ORIGINAL REPORT

Sleep Quality and Depression among Patients with Migraine

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Abstract-The aim of this study was to determine the sleep quality and level of depression among Iranian migraineurs. Among 380 cases that were selected by simple random selection from those who attended Outpatient Neurology Clinic of Imam Khomeini Hospital, 332 patients participated in this cross-sectional study. After an inclusive examination by a neurologist, the participants were asked to fill valid and reliable Persian versions of Pittsburg Sleep Questionnaire (PSQI) and Beck Depression Inventory (BDI). They also requested to score headache severity by means of a visual analogue scale graded from 1-10. According to frequency of attacks, patients were divided into three groups: with 1-4 migraine days per month, 5-7 migraine days in a month and more than 7 migraine days per month. Mean age of participants was 36.3±10.1 years and mean headache severity score was 6.0±1.9. The PSQI total score and headache severity score were highest among patients with frequent attacks. Mean BDI, PSQI and headache severity scores significantly differ between male and female participants. There was significant positive correlation between BDI and PSQI scores (r=0.5, P<0.001) also there was a positive correlation between headache severity score and PSQI score (r=0.6, P<0.001). Decreased sleep quality with other co-morbidities such as depression in migraineurs cases should be considered.

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Keywords: Depression; Migraine; Sleep quality

Introduction

Migraine is a neurologic problem characterized with severe headache and nausea with a prevalence of about 10% in general population. It is more common in women than men (three times higher in women than men) and is associated with psychological problems such as depression (1,2).

Sleep quality impairment is one of the common problems of migraineurs (adults or children) affecting between 30- 50% of these cases (3,4). Initial insomnia, sweating, snoring, restless legs, walking during sleep, and inadequate sleep along with common sleep problems are present in migraineurs (5,6). Impaired sleep quality and reduced sleep duration will result in excessive fatigue, lower energy, and daytime sleepiness which interfere with social actions and daily activities. As the consequence negative economic and psychosocial dysfunction and impaired quality of life are reported among patients with migraine (7).

Sleep disturbance and migraine are closely related. Studies showed that sleep quality has been impaired in many migraineurs while disturbed sleep can trigger migraine attacks, which could be finished by efficient sleep. People with chronic migraine are prone to have morning headaches due to sleep insufficiency (3,8).

The other comorbidity of migraine disease is depression which was reported in both young and elderly migraineurs with a prevalence of near 28% (9). In a study by Wang *et al*., the rate of depression was reported higher among elderly migraineurs than in non-migraine cases (10). Conversely, a sturdy association between migraine and depression was noticed in a previous study by Merikangas *et al.,* who evaluated 457 young migraineurs (11).

Therefore, the goal of this study was to determine the sleep quality and level of depression among Iranian migraineurs.

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Materials and Methods

In this cross-sectional study, 380 migraineurs were randomly selected by means of random selection table among those who attended Outpatient Neurology Clinic of Imam Khomeini Hospital (Affiliated hospital of Tehran University of Medical Sciences). Inclusion criteria were based on the International Headache Society (IHS) criteria, and exclusion criteria were history of seizure, drug abuse, brain injury and other headache types. All patients filled informed consent before entrance to the study. The study had been approved by the Ethics Committee of Tehran University of Medical Sciences.

After an inclusive examination by a neurologist, the participants were asked to fill valid and reliable Persian versions of Pittsburg Sleep Questionnaire (PSQI) and Beck Depression Inventory (BDI). Demographic characteristics were recorded including age, sex, marital status, educational level and work hours during a day. Cases were requested to score headache severity by means of a visual analogue scale graded from 1-10.

BDI includes 21 questions (each item scored 0-3) and is a self-explanatory questionnaire used to evaluate subjects' feelings in the previous week. Scores from 0 to 9 indicate no depression, 10 to 18 shows mild to moderate depression, 19 to 29 specify individuals with moderate to severe depression, and 30 to 63 reveal severely depressed cases. A valid and reliable Persian version of this test is used in the study (12).

PSQI, a self-administrative instrument, consists of 19 questions generating seven-component scores (sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction). Each component score ranged from 0 to 3 (0, not in the past month; 1, less than once per week; 2, once or twice per week; and 3, three or more times per week). A valid and reliable Persian version of this test was applied for assessing the quality of sleep in current survey. The total score ranged from 0 to 21 while higher scores indicating poorer sleep quality; A total score ≥ 5 indicates a 'poor' sleeper (13).

Data was analyzed using SPSS version 18 and was presented as Mean±SD. The Student's t-test, One-way ANOVA and Tukey post-hoc tests applied for continuous as well as the Pearson Chi-square test with Fisher's exact test were used for categorical variables assessment, respectively. Logistic regression was used for odds ratio calculation and P-value<0.05 was considered statistically significant.

Results

Among the eligible cases, 332 patients completed the study. Mean age of participants was 36.3±10.1 years and mean headache severity score was 6.0±1.9 (Table 1). Post-hoc multiple comparison test showed significant difference between BDI scores of first and third group cases (P=0.03). Patients with more frequent migraine had poorer sleep (Table 2). Mean BDI, PSQI and headache severity scores were significantly different between male and female participants (Table 3).

Two hundred and fifty seven (77.4%) had poor sleep quality (PSQI ≥ 5) while 75 (22.6%) had good sleep quality. Mean headache severity score, sleep latency time, sleep duration and BDI score were significantly different between two groups (Table 4).

Two hundred and twenty eight participants (68.6%) had BDI score less than 10 and 104 (31.3%) had BDI score equal or more than 10. Mean PSQI score in depressed ones was 12.4±4.2 which was significantly higher than total PSQI score of none depressed cases (7.3±4.0, P<0.001) (Table 5). Forty seven percent of non-depressed cases were good sleepers while only 7% of depressed ones were good sleepers, too.

There was significant positive correlation between BDI and PSQI scores (r=0.5, P<0.001) also we found a positive correlation between headache severity score and PSQI score (r= 0.6, P<0.001). BDI and headache severity score had positive correlation (r=0.4, P<0.001).

BDI score was an independent predictor of PSQI (Table 6).

Table 1. Characteristics of whole participants.

Age (year)	36.3±10.1
Sex	
Male	132 (39.8%)
Female	200 (60.2%)
Marital status	
Single	73 (22.9%)
Married	239 (72%)
Divorced	20 (6%)
Headache severity sore (mean ±SD)	6.0±1.9
Sleep latency (min)	22.1±24.1
Sleep duration (Hour)	6.7±1.4
Mean BDI score	9.5±11.5
Mean PSQI score	8.9±4.7

Table 2. Sleep quality in different attack frequency patient groups.

	Patients with 1-4 days migraine days	Patients with 5-7 days migraine days	Patients with ≥ 8 migraine days	*P*
Age (year)	36.4±10.3	35.8±9.5	36.3±10.3	0.9
Headache severity score	5.6±1.8	6.0±1.9	6.6±1.9	0.001
Sleep latency (min)	19.1±21.4	20.9±19.1	27.5±30.5	0.02
BDI	8.2±11.3	8.5±10.3	11.4±12.0	0.07
Cannot get to sleep within 30 min	0.7±1.1	1.1±1.2	1.1±1.2	0.002
Wake up in the middle of the night or early morning	0.8±1.1	1.2±1.2	1.3±1.1	0.003
Get up to use bathroom	0.8±1.0	1±1	1±1	0.5
Cannot breathe comfortably	0.7±0.9	0.7±0.9	0.9±1.0	0.3
Cough or snore loudly	0.5±0.8	0.6±0.9	0.6±0.8	0.6
Feel too cold	0.4±0.7	0.6±0.9	0.5±0.8	0.09
Feel too warm	0.6±0.9	0.5±0.9	0.6±0.9	0.8
Bad dreams	0.4±0.7	0.7±0.9	0.9±1.0	<0.001
Pain	0.3±0.6	0.4±0.7	0.9±1.1	<0.001
Quality of sleep	1.1±1.1	1.4±1.1	1.4±1.1	0.01
Sleep medication	0.7±1.1	1.0±1.2	1.1±1.2	0.04
Difficulties staying awake	0.6±1.0	1.1±1.2	1.1±1.2	0.002
Lack of enthusiasm for activities	1±1	1.2±1.1	1.3±1.1	0.04
Total PSQI	7.9±4.4	9.4±4.8	10.0±4.8	0.002

Table 3. Headache severity score, Beck depression inventory and PSQI in sex groups.

	Male	Female	*P*
Headache severity score	5.7±1.9	6.2±1.9	0.02
BDI	7.2±9.6	11±12.4	0.002
PSQI	8.2±4.6	9.4±4.7	0.02

Table 4. Headache severity score, Beck depression inventory, sleep latency and duration in patients with and without sleep quality impairment.

	PSQI <5	PSQI≥5	*P*
Sleep latency (min)	9.6±7.0	25.8±26.0	<0.001
Sleep duration	7.5±0.9	6.4±1.4	<0.001
Headache severity score	4.9±1.0	6.3±2.0	<0.001
BDI	2.1±3.8	11.7±12.1	<0.001

Table 5. Sleep quality in cases without depression and mild to severe depression.

	BDI<10 N=228	10≤BDI≤18 N=34	19≤BDI≤29 N=40	BDI≥30 N=30	*P*
Total PSQI	7.3±4.0	12.6±3.5	10.5±4.8	15.0±2.4	<0.001
Cannot get to sleep within 30 min	0.6±1.0	1.8±1.0	1.4±1.3	2.4±0.7	<0.001
Wake up in the middle of the night or early morning	0.7±1.0	1.8±1.1	1.4±1.2	2.4±0.7	<0.001
Get up to use bathroom	0.9±0.9	1.5±1.0	1.2±1.0	1.8±0.9	<0.001
Cannot breathe comfortably	0.6±0.8	1.1±1.1	0.9±1.0	1.4±1.1	<0.001
Cough or snore loudly	0.4±0.7	0.8±1.1	0.8±1.1	1.2±1.1	<0.001
Feel too cold	0.3±0.7	0.8±1.1	0.8±1.1	0.8±0.8	<0.001
Feel too warm	0.4±0.8	0.7±1.0	1.0±1.1	0.9±0.9	<0.001
Bad dreams	0.5±0.8	0.9±0.9	1.1±1.0	0.9±1.1	<0.001
Pain	0.3±0.7	0.9±0.9	1.1±1.2	0.8±1.2	<0.001
Quality of sleep	1±1	2.0±0.9	1.4±1.0	2.6±0.6	<0.001
Sleep medication	0.6±1.0	1.8±1.2	1.1±1.3	2.4±1.0	<0.001
Difficulties staying awake	0.5±0.9	1.7±1.1	1.2±1.2	2.3±1.0	<0.001
Lack of enthusiasm for activities	0.8±0.9	1.8±1.0	1.7±0.9	2.5±0.7	<0.001

Table 6. Logistic regression results of different variables as predictors for sleep quality impairment.

	Standardized B	*P*	OR	CI 95%
BDI	1.1	<0.001	3.1	[1.6-5.6]
Gender (M/F)	0.04	0.8	1	[0.5-1.8]
Frequency in a month	0.34	0.06	1.4	[0.9-2]
Headache severity score	1	0.001	2.9	[1.6-5.5]
Get up for bath room	1.4	0.01	4	[1.3-12]
Quality of sleep	3.4	<0.001	32.3	[7.6-136.9]
Lack of enthusiasm for activities	1.7	<0.001	5.6	[2.3-13.7]

Discussion

To our knowledge, this is the first study evaluating the sleep quality and depression in Iranian migraineurs patients. We found poor sleep quality and mild to moderate depression in our patients. In the whole study population, mean PSQI score was 8.9±4.7 which was significantly associated with BDI score (r=0.5, *P*<0.001).

Also, our study results showed that mean PSQI score is significantly different between three patient groups, patients with more days with migraine per month, had higher PSQI score which is indicative of impaired sleep quality. In the whole study population, PSQI was higher, sleep latency was longer and headache severity was worse in cases with eight or more migraine days per month.

These findings are compatible with Seidel *et al*. findings. They evaluated 370 cases with migraine and 119 healthy controls. They investigated that sleep latency and PSQI score were significantly higher in patients with more days per month with migraine (1).

In a previous study, Gori *et al*. reported lower sleep quality and longer sleep latency in migraine cases than in the healthy control group but they found no relation between sleep quality and migraine frequency (14). Niederbergere *et al*. investigated impaired sleep quality before migraine attacks in the nights in migraine suffers (15). Spierings *et al*. evaluated sleep hours of patients with chronic headache and healthy controls without differentiating between migraine and tension-type headache. They reported that sleep latency was longer and sleep duration was lower in headache suffers than controls (16).

In current study, patients with more than 7 migraine days had significantly more sleep disturbances due to bad dreams, pain, long sleep latency, and waking up during the night. Furthermore, these cases experienced lack of enthusiasm and excessive sleepiness (during driving, eating, and other activities) more than the other two groups with lower migraine frequency.

Post-hoc analysis showed that patients with eight or more migraine days per month differed in only pain subscale of total PSQI score from patients with one to four migraine days per month in Seidel *et al*. study (1). On the other hand, regression analysis revealed that headache severity, getting up for bath room, quality of sleep and lack of enthusiasm are predictor factors for sleep quality impairment.

As most migraine attacks occur at nights, especially at transitional time from REM (Rapid Eye Movement) period, dreams will be remembered easily in such cases (17). In addition, the migraineurs remember their dreams with more details (18). Levitan found that patients with migraine experience nightmares (19). In this survey, patients who experience more migraine frequently during a month reported bad dreams more than the two groups with lower migraine frequencies.

Two common explanations for sleep problems in migraineurs are as follow: migraine episodes mostly occur at night or early morning followed by migraine attacks as a consequence of sleep disturbances. Therefore sleep sanitation in these cases and appropriate interventions and treatments can be helpful (20). Calhoun *et al.* compared behavioral sleep instructions and placebo behavioral instructions on migraineurs women and found significant reduction in headache frequency and headache intensity in intervention group (21).

One of the co-morbidities of migraine disease is depression which has been reported in 28% of migraineurs (9). We found that 31% of participants were depressed (mild to severe) and poor sleep quality (PSQI≥5) was significantly associated with higher BDI score. Also, BDI was highest in cases with frequent migraine occurrence during a month in this study. Another study showed that migraineurs suffer from depression more than the healthy control group, and being depressed is related to poor sleep quality (14). On the other hand, our findings are indicative that patients

with higher BDI score suffer from impaired quality of sleep more than migraineurs with lower BDI scores. Fifty three percent of non-depressed cases and 93% of depressed ones were poor sleepers.

Gori *et al*. reported that half of migraineurs patients without depression and 85% of migraine patients with depression were poor sleepers (14).

Our study had some limitations. First, it was held in a tertiary care hospital so, it was not population based study. Second, the design of study was cross-sectional and third we had no healthy control group. Multi-center population based studies with healthy controls could help to recognize the relationship between migraine and sleep problems better.

In conclusion, decreased sleep quality with other co-morbidities such as depression in migraineurs should be evaluated and be considered.

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