sup>17 18</sup> Although all these studies offer critical information on the prevalence of healthcare use among people with insomnia symptoms and the factors associated with it, a population-based face-to-face study is imminently required. This is in consideration of the varying findings, low response rate for telephone or postal surveys, and weakness of the secondary analysis in the previous studies, especially in the Chinese mainland.

Since the prevalence of sleep-related healthcare use among adults is a fundamental factor for insomnia prevention, grasping it is vital to understand the current insomnia situation. We conducted this population-based study to investigate the prevalence of sleep-related healthcare use among adults with different insomnia symptoms and to analyse the factors associated with it. The findings can help us understand the situation of sleep-related healthcare use among adults with different insomnia symptoms and provide valuable information to develop health policies to control and manage insomnia.

## PARTICIPANTS AND METHODS

### Participants

This was a cross-sectional study conducted in Hebei province in northern China. Hebei is economically prosperous in both industry and agriculture. A multi-stage stratified cluster sampling was used to select the community residents of Hebei. First, five cities (Shijiazhuang, Baoding, Xingtai, Zhangjiakou and Qinhuangdao) were randomly selected from all 11 cities of Hebei. Second, three counties and one district were randomly chosen in each selected city. Third, one township or subdistrict was randomly selected from each county or district. Fourth, one village (community) was randomly chosen in each selected township (subdistrict). In total, 15 villages and 5 communities were chosen for the survey. All adult residents (aged 18 years and above) were interviewed, and a total of 21 376 valid questionnaires were collected.

### Interviewing procedures

Interviews were conducted from June to August 2018. Before starting the survey, all interviewers received training to fully understand the research and questionnaire contents. A face-to-face interview was scheduled by one interviewer for all participants on obtaining their agreement through a written informed consent form. The interviews were scheduled at the participants' homes. To ensure interview quality, all questionnaires were checked by different reviewers on each interview day. Participants who returned questionnaires with missing data were revisited or called on the next day.

### Patient and public involvement

The public was not involved in the design, conducting, reporting or dissemination plans of the research.

### Measures

#### Sleep-related healthcare use

Sleep-related healthcare use was evaluated using the question 'Have you ever seen a doctor because of sleep problems in the past year?' The participant was asked to respond either 'yes' or 'no'. Those who answered yes were considered to use healthcare, while those who answered no were considered to not use healthcare.

#### Insomnia status

*Insomnia status* was evaluated using the Chinese version of the Athens Insomnia Scale (AIS), which is a valid instrument based on the International Classification of Diseases, 10th Revision, criteria.<sup>19 20</sup> Higher scores indicate more severe insomnia symptoms. It contains eight symptoms: sleep induction, night awakenings, earlier awakening, sleep duration, sleep quality, daytime well-being, daytime functioning and daytime sleepiness. Each symptom should occur at least three times a week during the last month to receive a diagnosis of insomnia symptoms (total score  $\geq 1$ ). The Chinese version of the AIS has also been proven to be a reliable and valid instrument. Furthermore, for a diagnosis of insomnia disorder, the optimal cut-off point was a total score  $\geq 7$ .<sup>21</sup> In this study, we analysed the factors associated with healthcare use among adults with insomnia symptoms (total AIS score  $\geq 1$ ) and adults with insomnia disorder (total AIS score  $\geq 7$ ).

#### Living alone

*Living alone* was evaluated by the question 'How many persons live with you (not including yourself)?' The answer '0' was considered as living alone (1). All other answers were analysed as not living alone (0).

#### Chronic disease

*Chronic disease* was assessed using 13 self-reported items regarding chronic diseases in the past year. Participants were asked whether they had been diagnosed with chronic diseases of the respiratory system, cerebrovascular disease, immune system disease, skin complaint, hypertension, diabetes, thyroopathy, gastritis, anaemia, anaphylactic rhinitis, cancer or other chronic diseases.

**Table 1** Sample description and single analysis between sociodemographic variables, insomnia symptoms and sleep-related healthcare use (N=21 376)

Variables	Total	Sleep-related healthcare use		T/ $\chi^2$	P value
		Yes, n (%)	No, n (%)		
All	21 376 (100.0)	242 (1.1)	21 134 (98.9)	–	–
Gender				67.60	<0.001
Male	9839 (46.0)	48 (0.5)	9791 (99.5)		
Female	11 537 (54.0)	194 (1.7)	11 343 (98.3)		
Age (year), mean $\pm$ SD	50.85 $\pm$ 16.30	60.75 $\pm$ 13.03	50.74 $\pm$ 16.30	9.52	<0.001
Ethnicity				1.51	0.219
Hans	20 094 (94.0)	232 (1.2)	19 862 (98.8)		
Others	1282 (6.0)	10 (0.8)	1272 (99.2)		
Education				12.15	0.007
Illiteracy	2691 (12.6)	42 (1.6)	2649 (98.4)		
Elementary	5264 (24.6)	71 (1.3)	5193 (98.7)		
Middle school	8274 (38.7)	88 (1.1)	8166 (98.9)		
Senior high school or above	5147 (24.1)	41 (0.8)	5106 (99.2)		
Married status				23.14	<0.001
Unmarried	1548 (7.2)	3 (0.2)	1545 (99.8)		
Married	18 487 (86.5)	211 (1.1)	18 276 (98.9)		
Others	1341 (6.3)	28 (2.1)	1313 (97.9)		
Monthly income				7.17	0.028
$\leq$ ¥1000	5367 (25.1)	77 (1.4)	5290 (98.6)		
¥1001–	13 961 (65.3)	149 (1.1)	13 812 (98.9)		
¥7001–	2048 (9.6)	16 (0.8)	2032 (99.2)		
Living alone				8.73	0.003
Yes	1193 (94.4)	24 (2.0)	1169 (98.0)		
No	20 183 (5.6)	218 (1.1)	19 965 (98.9)		
Region				17.10	<0.001
Urban	5100 (23.9)	85 (1.7)	5015 (98.3)		
Rural	16 276 (76.1)	157 (1.0)	16 119 (99.0)		
Chronic disease				64.83	<0.001
Yes	5589 (26.1)	118 (2.1)	5471 (97.9)		
No	15 787 (73.9)	124 (0.8)	15 663 (99.2)		
Sleep induction				302.86	<0.001
Yes	6180 (28.9)	192 (3.1)	5988 (96.9)		
No	15 196 (71.1)	50 (0.3)	15 146 (99.7)		
Night awakenings				227.81	<0.001
Yes	6131 (28.7)	175 (2.9)	5956 (97.1)		
No	15 245 (71.3)	67 (0.4)	15 178 (99.6)		
Earlier awakening				218.24	<0.001
Yes	3397 (15.9)	122 (3.6)	3275 (96.4)		
No	17 979 (84.1)	120 (0.7)	17 859 (99.3)		
Sleep duration				262.40	<0.001
Yes	4394 (20.6)	151 (3.4)	4243 (96.6)		
No	16 982 (79.4)	91 (0.5)	16 891 (99.5)		
Sleep quality				411.41	<0.001
Yes	4693 (22.0)	183 (3.9)	4510 (96.1)		

Continued

**Table 1** Continued

Variables	Total	Sleep-related healthcare use		T/ $\chi^2$	P value
		Yes, n (%)	No, n (%)		
No	16 683 (78.0)	59 (0.4)	16 624 (99.6)		
Daytime well-being				316.66	<0.001
Yes	2252 (10.5)	110 (4.9)	2142 (95.1)		
No	19 124 (89.5)	132 (0.7)	18 992 (99.3)		
Daytime functioning				370.24	<0.001
Yes	2948 (13.8)	136 (4.6)	2812 (95.4)		
No	18 428 (86.2)	106 (0.6)	18 322 (99.4)		
Daytime sleepiness				123.34	<0.001
Yes	4154 (19.4)	115 (2.8)	4039 (97.2)		
No	17 222 (80.6)	127 (0.7)	17 095 (99.3)		
Any insomnia symptoms				193.78	<0.001
Yes	10 718 (50.1)	229 (2.1)	10 489 (97.9)		
No	10 658 (49.9)	13 (0.1)	10 645 (99.9)		
Insomnia disorder				622.38	<0.001
Yes	2430 (11.4)	150 (6.2)	2280 (93.8)		
No	18 946 (88.6)	92 (0.5)	18 854 (99.5)		
AIS score	2.15 $\pm$ 3.39	8.17 $\pm$ 5.04	2.09 $\pm$ 3.30	28.25	<0.001

AIS, Athens Insomnia Scale.

The answers were wither yes or no. Participants who responded ‘no’ to all the items were considered to have no chronic diseases.

### Sociodemographic variables

Gender was assessed as ‘male’ (1) or ‘female’ (0). Age was calculated by the participants’ date of birth. Ethnicity was evaluated by ‘Han’ (1) or ‘others’ (0). Education level was assessed by academic degree with the following options: ‘elementary school’, ‘middle school’, ‘senior high school’ or ‘above.’ Marital status was evaluated by a question with the following response options: ‘never married’, ‘married’, ‘divorced’, ‘widowed’, ‘deuterogamist’ or ‘others’. Only a small percentage of participants chose the last four options; therefore, we coded marital status as ‘unmarried’ (1), ‘married’ (2) and ‘others’ (3). Monthly income was assessed by a question about participants’ monthly family income. The response options were: ‘no income’, ‘below ¥1000’ (¥7=\$1), ‘¥1001–¥3000’, ‘¥3001–¥7000’, ‘¥7001–¥10000’, ‘¥10 001–¥20 000’ or ‘above ¥20 000’. A small percentage of responses were received for the last two categories, and income was recoded as ‘below ¥1000’ (1), ‘¥1001–¥7000’ (2) or ‘above ¥7000’ (3). Participants’ region of residence was classified into ‘urban region’ (0) or ‘rural region’ (1).

### Statistical methods

Data analysis was conducted using IBM SPSS Statistics for Windows V.24.0 (web version). Descriptive statistics were reported as means and SD for continuous variables, and percentages for categorical variables. Student’s t-test or the  $\chi^2$  test was used to compare the means or proportions

**Table 2** Single analysis between sociodemographic variables and sleep-related healthcare use among adults with insomnia symptoms and insomnia disorder

Variables	Total	Sleep-related healthcare use		T/ $\chi^2$	P value
		Yes, n (%)	No, n (%)		
Any insomnia symptoms (n=10 718)					
All	10 718 (100.0)	229 (2.1)	10 489 (97.9)	–	–
Gender				40.44	<0.001
Male	4289 (40.0)	45 (1.0)	4244 (99.0)		
Female	6429 (60.0)	184 (2.9)	6245 (97.1)		
Age (year), mean $\pm$ SD	54.51 $\pm$ 15.43	60.57 $\pm$ 12.31	54.37 $\pm$ 15.47	6.02	<0.001
Ethnicity				0.76	0.383
Hans	557 (5.2)	9 (1.6)	548 (98.4)		
Others	10 161 (94.8)	220 (2.2)	9941 (97.8)		
Education				1.92	0.589
Illiteracy	1738 (16.2)	41 (2.4)	1697 (97.6)		
Elementary	3023 (28.2)	66 (2.2)	2957 (97.8)		
Middle school	3859 (36.0)	85 (2.2)	3774 (97.8)		
Senior high school or above	2098 (19.6)	37 (1.8)	2061 (98.2)		
Married status				12.41	0.002
Unmarried	493 (4.6)	1 (0.2)	492 (99.8)		
Married	9342 (87.2)	201 (2.2)	9141 (97.8)		
Others	883 (8.2)	27 (3.1)	856 (96.9)		
Monthly income				1.15	0.563
$\leq$ ¥1000	3334 (31.1)	72 (2.2)	3262 (97.8)		
¥1001-	6526 (60.9)	143 (2.2)	6383 (97.8)		
¥7001-	858 (8.0)	14 (1.6)	844 (98.4)		
Living alone				1.46	0.227
Yes	765 (7.1)	21 (2.7)	744 (97.3)		
No	9953 (92.9)	208 (2.1)	9745 (97.9)		
Region				17.89	<0.001
Urban	2413 (22.5)	78 (3.2)	2335 (96.8)		
Rural	8305 (77.5)	151 (1.8)	8154 (98.2)		
Chronic disease				20.70	<0.001
Yes	3767 (35.1)	113 (3.0)	3654 (97.0)		
No	6951 (64.9)	116 (1.7)	6835 (98.3)		
AIS score	4.30 $\pm$ 3.70	8.63 $\pm$ 4.78	4.20 $\pm$ 3.62	18.16	<0.001
Insomnia disorder (n=2430)					
All		150 (6.2)	2280 (93.8)	–	–
Gender				8.25	0.004
Male	758 (31.2)	31 (4.1)	727 (95.9)		
Female	1672 (68.8)	119 (7.1)	1553 (92.9)		
Age (year), mean $\pm$ SD	59.28 $\pm$ 13.45	61.82 $\pm$ 12.53	59.11 $\pm$ 13.50	2.39	0.017
Ethnicity				1.50	0.221
Hans	2256 (92.8)	143 (6.3)	2113 (93.7)		
Others	174 (7.2)	7 (4.0)	167 (96.0)		
Education				4.99	0.173
Illiteracy	574 (23.6)	31 (5.4)	543 (94.6)		

Continued

**Table 2** Continued

Variables	Total	Sleep-related healthcare use		T/ $\chi^2$	P value
		Yes, n (%)	No, n (%)		
Elementary	819 (33.7)	45 (5.5)	774 (94.5)		
Middle school	712 (29.3)	56 (7.9)	656 (92.1)		
Senior high school or above	325 (13.4)	18 (5.5)	307 (94.5)		
Married status				3.38	0.184
Unmarried	75 (3.1)	1 (1.3)	74 (98.7)		
Married	2072 (85.3)	133 (6.4)	1939 (93.6)		
Others	283 (11.6)	16 (5.7)	267 (94.3)		
Monthly income				2.73	0.255
$\leq$ ¥1000	1003 (41.3)	53 (5.3)	950 (94.7)		
¥ 1001-	1252 (51.5)	87 (6.9)	1165 (93.1)		
¥ 7001	175 (7.2)	10 (5.7)	165 (94.3)		
Living alone				0.19	0.667
Yes	252 (10.4)	14 (5.6)	238 (94.4)		
No	2178 (89.6)	136 (6.2)	2042 (93.8)		
Region				21.01	<0.001
Urban	414 (17.0)	46 (11.1)	368 (88.9)		
Rural	2016 (83.0)	104 (5.2)	1912 (94.8)		
Chronic disease				0.11	0.739
Yes	1183 (48.7)	75 (6.3)	1108 (93.7)		
No	1247 (51.3)	75 (6.0)	1172 (94.0)		
AIS score	9.99 $\pm$ 3.09	11.15 $\pm$ 3.87	9.91 $\pm$ 3.02	4.76	<0.001

AIS, Athens Insomnia Scale.

between those who used sleep-related healthcare use and those who did not. Binary logistic regression with enter method was performed to examine the factors associated with sleep-related healthcare use. Missing data were deleted from the analysis. All significance tests were two-tailed; a p value of 0.05 or lower was considered statistically significant.

## RESULTS

We interviewed a total of 21 376 community residents in Hebei province, China. The participants' descriptions are listed in the second column of [table 1](#). The remaining parts of [table 1](#) show the prevalence of healthcare use among the participants. There were 10 718 (50.1%) adults who reported insomnia symptoms, whereas 2430 adults (11.4%) were categorised as having insomnia disorder. The prevalence of insomnia symptoms ranged from 10.5% to 28.9%. Single analyses revealed that self-reported healthcare use was associated with gender ( $p<0.001$ ), age ( $p<0.001$ ), education ( $p=0.007$ ), marital status ( $p<0.001$ ), monthly income ( $p<0.028$ ), living alone ( $p<0.003$ ), region ( $p<0.001$ ), chronic disease ( $p<0.001$ ) and all eight kinds of insomnia symptoms (all  $p<0.001$ ). In [table 1](#), we analysed the prevalence of sleep-related

**Table 3** Logistic analysis for the factors associated with sleep-related healthcare use among adults with any insomnia symptoms or insomnia disorder (aOR (95% CI))

Variables	Any insomnia symptoms	Insomnia disorder
Observation	10 718	2430
Male	0.44 (0.31 to 0.62)**	0.56 (0.37 to 0.85)*
Age (year), mean±SD	1.02 (1.01 to 1.04)**	1.01 (1.00 to 1.04)*
Hans	1.87 (0.92 to 3.77)	1.88 (0.85 to 4.16)
Education (Ref.: senior high school or higher)		
Illiteracy	0.66 (0.39 to 1.13)	0.91 (0.47 to 1.80)
Elementary	0.88 (0.56 to 1.39)	1.07 (0.58 to 1.97)
Middle school	1.22 (0.81 to 1.83)	1.61 (0.92 to 2.84)
Married status (Ref.: others)		
Unmarried	0.20 (0.03 to 1.51)	0.42 (0.05 to 3.43)
Married	1.04 (0.62 to 1.76)	1.38 (0.71 to 2.68)
Monthly income (Ref.: ¥7001-)		
≤ ¥1000	1.11 (0.58 to 2.11)	1.13 (0.52 to 2.44)
¥1001	1.57 (0.88 to 2.79)	1.45 (0.72 to 2.92)
Living alone	0.98 (0.54 to 1.78)	0.96 (0.47 to 1.99)
Rural region	0.45 (0.32 to 0.62)**	0.41 (0.27 to 0.63)**
Chronic disease	1.11 (0.84 to 1.48)	0.90 (0.64 to 1.28)
AIS score	1.23 (1.20 to 1.26)**	1.13 (1.08 to 1.19)**
Constant	0.002**	0.003**
R <sup>2</sup>	0.158	0.078

\*P<0.01, \*\*P<0.001.  
AIS, Athens Insomnia Scale; aOR, adjusted OR; Ref., reference.

healthcare use among adults with different insomnia symptoms. Only 2.1% of adults with any insomnia symptom used sleep-related healthcare in the past year. Even among those diagnosed with insomnia disorder, the prevalence of sleep-related healthcare use was 6.2%. Furthermore, among adults with sleep induction, night awakenings, earlier awakening, sleep duration, sleep quality, daytime well-being, daytime functioning and daytime sleepiness, the prevalence rates of sleep-related healthcare use were 3.1%, 2.9%, 3.6%, 3.4%, 3.9%, 4.9%, 4.6% and 2.8%, respectively.

Table 2 shows the results of the analysis between sociodemographic variables and sleep-related healthcare use among adults with insomnia symptoms and insomnia disorder. For adults with insomnia symptoms, gender ( $\chi^2=40.44$ ,  $p<0.001$ ), age ( $t=6.02$ ,  $p<0.001$ ), marital status ( $\chi^2=12.41$ ,  $p=0.002$ ), region ( $\chi^2=17.89$ ,  $p<0.001$ ), chronic disease ( $\chi^2=20.70$ ,  $p<0.001$ ), and AIS score ( $t=18.16$ ,  $p<0.001$ ) were associated with sleep-related healthcare use; for those with insomnia disorder, gender ( $\chi^2=8.25$ ,  $p=0.004$ ), age ( $t=2.39$ ,  $p=0.017$ ), region ( $\chi^2=21.01$ ,  $p<0.001$ ) and AIS score ( $t=4.76$ ,  $p<0.001$ ) were associated with sleep-related healthcare use.

Table 3 shows the results of the binary logistic regressions with enter method that analysed the factors

associated with sleep-related healthcare use among adults with insomnia symptoms and insomnia disorder. Among adults with insomnia symptoms, these factors included male gender (aOR=0.44,  $p<0.001$ ), age (aOR=1.02,  $p<0.001$ ), rural region (aOR=0.45,  $p<0.001$ ) and AIS score (aOR=1.23,  $p<0.001$ ). Among adults with insomnia disorder, these factors were male gender (aOR=0.56,  $p<0.01$ ), age (aOR=1.01,  $p<0.01$ ), rural region (aOR=0.41,  $p<0.001$ ) and AIS score (aOR=1.13,  $p<0.001$ ).

## DISCUSSION

We found that only 2.1% of adults with insomnia symptoms in this study used sleep-related healthcare. Furthermore, the prevalence of healthcare use was only 6.2% even among adults with insomnia disorder (AIS score  $\geq 7$ ). Sleep-related healthcare use showed a decline in ranking for different insomnia symptoms from daytime well-being, daytime functioning, sleep quality, earlier awakening, sleep duration, sleep induction, night awakenings to daytime sleepiness. The results also indicated that participants who were male, of younger age and living in a rural region tended not to use healthcare services when they experienced insomnia symptoms. Considering the high rates of prevalence of insomnia symptoms and the importance of healthcare use for insomnia, these findings are noteworthy.

First, this study revealed the prevalence of insomnia symptoms among adults (age  $\geq 18$  years). Almost half of the participants (50.1%) reportedly experienced insomnia symptoms; furthermore, 11.4% of them were at a high risk of insomnia disorder (AIS score  $\geq 7$ ). This is higher than the rates of prevalence in the UK and Korea.<sup>22 23</sup> However, the findings are similar to those in the USA.<sup>24</sup> The possible reasons for the differences in results may be the different criteria and number of insomnia symptoms evaluated in the studies. In two of the studies, only three main kinds of insomnia symptoms (ie, difficulty initiating sleep, difficulty maintaining sleep and early morning awakening) were assessed.<sup>25 26</sup> In other studies, the evaluation of insomnia symptoms did not meet the diagnostic criteria for insomnia (more than three nights a week).<sup>27 28</sup> However, regarding the prevalence of insomnia disorder, our findings were similar to prior research.<sup>29 30</sup>

One of the major findings of this study is the prevalence of sleep-related healthcare use among adults with insomnia symptoms in a year; the results showed a very low rate (2.1%) of prevalence. Moreover, even those with insomnia disorder reported a low prevalence rate (6.2%). The rate of prevalence for those with insomnia symptoms was similar to previous studies.<sup>18 31</sup> However, it was lower than that in Australia and Canada.<sup>15 16</sup> One of the possible reasons may be that many people do not consider insomnia symptoms as medical problems. Furthermore, they lack awareness on healthcare use for insomnia symptoms. Another reason may be the high-level use of

complementary and complementary medicine, which was found in previous studies.<sup>32 33</sup>

We also analysed the prevalence of sleep-related healthcare use among adults with different insomnia symptoms. Adults with daytime functioning and well-being symptoms showed the highest sleep-related healthcare use. We found that healthcare use was lowest among adults with daytime sleepiness and night awakening; this is worrisome, given the higher prevalence, burden and negative influence of other insomnia symptoms.<sup>34 35</sup> These findings may be explained by the perceived seriousness of different insomnia symptoms; participants considered the symptoms of functioning and well-being as more serious than other insomnia symptoms.

This study found that young men in rural regions did not use sleep-related healthcare when they suffered from insomnia symptoms, after controlling the AIS scores. However, women tended to use sleep-related healthcare when they suffered insomnia symptoms. This was consistent with previous findings.<sup>36</sup> One reason for this may be that the associations of inflammatory markers, cardiovascular diseases and insomnia are stronger in women than in men.<sup>37–39</sup> We also found that young adults did not use sleep-related healthcare when they experienced insomnia symptoms. These findings were also similar to previous studies.<sup>15</sup> Compared with older adults, young people may be more careless about their insomnia symptoms, leading to lower inclination to seek medical help. Rural adults with insomnia symptoms also showed a lower level of healthcare use. However, this may be explained by lack of access to healthcare.<sup>40</sup> The association between AIS scores and healthcare use can also be easily explained; a higher AIS score means more severe insomnia symptoms, which may promote sleep-related healthcare use among adults.

This study also has some limitations that should be considered when interpreting the results. First, this was a cross-sectional study, and the data were collected at a certain time point. Thus, we cannot infer any causal relationships among the factors associated with sleep-related healthcare use. Second, all insomnia symptoms were evaluated based on participants' self-report in 2018. Therefore, recall bias cannot be avoided; it is also possible that the symptoms changed over time, which may influence the results. Third, sleep-related healthcare use was evaluated by a single question regarding healthcare-seeking behaviour among people with sleep problems. Since there are a variety of sleep problems, the prevalence of sleep-related healthcare use may be over-rated in this study. Finally, the factors associated with sleep-related healthcare use analysed in this study are limited and there may be many more factors associated with healthcare use. However, we obtained a large sample size of 21 376 community residents through a population-based study. Moreover, our findings revealed the prevalence of sleep-related healthcare use and factors associated with it among people with insomnia symptoms. These results are significant in terms of the public health aspects of insomnia.

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## CONCLUSIONS

In conclusion, the prevalence of sleep-related healthcare use among adults with insomnia symptoms was very low. Considering the high prevalence and burden of insomnia in China, it is vital to control this condition. Policies and strategies should be developed to promote sleep-related healthcare use among adults with insomnia symptoms. Moreover, rural young men were found to not use healthcare services when they suffered from insomnia symptoms. Thus, policies for health education are urgently needed to deal with the situation of sleep-related healthcare use among adults with insomnia symptoms.

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