

## Evaluation of Sleep Quality in Patients with Multiple Sclerosis: A Case-Control Study

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### Abstract

**Background and Objective:** Studies indicate that people with multiple sclerosis (MS) are at increased risk of sleep disorders and the resulting negative outcomes. The aim of this study was to evaluate sleep quality in patients with MS.

**Materials and Methods:** In this case-control study, 110 patients with all confirmed types of MS as a case group and 110 healthy subjects as control group were evaluated in terms of sleep quality using Pittsburgh Sleep Quality Index (PSQI). The data collected was analyzed using t-test and chi-square tests.

**Results:** Total score of PSQI was significantly higher in patients with MS than that of the control group ( $7.32 \pm 2.78$  vs.  $5.30 \pm 2.00$ ,  $P = 0.001$ ). Furthermore, PSQI scores of patients with MS was significantly higher than that of the control group in subscales including sleep latency ( $1.14 \pm 0.99$  vs  $0.85 \pm 0.91$ ,  $P = 0.029$ ), sleep duration ( $1.09 \pm 0.80$  vs.  $0.83 \pm 0.88$ ,  $P = 0.048$ ), habitual sleep efficiency ( $1.15 \pm 0.92$  vs.  $0.85 \pm 0.83$ ,  $P = 0.017$ ), sleep disturbance ( $1.25 \pm 0.96$  vs  $0.96 \pm 0.88$ ,  $P = 0.013$ ), use of sleep medication ( $0.69 \pm 0.94$  vs.  $0.33 \pm 0.65$ ,  $P = 0.001$ ), and daytime dysfunction ( $0.88 \pm 0.93$  vs.  $32.2 \pm 0.69$ ,  $P = 0.001$ ).

**Conclusion:** Patients with MS had a significantly more improper sleep quality compared to the control group. So, poor sleep quality has a negative effect on daily activities and social communication of these patients and generally reduce their quality of life (QOL).

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**Keywords:** Sleep hygiene; Multiple sclerosis; Sleep disorders

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### Introduction

Multiple sclerosis (MS) is a major autoimmune disease in the central nervous system (CNS) that is prevalent in 20-50 year-old individuals with an incidence rate of about 3 times in women than men (1). MS has an ascending trend with an estimated worldwide number of patients increasing from 2.1 million in 2008 to 2.3 million in 2013 (1). The highest prevalence rate with 250 per 100,000 population was seen in the Orkney Is-

lands in northern Scotland. MS prevalence in Iran is 15-30 per 100,000 population (2, 3). Studies have shown that environmental factors such as viral infections stimulate immune system and produce antibodies against myelin in the nervous tissue and cause nerve's myelin destruction. MS has several symptoms including weakness, hand and foot buckling, incoherent movements and loss of balance, pain, blurred vision, sensitivity to heat, dizziness, sexual dysfunction, and urinary and fecal problems (4, 5).

Fatigue is the most common symptom of patients with MS that is associated with decreased

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quality of life (QOL). The clinical manual of the MS Society defines exhaustion as a lack of physical or mental power, which is perceived by the person and hinders his usual activities. The basis of fatigue and exhaustion pathophysiology is complex in MS and its exact mechanism is unknown. However, fatigue can be due to early stage factors associated with the disease process or secondary factors associated with sleep disorders and depression (6). About half of people with MS suffer from sleep problems. Since 1960, reports of different sleep disorders have been reported in patients with MS. Many studies have shown the relation between MS and sleep disorders such as insomnia, rapid eye movement (REM) sleep behavior disorder, narcolepsy and obstructive sleep apnea syndrome (OSAS) and restless legs syndrome (RLS) compared to the general population (7, 8).

Multifactorial causes contribute to sleep disorders in MS and they potentially associate with the onset of symptomatic and immunologic treatments and also related factors to MS disease such as pain (9). Sleep disturbance can lead to drowsiness during the day, increasing fatigue and depression that these cases can be linked to an increased risk of mortality, heart disease, obesity, and diabetes mellitus (DM) (10). Reducing fatigue and improving sleep quality through behavioral and therapeutic treatments improve QOL in patients with MS. Due to lack of studies on sleep disorders in patients with MS in Ardabil City, Iran, the present study was conducted to evaluate the quality of sleep in patients with MS.

## Materials and Methods

This was a case-control study carried out among 110 patients with all confirmed types of MS in the stable phase who registered in the MS registry system of neurology clinic of Alavi Hospital in Ardabil as case group and 110 healthy age- and sex-matched individuals as a control group. Patients with age up to 18 years and the duration of MS for more than 1 year entered the study and patients with the disease in acute phase, drug addiction, sleep problems before the onset of the disease (by interview and asking some questions), chronic illness, and pregnancy were excluded from the study. Demographic data such as age, sex, duration of illness, marital status, and educational level were collected through a checklist. The quality of sleep was measured using Pitts-

burgh Sleep Quality Index (PSQI) in which the items were scored in the range of 0-3 and included seven areas of sleep quality, sleep latency, sleep time, sleep efficiency, sleep disorders, sleep deprivation, and daily functional disorders. In this study, the scores of 5 and below and the scores of more than 5 were considered as good sleep quality and improper sleep quality, respectively. The collected data were analyzed using statistical methods in SPSS software (version 16.0, SPSS Inc., Chicago, IL, USA). Additionally, the t-test and chi-square test were respectively used for pairwise comparison of the mean values between the two groups and to determine the association between the demographic variables in the two groups in term of improper sleep quality disorders. The P-value less than 0.05 was considered significant. This study was approved by the ethics committee of Ardabil University of Medical Sciences with the code REC.ARUMS.2017.639.

## Results

73.6% of the patients with MS and 74.5% of the controls were female and the rest were males. The mean age of the patients with MS and the control group was  $35.50 \pm 9.30$  and  $35.80 \pm 9.90$ , respectively, and most of them were in the age group 30-39 years. Of all patients, 52.7% were married and 36.4% had an education degree of diploma and lower. There were no significant differences between the two groups in demographic characteristics of the patients (Table 1).

**Table 1.** Demographic characteristics of study groups

Variable		MS		Control		P-value
		n	%	n	%	
Sex	Female	81	73.6	82	74.5	0.870
	Male	29	26.4	28	25.5	
Age group	18-20	4	3.6	5	4.5	0.450
	21-29	28	25.5	27	24.5	
	30-39	42	38.2	41	37.3	
	40-49	27	24.5	28	25.5	
	≥ 50	9	8.0	9	8.2	
Marital status	Married	58	52.7	55	50.0	0.830
	Single	47	42.7	51	46.4	
	Divorced	5	4.5	4	3.6	
Education	Diploma and low	80	72.8	69	62.8	0.410
	Bachelor	23	20.9	33	30.0	
	MSc and	7	6.4	8	7.2	
	Doctoral					

MS: Multiple sclerosis

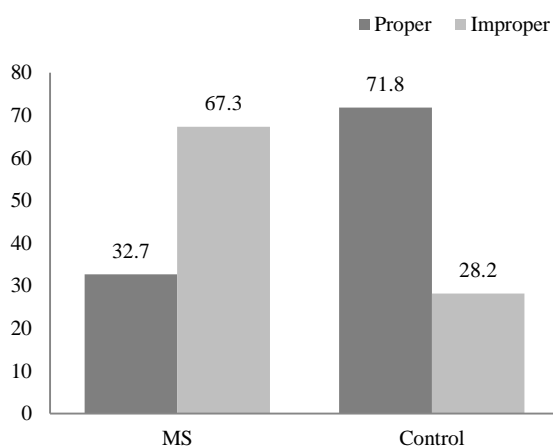
Of the patients with MS, 32.7% and of the control group, 71.8% had a good sleep quality and the difference was statistically significant (Figure 1).

**Table 2.** Mean of sleep quality indices between two groups

Sleep quality indices	Control (n = 110)	MS (n = 110)	P-value
Total score	5.03 ± 2.02	7.32 ± 2.78	0.001*
Sleep mental quality	0.89 ± 0.91	1.1 ± 0.97	0.100
Delay in sleep	0.85 ± 0.91	1.14 ± 0.99	0.020*
Sleep duration	0.83 ± 0.88	1.09 ± 1.08	0.040*
Sleep efficiency	0.85 ± 0.93	1.15 ± 0.92	0.010*
Sleep disorders	0.95 ± 0.88	1.25 ± 0.96	0.010*
Use of hypnotic drugs	0.33 ± 0.65	0.69 ± 0.94	0.001*
Daily physical disorders	0.32 ± 0.69	0.88 ± 0.93	0.001*

MS: Multiple sclerosis

\*Significant at level 0.05



**Figure 1.** The quality of sleep between the two groups

The average total score of sleep quality index in MS group was significantly higher than that in the control group ( $7.32 \pm 2.78$  vs.  $5.30 \pm 2.00$ ,  $P = 0.001$ ). Moreover, indexes such as delay in sleep, sleep duration, sleep disorders and efficiency, use of hypnotic drugs, and daily physical disorders in MS group were significantly higher than those in the control group (Table 2).

21.9% of all male patients and 78.1% of all female patients had improper sleep disorders and the difference was statistically significant. The rate of improper sleep disorder between both sexes in the two groups was not significant. The rate of improper sleep quality in age groups  $\geq 50$  years in MS group with 8.1% was higher than that in the control group with 3.2%, but the difference was not significant between the two groups in all age groups. Patients without an educational degree had a higher rate of improper sleep disorder in MS group compared to the control group, however the difference was not significant (Table 3). The average duration of MS was  $6.30 \pm 3.70$  years in patients; among whom, the improper sleep quality group with  $6.39 \pm 3.74$ , it was significantly higher than that in the good sleep quality group with  $5.6 \pm 3.55$ .

**Table 3.** Relation between improper sleep quality and demographic characteristics in two groups

Characteristics	MS		Control		P-value	
	n	%	n	%		
Sex	Female	17	23	6	19.4	0.68
	Male	57	77	25	80.6	
Age group	18-20	23	31.1	10	32.3	0.65
	21-29	45	60.8	20	64.6	
	30-39	6	8.1	1	3.2	
Marital status	Married	33	44.6	19	27.5	0.12
	Single	41	55.4	12	38.7	
Education	Graduated	52	70.3	19	61.3	0.37
	Non-graduated	22	29.7	12	38.8	

MS: Multiple sclerosis

### Discussion

Numerous studies conducted recently have shown a positive and direct correlation between MS and risk of sleep disorders, and sleep disturbances are effective in fatigue and other chronic symptoms in these patients. Although fatigue is commonly found in people with MS, this sign is only attributed to the MS pathology and as a result, sleep disorders are not often diagnosed and remain untreated (6).

The findings of this study indicated an average score of sleep quality index as  $7.32 \pm 2.78$ ; in the study by Nociti et al. performed in Italy (11), it was reported to be  $7.40 \pm 4.00$  which was similar to the findings of the present study. Furthermore, in the present study, the average scores of patients in the areas of delayed sleep, sleep duration, sleep efficiency, sleep disorders, sleep deprivation, daily functional disorders, and sleep quality were 1.09, 1.97, 1.15, 1.25, 0.69, 0.88, and 1.10, respectively, similar to the quality of sleep indicators reported by Nociti et al. The results of the two studies showed that the highest score of patients was in the sleep disorders and the rate of sleep efficiency indexes and the lowest score in the use of hypnotics drugs which was similar to the present study (11). The average score of patients in

the study by Garland et al. was  $5.98 \pm 3.94$ , which was less than that of the current study. The highest score in this study was for delayed sleep, which was different from that of the present study, but the lowest score was related to the hypnotics, which was similar to the study (12).

In a study in China, the total score of patients with MS was  $8.90 \pm 2.50$  which was more than the present study, however, similarly, the average of sleep quality index was more than that in the control group (13). The average scores of patients in studies by Vitkova et al. (14) and Carnicka et al. (15) in Slovakia were  $5.80 \pm 3.50$  and  $5.50 \pm 4.50$ , respectively, both of which being lower than the present study. In the study by Boe Lunde et al. in Norway, the average total score of patients was  $6.80 \pm 4.60$  which was higher than the average score of patients, and similar to the current study, the patients' scores on indices of delay in sleep, use of hypnotic drugs, and daily functional disorders were significantly more than the control group (16).

In studies conducted in Iran such as Taghavifar et al. in West Azerbaijan Province (17) and Ghajarzadeh et al. in Jahrom (18), the mean scores were  $9.28 \pm 1.12$  and  $8.40 \pm 6.30$ , respectively which are more than those in the present study. The results of this study showed that 67.3% of patients suffered from poor quality of sleep. The rate of poor sleep quality among patients with MS in the studies by Nociti et al. (11), Garland et al. (12), and Vitkova et al. (14) was 57.8%, 52.0%, and 44.4%, respectively, which was less than that in the present study. In addition, in studies by Ma et al. (13), Boe Lunde et al. (16), and Taghavifar et al. (17), this rate was respectively equal to 64.9%, 67.1%, and 69.1% which were similar to those in the present study. The findings of this study showed that there is a significant relationship between the quality of sleep in patients with the duration of their disease so that duration of MS in the group with improper sleep quality was more than the group with good sleep quality and similar to the study by Vitkova et al. (14). However, in the study by Nociti et al., there was no statistically significant association between the duration of illness with low sleep quality in patients with MS, which was not in agreement with the results of this study (11). Despite many studies, the cause of sleep disorders in patients with MS was exactly unknown and it seems that metabolic changes as well as structural damage in neu-

ral pathways associated with basic nuclei, thalamus, limbic system, and cortical areas can be effective in the pathology of sleep disorders in patients with MS.

## Conclusion

The results of this study showed that there was a direct correlation between MS and sleep disorder, because compared to normal population, patients with MS have a significantly poorer sleep quality. Sleep quality may be associated with other issues such as fatigue, depression, pain, and physical disability in patients with MS and it affects patients' daily activities and social connections and reduce their QOL. Therefore screening and treating sleep disorders of these patients can be effective in reducing some of their side effects and improving their QOL.

**Limitations:** Due to lack of data about the diseases activity index, EDS, type of MS, and medications used, it was not possible to discuss these relationships. So future studies are recommended using these data.

## Conflict of Interests

Authors have no conflict of interests.

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