Sleep Quality and Its Contributing Factors Among Elderly People: A Descriptive-Analytical Study

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Abstract

Background: Population aging is a major health issue in most countries. Sleep is one of the significant factors affecting aging and elderly people's quality of life. The present study was done to assess sleep quality and its contributing factors among elderly people.
Methods: This cross-sectional descriptive-analytical study was conducted in 2016 on 284 elderly people aged sixty or more. Participants were selected from healthcare centers located in Birjand city, Iran, via the two-stage cluster sampling method. Data collection tools were a demographic questionnaire and the eighteen-item pittsburg sleep quality index. The collected data were entered into SPSS software (v. 16.0) and analyzed using Mann-Whitney U and Kruskal-Wallis tests at the significance level of less than 0.05.
Results: Participants were mostly female (59.3%) and aged 68.93 ± 8.44 on average. Around 69% of them had good sleep quality. The majority of them had mild problems in subjective sleep quality (66.2%), sleep latency (40.5%), and sleep disturbances (64.8%), no problem in sleep duration (58.1%) and sleep efficiency (64.2%), no daytime dysfunction (71.5%), and most of them did not use sleeping medications (79.3%). Sleep quality had significant relationships with gender (P = 0.03), pain (P = 0.007), exposure to environmental stimuli (P < 0.001), regular physical activity (P = 0.008), and menopause-related problems (P = 0.03).
Conclusions: Elderly people in Birjand, Iran, have a relatively good sleep quality. The most important factors contributing to their sleep quality are gender, pain, exposure to environmental stimuli, regular physical activity, and menopause-related problems. Empowerment of healthcare providers regarding the accurate diagnosis and effective management of elderly people's sleep disorders is recommended.

Keywords: Aging, Sleep Quality, Sleep Problem, Daily Function

1. Background

Aging is a natural inescapable biological phenomenon. Population aging is a major health issue in many countries (1, 2). The global population of people aged sixty or more increased by 48% from 2000 to 2015 and reached 901 million by 2015. In 2015, one out of every eight persons around the world was aged 65 or more and this rate is estimated to reach one out of every six persons by 2030. Moreover, estimates show that by 2030, the number of elderly people will exceed the number of children aged 0 - 9 years-old (1.4 vs. 1.3 billion). Furthermore, the number of people aged eighty or more will increase from 125 million in 2015 to 434 million by 2050 that shows more than threefold increase. The 2006 census in Iran also showed that the population of people aged sixty or more was around 7.27% of the total population. This rate

is estimated to reach 25% - 30% by 2030 (3). The increasing number of elderly people and the adverse physical, mental, and socioeconomic effects of aging highlight the importance of paying special attention to the physical, mental, and socioeconomic needs of elderly people.

Evidence shows that aging is affected not only by genes but also by lifestyle factors such as sleep (4). Sleep constitutes about one-third of human life. A restful sleep helps regain physical and mental energy (5) and is an indication of physical and mental health (6). During sleep, energy is saved and bodily functions are revitalized. Contrarily, poor sleep is associated with different negative outcomes. For instance, the death rate is 30% more among individuals who sleep less than six hours a day than in those who sleep 7 - 8 hours. Moreover, the direct costs of sleep disorders are around sixteen billion dollars while their indirect

costs (i.e. the costs of sleep-related events, quarrels, and mortality) are 50 - 100 billion dollars (4, 6). After headache and gastrointestinal problems, poor-quality sleep is the most prevalent problem among elderly people and it is one of the most common reasons for seeking medical help by them (7).

Aging is associated with alterations in sleep structure. A meta-analysis of 65 studies including 3557 persons showed a significant decrease in the duration of rapid eye movement sleep and a significant increase in the duration of light (or stage I and II) sleep. Moreover, slow-wave sleep showed a downward linear trend among young and middle-aged adults while after the age sixty, it remained unchanged. These alterations in sleep structure are non-pathologic and can be due to neurodegeneration (8).

The need for sleep remains unchanged throughout adulthood; yet, the ability to have a restful sleep impairs with age. The most common sleep disorders among elderly people are sleeplessness and sleep apnea. Age-related sleep disorders are mainly brought about by psychiatric disorders (such as depression, anxiety, and delirium), alterations in circadian rhythms, primary sleep disorders (8), physical health problems (such as respiratory or cardiovascular diseases), acute or chronic pain, medications, restricted physical mobility, smoking, alcohol or caffeine use, environmental factors (such as harsh lighting or noise), and distracting stimuli (2, 6). Of course, sleep disorders are not an inseparable part of aging; rather, a large number of elderly people have good-quality sleep up to death (8).

Sleep disorders can be associated with serious physical and psychosocial consequences such as depression, fall, memory impairments, concentration problems, irritability, low quality of life, dementia, fatigue, and mood instability (4, 9). Some studies also noted that sleeplessness causes depression, immunity dysfunction, and cardiovascular diseases and negatively affects different aspects of life such as interpersonal communication, employment, health status, learning, memory, and cognitive skills (10, 11).

Previous studies reported different statistics on the prevalence of sleep disorders among elderly people and showed that elderly people have low sleep quality. For instance, Li et al. conducted a study on 2700 Chinese elderly people and reported that 49.7% of them had low sleep quality (12). Wang et al. also found that the prevalence of sleeplessness among Chinese elderly people was 37.75%. The most common sleep disorders in their study were difficulty in staying asleep, difficulty in falling asleep, and early morning awakening, respectively (13). Moreover, Torabi et al. conducted a study on 360 elderly people who referred to rural and urban healthcare centers in Iran and

reported that the prevalence rates of sleep disorders and primary sleeplessness among their participants were 70.3% and 81.8%, respectively (14).

Despite the high prevalence and the great importance of sleep disorders, there is no credible information about sleep quality among elderly people who live in Birjand, Iran. Therefore, the present study was carried out to assess sleep quality and its contributing factors among elderly people.

2. Methods

This cross-sectional descriptive-analytical study was conducted in 2016 on 284 elderly people aged sixty or more referring to healthcare centers located in Birjand city, Iran, for periodic health assessments. Sample size was calculated based on the results of a study conducted by Sheikhy et al. (15) and using the sample size calculation formula for estimating a proportion with a specified precision (i.e. N = (P (1 - P) × $Z^2_{1-\alpha/2}$)/d^2). Therefore, with P of 0.245, $Z^2_{1-\alpha/2}$ of 1.96, alpha of 0.05, and d of 0.05, 284 persons were estimated to be necessary. Sampling was performed via the two-stage cluster sampling method. Primarily, Birjand city was divided into three geographic regions based on the socioeconomic status of its residents. Then, a list was created from the healthcare centers of each region and two centers were recruited from each region through simple random sampling. After that, a convenience sample of 40 - 50 elderly people was drawn from each selected center. Eligibility criteria were being consent to participate and no history of dementia.

Data collection tools were a demographic questionnaire and the pittsburg sleep quality index (PSQI). PSQI is a standard self-administered questionnaire for the assessment of sleep quality in the past month. It includes eighteen items in the seven subscales of subjective sleep quality (item 9), sleep latency (items 2 and 5a), sleep duration (item 4), sleep efficiency or the duration of true sleep divided by the total hours in the bed (items 1, 3, and 4), sleep disturbances or nighttime awakening (items 5a to 5j), use of sleeping medications (item 6), and daytime dysfunction or sleeplessness-related daytime problems (items 7 and 8). Each item is scored on a 0 - 3 scale, in which scores 0, 1, 2, and 3 stand for no problem, mild problem, moderate problem, and severe problem, respectively. The total score of the index is calculated by summing the subscale scores and ranges from 0 to 21. Sleep quality is considered poor when PSQI total score is greater than 5. The psychometric properties of the scale have been assessed in previous studies. For instance, Buysse et al. reported sensitivity, specificity, and Cronbach's alpha values of 89.6%, 86.5%, and 0.75, respectively, for the index (16). Farrahi-Moghaddam et

al. also found that Cronbach's alpha, sensitivity, and specificity values of the Persian PSQI were 0.83, 94%, and 72%, respectively (17). Moreover, Hedayat et al. reported that the test-retest correlation coefficient and Cronbach's alpha of the Persian PSQI were 0.78 and 0.86, respectively (1). PSQI Cronbach's alpha in the present study was 0.84. All participants were invited to complete the data collection tools.

After data collection, the data were entered into the SPSS software (v. 16.0) and analyzed using Mann-Whitney U and Kruskal-Wallis tests at a significance level of less than 0.05.

3. Results

Among 284 recruited elderly people, twelve returned questionnaires incompletely filled. Therefore, they were excluded from the study. The mean age of the remaining 272 participants was 68.93 ± 8.44. They were mostly female (59.3%), illiterate (53.2%), and married (72.8%). About one-third of them (35.9%) reported sleep problems in the past month due to factors such as environmental noise and lighting. Table 1 shows participants' demographic, socioeconomic, and health-related characteristics.

The mean score of PSQI was 4.83 ± 3.58. Around 69% of the participants had good sleep quality. As Table 2 shows, the majority of them had mild problems in subjective sleep quality (66.2%), sleep latency (40.5%), and sleep disturbances (64.8%), no problem in sleep duration (58.1%) and sleep efficiency (64.2%), no daytime dysfunction (71.5%), and most of them did not use sleeping medications (79.3%).

The results of Mann-Whitney U test illustrated that the mean score of PSQI had significant relationships with gender, pain, exposure to environmental stimuli, regular physical activity, and menopause-related problems ($P < 0.05$; Table 3). However, Mann-Whitney U and Kruskal-Wallis tests indicated that PSQI mean score was not significantly related to marital status, and educational status, income level, smoking status, independence in doing daily activities, and affliction by physical and mental disorders ($P > 0.05$).

4. Discussion

This study aimed to assess sleep quality and its contributing factors among elderly people. Findings revealed that 31% of the elderly people had poor sleep quality. Izadi et al. also conducted a study in Kashan, Iran, on hospitalized elderly people and found that 45.9% of them suffered from poor sleep quality (10). Similarly, Wang et al. reported that the prevalence of sleeplessness among elderly people in China was 37.75% (13). Luo et al. also studied 1086 elderly people in urban areas of China and found that 41.5% of them had poor sleep quality (18). The prevalence of poor-quality sleep is greater in all these studies than in ours (18). This difference may be because those studies were conducted on elderly people who were hospitalized in hospitals or nursing homes while we selected our participants from outpatient healthcare centers. It is noteworthy that elderly people who are in hospitals or nursing homes are older and have inadequate family and social support. Moreover, sociocultural, environmental, and geographical differences can contribute to the differences among studies respecting the prevalence of poor sleep quality.

Another finding of the study was female elderly people had significantly poorer sleep quality compared to their male counterparts. Lee et al. (19), Quan et al. (20), and Sheikhy et al. (15) also reported the same finding. An explanation for this finding may be the differences among men and women respecting their biological and psychological responses to stress. Some studies reported that women experience higher levels of anxiety, concern, and stress (21-23). Stress affects the endocrine system and causes the release of corticotropin-releasing hormone from the hypothalamus, which in turn stimulates the pituitary and the adrenal glands to produce stress hormones. Stress hormones cause arousal and thereby, bring about sleep problems (21). On the other hand, gender affects the anatomy, biochemistry, and function of the brain. Moreover, evidence supports the effects of sex steroids on rapid eye movement and non-rapid eye movement sleep as well as circadian rhythms via affecting estrogen and progesterone receptors in the brain (22, 23).

Study findings also revealed that pain was directly correlated with PSQI score. In other words, elderly people who suffered from pain had significantly lower sleep quality. Pain, particularly constant pain, undermines sleep quality via preventing people from falling asleep or having a deep sleep (10). The correlation between pain and sleep quality is even stronger among women, particularly among those with fibromyalgia and emotional disorders such as depression and anxiety. However, a micro-longitudinal prospective study supported that sleep disorder is a stronger, more acceptable predictor of pain than pain is of sleep disorder. Accordingly, a sleep disorder can increase the risk of chronic pain among patients with no pain and aggravates the prognosis of existing headaches and chronic musculoskeletal pain (24). Similarly, another study assessed the effects of four-hour sleep restriction per night for twelve consecutive nights and reported spontaneous bodily pain from the second night (25).

Findings also indicated that exposure to environmental stimuli was directly correlated with PSQI score. In other

Table 1. Demographic, Socioeconomic, and Health-Related Characteristics of the Participants

Characteristics	Categories	N	%
Gender	Female	159	59.3
	Male	109	40.7
Educational status	Illiterate	143	53.2
	Literate	126	46.8
Employment status	Retired	80	54.8
	Disabled	55	37.7
	Employed	6	4.1
	Housewife	3	2.1
	Unemployed	2	1.3
Marital status	Married	198	72.8
	Widowed	66	24.3
	Second marriage	8	2.9
Monthly income	Less than $50	69	25.4
	$50 - 125	55	20.2
	$125 - 250	88	32.4
	More than $500	51	18.7
	No response	9	3.3
Self-evaluation of income	Low	97	35.7
	Moderate	106	39
	High	45	16.5
	No response	24	8.8
Physical health problems	Diabetes mellitus	61	22.4
	Hypertension	136	50
	Hypercholesterolemia	75	27.6
	Joint disorders	45	16.5
	Hematologic disorder	2	0.7
	Respiratory disorders	15	5.5
	Musculoskeletal disorders	12	4.4
	Cardiovascular diseases	46	16.9
	Neurologic disorders	18	6.6
	Gastrointestinal diseases	13	4.8
	Eye or ear problems	28	10.3
	Urologic diseases	10	3.7
	Other	8	2.9
Mental health problems	Anxiety	18	6.6
	Depression	16	5.9
	Obsession	3	1.1
	Cognitive disorders	7	2.6
	Healthy	228	83.8
Exposure to environmental stimuli (light or sound)	Yes	97	35.9
	No	173	64.1
Pain	Yes	81	29.8
	No	191	70.2
Non-pharmacological sleeping therapies	Yes	15	5.6
	No	252	94.4
Smoking	Yes	28	10.4
	No	240	89.6
Regular physical activity	Yes	64	24.3
	No	199	75.7
Independence in doing daily activities	Yes	47	17.5
	No	222	82.5
Menopause-related problems	Yes	61	26
	No	174	74
	No response	37	13.6

words, elderly people who were exposed to such stimuli had lower sleep quality. Similarly, Izadi et al. noted that elderly people are more sensitive to environmental stimuli and hence are more at risk of sleep disorders. They also re-

ported lighting, noise, and high temperature as the most prevalent environmental stimuli that disturb elderly people's sleep (10).

Menopause-related problems were also associated

Table 2. The Frequency Distribution of Sleep Disorders Among Elderly People

Problems in Different PSQI Subscales	Severity			
	Normal	**Mild**	**Moderate**	**Severe**
Subjective sleep quality	17.9	66.2	13.3	2.7
Sleep latency	31.9	40.5	21.8	5.8
Sleep duration	58.1	15.1	12.8	14
Sleep efficiency	64.2	10.8	9.1	15.9
Sleep disturbances	13.8	64.8	20	1.4
Use of sleeping medications	79.3	11.2	3.7	5.8
Daytime dysfunction	71.5	19.8	8.3	0.4
Total	48.1	32.63	12.7	6.6

Table 3. Elderly People's Sleep Quality Based on Its Contributing Factors

Factors	Interquartile Range	Mean $\pm$ SD	The Results of the Mann-Whitney U Test
Gender			
Male	3 (2 - 11)	4.05 $\pm$ 3.38	Z = -2.017
Female	4 (3 - 13)	5.42 $\pm$ 3.66	P = 0.03
Pain			
Yes	6.5 (4 - 17)	7.33 $\pm$ 4.86	Z = -2.69
No	3.5 (2 - 10)	4.15 $\pm$ 2.85	P = 0.007
Exposure to environmental stimuli			
Yes	7 (5 - 15)	7.81 $\pm$ 3.99	Z = -4.6
No	3 (2 - 10)	3.87 $\pm$ 2.86	P < 0.001
Regular physical activity			
Yes	2 (1 - 17)	3.47 $\pm$ 4.03	Z = 2.65
No	4 (3 - 11)	5.15 $\pm$ 3.41	P = 0.008
Menopause-related problems			
Yes	6 (3.5 - 11.5)	6.15 $\pm$ 3.44	Z = 2.09
No	4 (2.5 - 15)	4.61 $\pm$ 3.63	P = 0.03

with lower sleep quality among female elderly people in this study. Sleep disorders are one of the most important health problems among menopausal women. Aliasgharpoor and Eybpooshalso found that sleep quality among elderly women was significantly correlated with menopause-related problems such as anxiety and hot flashes. They also noted that menopause has a significant role in altering sleep structure among female elderly people so much so that after menopause, women suffer from different sleep problems such as long sleep latency, frequent nighttime awakenings, and shorter sleep (26). Taavoni et al. also reported that 70% of healthy menopausal women in Tehran, Iran, suffered from sleep

disorders (27). Similarly, Kravitz et al. showed that sleep disorders become more common during menopause transition so much so that 38% of menopausal women suffer from these disorders (28). Different factors such as hormonal changes and the resultant hot flashes and night sweats can affect postmenopausal sleep quality. It is noteworthy that the population of menopausal women is progressively increasing and it is estimated to reach 1.2 billion by 2030; therefore, effective strategies are needed to prevent sleep disorders and improve sleep quality among postmenopausal women (3).

We also found a significant relationship between physical activities and sleep quality so that elderly people who

engaged in regular physical activity had better sleep quality. Aliasgharpoor et al. (26) and Wu et al. (29) also reported the same finding. Kubitz et al. also found that regular physical activity promotes slow-wave sleep, increases total sleep duration, and reduces rapid eye movement sleep (30). Therefore, encouraging elderly people to engage in regular physical activity can improve their sleep quality.

Our study also showed that smoking status was not correlated with sleep quality. This is in line with the findings reported by Aliasgharpoor et al. (26) and contradictory to the findings reported by Wang et al. (13). Smoking can disturb sleep through increasing blood pressure and causing respiratory problems (26). The insignificant relationship of smoking status with sleep quality in the present study may be due to the small number of smokers in the study.

We also found no significant relationship between sleep quality and marital status. Conversely, several studies reported that married people had better sleep quality compared to their single or widowed counterparts (10, 14, 18) probably because they had the strong support of their spouses. The insignificant relationship of sleep quality with marital status in this study may be because our participants received support not only from their spouses, but also from their children, relatives, and society and thereby, they did not feel very much alone and had good sleep quality.

Another finding of the study was the insignificant relationship between sleep quality and affliction by physical and mental disorders. Aliasgharpoor et al. (26) also reported the same finding, while other studies reported that sleep quality was significantly related to affliction by physical and mental disorders (10, 12, 13). The insignificant relationship between these two variables in the present study can be attributed to the fact that most of our participants were non-hospitalized elderly people who had better health status compared to other elderly people. Moreover, assessing affliction by physical and mental disorders via the self-report method might have affected our findings.

Finally, findings revealed that sleep quality had no significant relationship with dependence in doing daily activities. However, Li et al. reported that disturbances in doing daily activities reduce sleep quality (12). It is worthy to note that most of our participants were married and lived with their spouses and children. Therefore, they might have been able to fulfill their needs with the help of their own family members, resulting in the insignificant effect of dependence in doing activities on their sleep quality. Moreover, we assessed independence through a single general question. Studies with standardized dependence-assessment tools are needed to produce more credible results.

4.1. Conclusion

The findings of this study indicate that elderly people in Birjand, Iran, have a relatively good sleep quality. The most important factors contributing to their sleep quality are gender, pain, exposure to environmental stimuli, regular physical activity, and menopause-related problems. Therefore, sleep quality among elderly people can be improved through encouraging them to engage in a regular physical activity, removing environmental stimuli, providing them with counseling services, and employing medical and rehabilitative strategies to relieve their physical pain. Moreover, in-service educations should be provided to healthcare providers in order to empower them for the accurate diagnosis and effective management of sleep disorders among elderly people.

Acknowledgments

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