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Migraines in Medical Students from Inner Mongolia University

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Abstract:
Background and aim: The epidemiological characteristics of migraines in medical students are not clear. We tend to use the census results to assist with the design of interventions to reduce the prevalence of migraines and related issues among medical students.
Methods: The census employed was a self-administered questionnaire regarding various migraine symptoms and related factors administered to students attending Inner Mongolia Medical College in China. We calculate migraine prevalence and evaluate migraine-related factors. Migraine prevalence based on related factors and according to gender were compared using χ^2 tests. The proportion of other symptoms related to migraines was also calculated. Multivariate logistic regression analysis was used to determine the independent association between each factor and migraine. **Results:** 17.2% of surveyed students had experienced migraines. The migraines prevalence among students who used the computer for over three hours was nearly 1.5 times higher than for those who used it for less than one hour. Of those students who used a computer for more than 3 hours, migraine prevalence among female students was approximately 1.5 times greater than for males. The migraine prevalence among students with poor sleep was nearly two times higher than among those with good sleep. The migraine prevalence among students with anxiety was approximately 2.5 times higher relative to those who experienced no anxiety. The most common symptom complaint associated with migraines (>97%) included limited ability to study and restricted daily activities.
Conclusions: Although the migraine prevalence in our study was moderate, it led to serious limitations in students' study time and daily activities. In addition to measures to relieve anxiety and improve sleep quality, stricter control of computer use will be necessary, especially in female. Taken together, our study provides better insight regarding medical students' migraine-related problems.
Key words: migraines, prevalence, medical student, risk factor

Introduction

Migraines are one of the most common neurological problems, characterized by periodic episodes of paroxysmal headache and accompanied by nausea, vomiting, and abdominal pain[1] .A global, meta-analysis of migraine prevalence data available for each continent's population revealed that a small range of variability from approximately 10% to 16%[2]. However, a meta-analysis of 34,904 students from 56 independent studies conducted around the world revealed that migraine prevalence actually had a far larger range of variability (2.4-48.5%)[3].In China, the first large-scale epidemiological migraine study was conducted in 1985 and showed that migraine prevalence in adults was 0.69%[4] .An longitudinal investigation into headaches from 2004–

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2011 revealed that 7.5% of Chinese respondents had reported experiencing migraines[5,6] .Given these past findings, it is clear that there are obvious differences regarding the true migraine prevalence in China.

Migraines are the most common type of headaches found in young adults. Of this population, the lives of medical students are inordinately stressful, owing to their heavy work load, studies, and emotional reactions to interpersonal relationships and socioeconomic conditions[7] .A separate study reported that stress is one of the most common factors triggering migraines in the medical students of Peshawar[8] .Medical students have more psychological distress than those of the general population. They are also prone to both depression and anxiety [9] .Furthermore, a high percentage of medical students suffering from migraines do not seek professional help; rather, they self-medicate. This approach is not ideal, as they may actually be aggravating their migraines[10].Many studies have also shown that migraines are associated with unhealthy lifestyle choices, including sleeplessness[10,11], smoking[12,13], unhealthy snacking[11], and high computer use[14]. Other work has shown that either obesity or being underweight[15] ,being female[12],and/or chronic rhinitis[16] may also increase the risk for migraines.

The epidemiological characteristics of migraines in China are not explicit known, especially in college students. Moreover, no epidemiological research has been previously conducted on migraines among medical students in China. The current survey used here was based on the aforementioned study and was conducted among medical students of the Inner Mongolia Medical College (IMMU). The primary aim was to evaluate migraine prevalence as well as the associations between migraines and both demographic characteristics and lifestyle factors. A longer-term goal will be to use the survey results to assist with the design of interventions to reduce the prevalence of migraines and related issues among medical students.

Materials & Methods

Survey setting and participants

The study investigated students who resided on the campus of IMMU. Our university's academies are divided into two categories: One for direct medical studies (e.g. Basic Medicine, Public Health, Mongolian Medicine, Clinical Medicine, Stomatology, Traditional Chinese Medicine, Nursing, Pharmacy, and Postgraduate, and Continuing Education) and the second for related studies in service to primary medical practice (e.g. Computer Information, Foreign Languages, Public Health Administration, and Marxist Studies). The length of undergraduate education differed based on the student's academy. To this end, the different academic tracts on the campus experience different education periodicities. For instance, students in Clinical Medicine, Traditional Chinese Medicine, and Mongolian Medicine Clinical are in their respective programs for three years while students in Public Health Administration or Medicine Information Management are in their programs four years. A few students in other academic tracts may be matriculated in five-year programs[17].

The questionnaire included fill-in-the-blank and multiple-choice questions. Field workers included the head teachers who were responsible for students' studies and life while at school as well as researchers from the study project team. The field workers from IMMU were trained to administer the survey. After the head teacher of each class made arrangements with the study coordinator, students completed the questionnaires in the classroom. All participants knew the aim and design of the study and signed a form indicating their informed consent. Field workers assured students that their participation was voluntary and reminded them that individual responses would be kept confidential. Printed copies of the questionnaires in Chinese were distributed to the students. The students' respective health education curricula also incorporated extra credit to encourage student participation in the survey[18]. During administration of the questionnaire, field workers ensured that the classroom was silent to allow students to work in private and avoid confounding their answers through discussion with their peers. Finally, the completed questionnaires were returned to the field workers. The field workers were responsible for checking the questionnaires, counting the number of questionnaires, and placing them in a sealed envelope.

Variables and measurements

The self-report questionnaire contained questions on various migraine symptoms and related factors. It also included basic information, including lifestyle and psychological factors. Students were asked as to the type of area in which they had resided before coming to IMMU. Urban students included those coming from an urban or suburban area, while rural students included

those coming from a village or pastoral area[19] .Students in years 1 and 2 were defined as underclassmen, while those in years 3–5 were defined as upperclassmen. As described previously by Alexander *et al.*[20] , those who did not eat breakfast at least once every two days were defined as "breakfast skippers", while those who ate breakfast on at least two consecutive days were defined as "breakfast eaters". Snacking was categorized according to the definition set out by Chaplin and Smith and was as follows: snack skippers (never or rarely) and snack eaters (everyday, often, or occasionally)[21] .Smoking status was defined according to the definition by the U.S. Centers for Disease Control and Prevention[22] .Subjective sleep quality was assessed using a question describing self-sensation. Responses were characterized on the basis of the Pittsburgh Sleep Quality Index as "good," "moderate," or "bad"[23] .Academic performance was assessed by asking students to compare their performance to that of their classmates; possible responses were "good," "moderate," or "bad"[24]. Questions about interpersonal relationships addressed relationships with both peers and teachers; possible responses were "good," "moderate," or "bad"[24] .Questions about psychological factors assessed the presence of depression and anxiety by using the SCL-90-R questionnaire, which is considered a reliable measure of psychological distress[25-27].

The study used ID Migraine™, which was described by Bicakci and colleagues and was used as the migraines' diagnostic criteria[28]. ID Migraine™ was based on the International Headache Society's criteria after completing a semi-structured diagnostic interview and designed by Pfizer Inc. (New York, USA)[28].If the tested individual suffers from migraines, the first two questions would be answered with at least one positive response and the remaining three questions would be answered with at least two positive responses. ID Migraine™ is a quick and appropriate test and has been used as a self-administered screening test. It is also recommended as a simple method for diagnosing migraines in primary care settings[29] .Sensitivity, specificity, and positive predictive value of this test in primary care settings have been defined as 81%, 75%, and 93%, respectively[29].

Statistical analyses

Cronbach's α was used to assess the internal consistency of the questionnaire. We calculated migraine prevalence and evaluated migraine-related factors. The associations between various symptoms and migraine prevalence were calculated using a factors analysis. The migraine prevalence based on related factors by gender was compared. A χ^2 test using a 2 × 2 contingency table assessed migraine frequency distribution as a binary categorical variable. A χ^2 test using a 2 × 3 contingency table assessed migraine frequency distribution as a multicategorical variable. The partitions of the χ^2 test were used for multiple comparisons using a 2 × 3 contingency table. Bonferroni-corrected significance tests for pairwise comparisons were used with an adjusted p-value of 0.0167. Unconditional multivariate logistic regression analysis was used to determine the independent association between each factor and migraine. Variables included in the multivariate analysis were significant for univariate analysis. The adjusted odds ratios (ORs) and 95% confidence intervals (CIs) for migraine were also calculated. Data were recorded using EpiData and transferred to SPSS version 13.0. All statistical analyses were performed using SPSS and the level of significance was set at $P < 0.05$.

RESULTS

The self-administered questionnaires were administered to 6168 students, with 6109 questionnaires being returned (99% respond rate). The remaining 1% of students were unable participate in the study owing to being on leave or under school suspension. The internal consistency of the questionnaire was good (α = 0.966). According to student responses, 17.2% (n = 1045) had experienced migraines. As set out in ID Migraine™, a positive response for migraine was defined as the experience of having a migraine headache at least once in the student's lifetime, as well as at least one headache in the last three months in the presence of at least two additional symptoms (light sensitivity, limited ability to study/carry out daily activities, or nausea). Migraines accounted for 38.2% of headaches. Student responses were grouped into four combinations of migraine symptoms: 37.7% had light sensitivity and limited ability to study/carry out daily activities; 34% had nausea and limited ability to study/carry out daily activities; 26.6% had nausea, light sensitivity, and limited ability to study/carry out daily activities; and only 1.7% had nausea and light sensitivity.

Table 1 shows migraine prevalence in students with respect to migraine-related factors. The prevalence of migraines in male and female students was 12.9% and 18.9%, respectively. Among students with anxiety and depression, 38.4% and 35.7% had experienced migraines, respectively.The linear-by-linear association χ^2 test showed that computer use, sleep quality,

interpersonal relationships, and academic performance exhibited significant dose-response relationships with migraine ($P < 0.001$).

Table 1. Migraine prevalence among students at Inner Mongolia Medical University.

Variable	*N*	Prevalence
Sex		
Female	832	18.9
Male	213	12.9
Class years		
Lower grades	807	16.7
Higher grades	238	19.2
Area of Origin		
Urban	420	16.7
Rural	625	17.7
Monthly expenses (Yuan)		
<300	39	20.6
>300	1006	17.1
Academic performance		
Good	221	13.7
Moderate	747	18.6
Poor	77	18.5
Interpersonal relationships		
Good	607	15.3
Moderate	424	20.9
Poor	14	27.5
Breakfast consumption		
No	330	18.5
Yes	711	16.7
Regular snacker		
No	209	16.2
Yes	832	17.5
Smoker		

No	984	17.1
Yes	61	19.6
Duration of computer use (h)		
<1	226	15.3
1–3	579	16.9
>3	228	20.8
Sleep quality		
Good	460	13.4
Moderate	449	20.3
Poor	136	32.5
Anxiety		
No	885	15.9
Yes	131	38.4
Depression		
No	948	16.5
Yes	86	35.7

Table 2 shows the results of the multivariate logistic regression analysis. Four factors were significantly associated with migraine. Anxiety and poor sleep quality were most strongly associated with migraine—students with these characteristics were approximately three times more likely to have migraines than students without anxiety and who had good sleep quality. Moreover, students who used a computer for more than three hours per day had a significantly higher risk of migraine than those who used a computer for less than one hour per day (OR = 1.449, 95% CI: 1.172–1.793, $P = 0.001$). There was also a large gender difference—women had nearly twice the risk of migraine than men.

Table 2. Multivariate logistic regression analysis of factors associated with migraine in IMMU medical students.

Variable	**OR**	**95% CI**		***P***
		Lower	**Upper**	
Sex				
Female				
Male	0.604	0.510	0.716	< 0.001
Duration of computer use (h)				
<1				0.003
1–3	1.204	1.012	1.432	0.037
>3	1.449	1.172	1.793	0.001

Sleep quality				
Good				< 0.001
Moderate	1.583	1.367	1.834	< 0.001
Poor	2.780	2.190	3.528	< 0.001
Anxiety				
No				
Yes	2.809	2.214	3.563	< 0.001

Table 3shows the migraine prevalence based on related factors by gender. The migraine prevalence for computer use over three hours among female students (23.6%) was approximately 1.5 times higher than among male students (16.1%). Among male students, migraine prevalence in those who used the computer for over three hours was nearly two times higher than among those who used it for less than one hour (8.9%). The migraine prevalence in female students with poor sleep (33.6%) was similar to prevalence among male students with poor sleep (30.3%). The migraine prevalence in those with poor sleep in both genders was nearly two times higher than among students with good sleep. Migraine prevalence in female students with anxiety (40.1%) was approximately 1.2 times higher than among male students with anxiety (34%).

Table 3. Migraine prevalence based on related factors by gender.

Variable	**Female**				**Male**			
	n	**Prevalence%**	**χ^2（compared group）**	***P***	***n***	**Prevalence%**	**χ^2（compared group）**	***P***
Duration of computer use (h)				0.000				0.000
<1(a)	196	17.2	0.650(a&b)	0.420	30	8.9	3.604(a&b)	0.058
1–3(b)	464	18.3	9.685(b&c)	0.002	115	12.8	2.594(b&c)	0.107
>3(c)	161	23.6	11.143(a&c)	0.001	67	16.1	8.609(a&c)	0.003
Sleep quality				0.000				0.000
Good (a)	359	14.4	50.930(a&b)	0.000	101	10.7	1.150(a&b)	0.284
Moderate (b)	377	23.1	14.347(b&c)	0.000	72	12.5	25.560(b&c)	0.000
Poor (fc)	96	33.6	68.833(a&c)	0.000	40	30.3	39.085(a&c)	0.000
Anxiety			83.609	0.000			40.139	0.000
No	710	17.5			175	11.6		
Yes	99	40.1			32	34		

Table 4 shows the prevalence of migraine symptoms with respect to migraine-associated factors in IMMU students. The overall prevalence of associated factors among students with migraines was limited ability to study/carry out daily activities (98.3%), light sensitivity (66.0%), and nausea (62.3%). Of all the associated factors, the most prevalent symptom was limited ability to study/carry out daily activities (>97%), followed by light sensitivity (60–85%) and nausea (58.7–66.9%).

Table 4. Prevalence of three co-occurring migraine symptoms according to related factors.

	Nausea		**Light sensitivity**		**Limited ability to study and perform daily activities**	
Variable	***n***	**Prevalence**	***n***	**Prevalence**	***n***	**Prevalence**
Sex						
Female	509	61.2	556	66.8	814	97.8
Male	142	66.7	134	62.9	213	100
Duration of computer use (h)						
<1	136	60.2	156	69	220	97.3
1–3	372	64.2	361	62.3	571	98.6
>3	134	58.8	166	72.8	224	98.2
Sleep quality						
Good	270	58.7	306	66.5	455	98.9
Moderate	290	64.6	287	63.9	439	97.8
Poor	91	66.9	97	71.3	133	97.8
Anxiety						
No	551	62.3	564	63.7	868	98.1
Yes	82	62.6	106	80.9	130	99.2

Discussion

The prevalence of migraines among medical students in different regions around the world are as follows: Nigeria (14.1%)[30], Southeast Nigeria (13.1%)[31], Turkey (12.6%)[32], Oman (12.2%)[33], Southeast Iran (7.14%)[34], and Kuwait (27.9%)[35].The range of variation in past prevalence assessments is large; however, most results have been within a range of more than 10% and 17.2% of the results of this study were near the scope of previous studies. Currently, the true prevalence of migraines among Chinese medical students is not known. Headaches are the main symptom of migraines. The proportion of migraines among students experiencing headaches in our study was higher than the proportion of patients reporting headaches in Chongqing, China (23.8%)[36] and medical students at the University of Lagos (13.9%)[30].

Our results show that students with anxiety had a higher migraine prevalence—as well as a higher risk of migraine—than students without anxiety. Anxiety was the factor most strongly associated with migraine prevalence. The new social and intellectual challenges present in medical school may cause psychological pressure, which may consequently increase the risk of anxiety[34] and, therefore, lead to increased migraines[37] .Migraine is reported to be associated with anxiety[38];moreover, people suffering from migraines have a greater risk of anxiety than those without migraines[39]. People with migraines are also

more likely to suffer from anxiety disorders than the general population[40,41].Given this, it is clear that migraines and anxiety have a symbiotic relationship with each other. The results of our study have also demonstrated that students with depression had a higher prevalence of migraines. With this in mind, we adhere to the principal tenet of psychosomatic medicine that psychological factors play an important role in the pathogenesis of all diseases[37]. Therefore, our results suggest that addressing psychological issues may be beneficial for those experiencing migraines.

In the present study, students with poor sleep quality were more likely to have migraines; in addition, sleep quality exhibited a dose-response relationship with the prevalence of migraine. This finding is concordant with those of studies reporting that stress and poor sleep are migraine triggers[11,14]. Sleep disturbance is also more common in migraine patients[42]. Previous work has reported that alterations to biorhythms, including sleep-wake cycles, sleep stages, and a lack of and/or excess of sleep, may play crucial roles in migraine attacks[43]. Finally, short sleepers showed a greater tendency to develop migraine attacks during nocturnal sleep and were more prone to experience awakening headaches[44].

Our results showed that students who used a computer for more than three hours per day had an elevated migraine risk. One study showed that computer use was associated with shorter sleep duration and higher psychological and somatic symptom loads[45]. In the present study, migraine prevalence in women was 1.5 times higher than in men, which is in agreement with previous studies[10,34, 46]. All factors significantly associated with migraine consistently impact the prevalence of migraine in both genders. In addition computer use time, there was a large difference in migraine prevalence between males and females. Our results showed that female students had a higher overall risk of migraines than male students. It is possible that this is due to the role of estrogen in migraines in women[47]. Female hormones likely modulate nociception, leading to a greater incidence of migraines among female. This is particularly true during menstruation. Moreover, psychosocial factors may also affect perceived pain sensation[48,49].

Migraines—as syndromes excluding headaches—involve other symptoms to varying degrees. Few studies have focused on these symptoms and how much they co-occur with migraines. In our study, the proportion of various symptoms co-occurring with migraines was similar based on associated factors. The results were similar with regards to the proportion of various symptoms among students experiencing migraines. All significantly associated factors did not affect the frequency of symptom occurrence. The proportion of students who experienced an inability to study or carry out daily activities and those who experienced nausea were also similar to the rates these symptoms were experienced by other medical students at the University of Lagos[30]. Light exposure can worsen acute migraines; it has been suggested that sunglasses may be helpful in bright sunlight for patients with a history of migraines[50].

Conclusion

Our results suggest that the migraine prevalence in medical students at IMMU is similar to that in medical students of other counties. Students with anxiety and poor sleep quality have an increased risk for migraines; these results were consistent with those of previous studies. We first found an association between the frequency of computer use and migraines. Students who used the computer for more than three hours per day had an increased risk for migraines. This was especially true for female students. The results presented here were obtained from medical students who be aware of the potential risk their use poses to future migraine occurrence. The proportions of the other three symptoms, except headaches of migraine, were not notably different from students without migraines. Collectively, these findings may help health care professionals develop targeted policies to address factors associated with migraines.

Author Contributions

Fengqing Li and Juan Sun conceived, designed, and supervised the study. Erqing Hao and Zeyu Lu participated in the design of the questionnaire. Chengyi Zhang confirmed the migraine diagnostic criteria used from the available literature. He Sun and Xin Zhang collected and organized the data. Erqing Hao and Chengyi Zhang were responsible for understanding the current progress of migraine research as presented in the literature. All authors reviewed and approved of the final version of the manuscript.

Conflicts of Interest

The authors report no conflicts of interest.

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Ethical approval

Ethical approval for this study was obtained from the Ethics Committee of IMMU.

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