ORIGINAL ARTICLE

Prevalence of poor sleep quality and associated factors among the elderly in Amirkola, Iran

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Abstract

Background & Aims: Sleep problems have become the most common complaint among the elderly. Various factors are involved in the prevalence of poor sleep quality in this age group. Due to the lack of community-based data, this study was conducted to determine the prevalence of poor sleep quality among the elderly in Amirkola, Northern Iran.

Methods: This cross-sectional study is part of the second phase of the Amirkola Health and Ageing Project (AHAP), a cohort study conducted on all elderly aged 60 and over in Amirkola, Northern Iran, since 2011. The sleep quality and related factors were assessed through Pittsburgh Sleep Quality Index (PSQI-P) and interviews, respectively.

Results: Of the 1675 older people, 914 (54.6%) were male, and 761 (45.4%) were female, of whom 714 (42.6%) had poor sleep quality. The prevalence of poor sleep quality in women and men was 56.9% and 30.7%, respectively (p <0.001). Poor sleep quality was significantly more frequent among unmarried elderly (50.4%) (p = 0.004), those with lower education level (p<0.001), individuals who were living alone (51.3%) (p<0.001), and those with more chronic disease (p<0.001), compared to other groups. Older men with diabetes had more poor sleep quality (p=0.048). Also, poor sleep quality was significantly related to depression and the number of chronic diseases in both men and women (p<0.001). Logistic regression analysis revealed that the female sex (OR=2.34, 95% CI (2.85-95.95)) and chronic diseases (OR=4.48, 95% CI (2.02-9.93)) had the most important roles in poor sleep quality.

Conclusion: This study showed a relatively high prevalence of poor sleep quality in older people, particularly among females. Therefore, sleep quality inquiry of the elderly seems pivotal in routine public health assessments by physicians and health care providers.

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Introduction

As a major public health challenge, the progressive increase in the elderly population highlights the importance of aging studies for health professionals and government officials. Physiological aging is concurrent with alterations in quantity, quality, and architecture of sleep, leading to a variety of diseases and causing significant social and economic problems for the elderly. Treatment involves psychotherapy, counseling, cognitive behavioral therapy, such as sleep regulation training, sleep hygiene training, and relaxation therapy.[1,2]

According to the definition, good quality sleep has four characteristics: 1. sleeping at least 85% of the time in bed, 2. falling asleep in less than 30 minutes, 3. waking up more than once, and 4. being awake for a maximum of 20 minutes after first falling asleep. Poor sleep quality includes delay in the onset of sleep, short duration of sleep, fragmented sleep, increased time of insomnia in bed, and decreased time of deep sleep.[4]

Sleep is a vital physiological process with important restorative functions.[5] As with physical changes in aging, alterations in sleep patterns are also part of the normal aging process.[6] However, data from the US National Social Life, Health, and Aging Project have shown that older adults with greater social participation sleep better; nevertheless, increasing social participation does not improve sleep.[7] Sleep disorders rank third after headache and gastrointestinal disorders as problems affecting the elderly's quality of life.[8]

The quality of sleep is a physical and mental health determinant factor that affects not only the daily performance but also the physical capacity of individuals.[9] It is also one of the five factors that are considered in evaluating individuals' physical and mental health.[10] Sleep is a basic human need, and there is strong evidence that sleep disorders have extensive adverse effects on health.[11]

Sleep disorders are common among the elderly for three reasons: disease, the natural aging process, and psychosocial and economic factors, with negative health-related consequences, including increased complications and mortality.[12]

Along with many physiological alterations in normal aging, sleep patterns change with aging, independent of other factors, such as medical comorbidity and medications. Age-related changes in the sleep pattern include advanced sleep timing, shortened nocturnal sleep duration, increased frequency of daytime naps, increased number of nocturnal awakenings and time spent awake during the night, decreased slow wave sleep, and other changes.[13]

Studies have shown that poor sleep quality is common in the elderly and various factors play a role in its occurrence.[6,14] A study showed that 33.8% of the elderly had poor sleep quality, which was more common in women (39.2%) than in men (26.3%). The most common abnormal sleep domains were prolonged sleep latency (39.7%), decreased sleep duration (31%), and reduced habitual sleep efficiency (28.8%). Furthermore, poor sleep quality was associated with hypertension, coronary artery disease, and chronic obstructive pulmonary diseases.[15] According to Zhu et. al., the prevalence of poor sleep quality among the elderly in nursing homes was 67.3% and related to aging, the number of chronic diseases, depression symptoms, anxiety symptoms, and social support.[16] The elderly population of Iran is growing, and this age group is more susceptible to poor sleep quality than other groups.[17] Although there have been several studies regarding the quality of sleep in different countries and elderly societies, few studies have been conducted in Iran with respect to the elderly's quality of sleep and related factors, most of which have been either on nursing home populations[18,19] or on small populations. They have not been based on a general population.[20] The aim of this study was to determine the prevalence of poor sleep quality among a general population of elderly in Amirkola.

Materials and Methods

This descriptive-analytical, cross-sectional study is a part of the second phase (2016-17) of the Amirkola Health and Ageing Project (AHAP), a cohort study conducted on all older people aged 60 and over in Amirkola in the northern part of Iran.[21]

There are 2135 older people in Amirkola, where there are two health care centers. The list of all older people and their addresses are available. All older people were invited to participate in the study through phone calls and home visits while providing the necessary information about the plan. Although there are nursing homes under the supervision of the country's welfare organization, in small cities such as Amirkola, the elderly still live with their families.

Older people's place of reference was the Social Determinants of Health Research Center of the university in Amirkola. The necessary information was collected by a trained nurse or midwife using standard questionnaires and examinations. Inclusion criteria included age 60 or over and residence in Amirkola. Exclusion criteria were cognitive impairment, inability to answer questions, reluctance to participate in the study, and incomplete records.

This study was conducted after being approved by the ethics committee of Babol University of Medical Sciences with the code IR.MUBABOL.HRI.REC.1398.044. After initial explanation and consent acquisition, individuals were enrolled in this study. Data collection tools included a demographic questionnaire (age, sex, education level, living status, and occupation), questions about chronic diseases, and questions about the elderly's sleep status.

The Pittsburgh Sleep Quality Index questionnaire (PSQI-P) was used to investigate sleep quality. The questionnaire consists of 19 questions scored on a 4-point Likert scale ranging from 0 to 3. This questionnaire has seven subscales: subjective sleep efficiency, sleep latency, sleep duration, sleep quality, sleep disturbance, sleep medication use, and daytime dysfunction due to sleepiness. On each scale, scores are defined as zero = no sleep problem, 1 = average sleep problem, 2 = serious sleep problems, 3 = very serious sleep problems. A score above 5 on the whole questionnaire means poor sleep quality. The internal consistency of this questionnaire was assessed by Bovis et al. with Cronbach's alpha of 0.83.[22] The validity and reliability of the Persian version of this questionnaire were determined in a study by Farahi

Moghaddam et al. with Cronbach's alpha of 0.77, the sensitivity of 94%, and specificity of 72% at cut off 6.[23]

Chronic diseases in this study included diabetes, hypertension, hyperthyroidism, hypothyroidism, stroke, Parkinson's disease, dementia, depression, epilepsy, myocardial infarction, angina, heart failure, asthma, emphysema, liver disease, kidney disease, kidney stones, gastric ulcer, urinary incontinence, stool incontinence, any cancer type, headache, arthritis, immune disorders, hearing loss, fractures and consumption of stimulants and antidepressants, the measurement method of which was through documented self-reports.

At first, descriptive analysis was conducted to compute all variables' percentages, means, and standard deviations. The t-test was used to identify the significant differences between men and women. A Chi-square test was used to identify univariate relationships between the family and social variables and Poor Sleep Quality. Multiple logistic regression was used to obtain odds ratios (ORs), and 95% CIs was employed to examine the associations between factors analyzed in the study and poor sleep quality. All tests were two-sided, and a p-value ≤ 0.05 was considered significant. All analyses were performed using SPSS software version 18.

Results

Of all the 2135 older people under investigation in the second phase of the Amirkola cohort, 1675 were eligible for inclusion, of whom 914 (54.6%) were male, and 764 (45.4%) were female. The mean age of the participants was 69.74 ± 7.36 (range 60-96), and the largest cohort (30.7%) belonged to the age group of 65-69 years (Table 1).

Table 1. Frequency of distribution and percentage of demographic characteristics in the elderly of Amirkola.

Variable	Female Frequency (%)	Male Frequency (%)	Total Frequency (%)
Age			
64-60	229 (30.1)	211 (23.1)	440 (26.3)
69-65	238 (31.3)	277 (30.3)	515 (30.7)
74-70	141 (18.5)	169 (18.5)	310 (18.5)

79-75	88 (11.6)	124 (13.6)	212 (12.7)
84-80	45 (5.9)	86 (9.4)	131 (7.8)
+85	20 (2.6)	47 (5.1)	67 (4)
Marital Status			
Non-married	209 (27.5)	71 (7.8)	280 (16.7)
Married	552 (72.5)	843 (92.2)	1395 (83.3)
Level of Education			
Illiterate	517 (67.9)	453 (49.6)	970 (57.9)
Diploma and below	230 (30/2)	363 (39/7)	593 (35/4)
University Degree	230 (30.2)	363 (39.7)	593 (35.4)
Living condition			
Alone	114 (15)	44 (4.8)	158 (9.4)
with family	647 (85)	870 (95.2)	1517 (90.6)
The number of chronic diseases			
0	10 (1.3)	28 (3.1)	38 (2.3)
1-2	139 (18.3)	369 (40.4)	508 (30.3)
3-5	341 (44.8)	405 (44.3)	746 (44.5)
>5	271 (35.6)	112 (12.3)	383 (22.9)
Poor sleep quality			
No	328 (43.1)	633 (69.3)	961 (57.4)
Yes	433 (56.9)	281 (30.7)	714 (42.6)

In this study, 714 (42.6%) of Almirola's elderly suffered from poor sleep quality. The prevalence of poor sleep quality in women (56.9%) was higher than in men (30.7%) (p<0.001). Poor sleep quality was prevalent in unmarried elderly (p=0.004), those with lower education levels (p<0.001), and those who lived alone (p=0.021). Totally, 65.8% of the elderly with more than five chronic diseases had significantly more poor sleep quality (p<0.001) (Table 2).

The present study showed that elderly men with diabetes had more poor sleep quality (p=0.048). Poor sleep quality was significantly related to depression and the number of chronic diseases in both men and women (p<0.001). In this research, poor sleep quality was not significantly associated with living alone and marital status in both men and women (Table 3). Moreover, there was a significant positive correlation between the number of chronic diseases and the score of poor sleep quality (r = 0.241, P <0.001) (figure1).

After entering all variables in the logistic regression model, gender (OR= 2.34, CI 95% (1.85-2.95)) and chronic diseases (more than five diseases) (OR = 4.48, CI 95% (2.02-9.93)) contributed the most to poor sleep quality.

Table 2. Odds Ratios and confidence interval of effective variables on poor sleep quality in raw and adjusted models based on the logistic regression in the elderly of Amirkola.

| Variables	Poor sleep quality		Crude OR* (95% CI**)	P-value	Adjusted OR (95% CI)	P-value
	Yes	No				
	Frequency (%)	Frequency (%)				
Gender						
Male	281 (30.7)	633 (69.3)	1		1	
Female	433 (56.9)	328 (43.1)	2.97 (2.43-3.64)	>0.001	2.34 (1.85-2.95)	>0.001
Age						
60-64	176 (40)	264 (60)	1	0.620	1	0.339
65-69	221 (42.9)	294 (57.1)	1.13 (0.87-1.46)	0.363	1.07 (0.81-1.42)	0.632
70-74	128 (41.3)	182 (58.7)	1.06 (0.79-1.42)	0.723	0.90 (o.65-1.25)	0.529
75-79	97 (45.8)	115 (542)	1.27 (0.91-1.76)	0.163	1.19 (0.82-1.73)	0.362
80-84	61 (46.6)	70 (53.4)	1.31 (0.88-1.94)	0.181	1.40 (0.90-2.18)	0.135
84-99	31 (46.3)	36 (53.7)	1.29 (0.77-2.17)	0.332	1.42 (0.80-2.54)	0.233
Marital Status						
Non-married	141 (50.5)	139 (49.6)	1		1	
Married	573 (41.1)	822 (58.9)	0.69 (0.53-0.89)	0.004	1.18 (0.82-1.68)	0.377
Level of Education						
Illiterate	455 (46.9)	515 (53.1)	1		1	
Diploma & below	229 (38.6)	364 (61.4)	0.71 (0.58-0.88)	0.001	0.94 (0.75-1.19)	0.623
University Degree	30 (26.8)	82 (73.2)	0.41 (0.27-0.64)	<0.001	0.70 (0.43-1.12)	0.133

Table 2. (continued)

Living condition						
with family	633 (41.7)	884 (58.3)	1		1	
Alone	81 (51.3)	77 (48.7)	1.47 (1.o6-2.04)	0.021	1.09 (0.70-1.70)	0.694
The number of chronic diseases						
0	9 (23.7)	29 (76.3)	1		1	
1-2	142 (28)	366 (72)	1.25 (0.58-2.71)	0.57	1.25 (0.57-2.73)	0.585
3-5	311 (41.7)	435 (58.3)	2.30 (1.08-4.94)	0.032	1.99 (0.92-4.33)	0.083
>5	252 (65.8)	131 (34.2)	6.20 (2.85-13.48)	<0.001	4.48 (2.02-9.93)	<0.001

Note. **CI: Confidence interval *   OR: Odds ratio

Table 3. Poor sleep quality in elderly women and men according to clinical and demographic characteristics

Variables	Female Poor sleep quality		P-value	Male Poor sleep Quality		P-value
	Yes Frequency (%)	No Frequency (%)		Yes Frequency (%)	No Frequency (%)	
Living condition						
with family	364 (56.3)	283 (43.7)	0.396	269 (30.9)	601 (69.1)	
Alone	69 (60.5)	45 (39.5)		12 (27.3)	32 (72.7)	0.609
Marital Status						
Non-married	120 (57.4)	89 (42.6)	0.859	21 (29.6)	50 (70.4)	
Married	313 (56.7)	239 (43.3)		260 (30.8)	583 (69.2)	0.824
Diabetes						
Yes	164 (56.9)	124 (43.1)	0.984	84 (35.9)	150 (64.1)	
No	204 (43.1)	269 (56.9)		197 (29)	483 (71)	0.048
Depression						
Yes	173 (47.4)	192 (52.6)	< 0.001	113 (45.6)	135 (54.4)	
No	260 (65.7)	136 (34.3)		168 (25.2)	498 (74.8)	< 0.001
The number of chronic diseases						
0	2 (20)	8 (80)	< 0.001	7 (25)	21 (75)	< 0.001
1-2	60 (43.2)	79 (56.8)		82 (22.2)	287 (77.8)	
3-5	176 (51.6)	165 (48.4)		135 (33.3)	270 (66.7)	
>5	195 (72)	76 (28)		57 (50.9)	55 (49.1)	

Figure 1. The Relationship between Pittsburgh Sleep Quality Index and the Number of Chronic Diseases by Sex in the Elderly of Amirkola
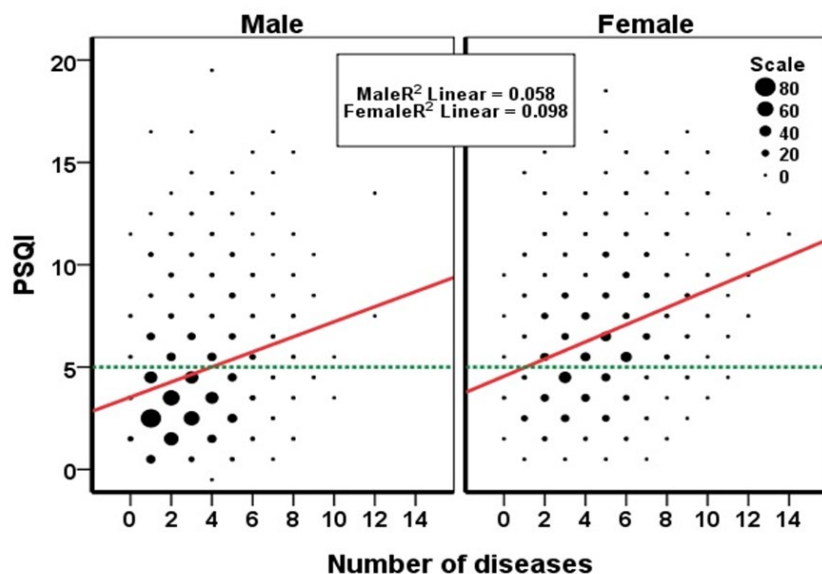
Discussion

The findings of this study revealed that 42.6% of the elderly suffered from poor sleep quality. This result coincides with the results of studies by Luo et al. in China,[24] Weerakorn et al. in Thailand,[25] and Razali et al. in Malaysia,[26] in which 41.5%, 44%, and 47.2% of the elderly, respectively, had poor sleep quality. However, in studies by Gouthaman et al. in India,[27] Gulseren et al. in Turkey,[28] and Berhanu et al. in Ethiopia,[29] 65.2%, 63.3%, and 65.4% of the elderly, respectively, were afflicted with poor sleep quality, which is relatively higher than the results of this study. In addition, Wang et al. in China[30] and Aliabadi et al. in Iran[31] reported that 33.8% and 31% of the elderly, respectively, had poor sleep quality, which was demonstrated to be less than that of our study. The variations among studies might be due to socioeconomic status, cultural habits, and different lifestyles across countries. Moreover, the prevalence of poor sleep quality varies according to the cut-off point in the PSQI score. For instance, in Wang's study, the PSQI score was assigned to be more than 7[30]; in other studies, this score was more than 5.[20,24,25] In the present study, a score greater than 5 was considered Poor Sleep Quality.

In the present study, the prevalence of poor sleep quality among women was significantly higher than that of men, which is consistent with other studies, such as Wu et al. in China,[32] Dehghankar et al. in Iran,[33] Kara et al. in Turkey,[34] and Lue et al. in China.[24] Various reasons have been proposed by Dong et al. and Leblanc et al. regarding this increase among women, including the lower level of education and individual income and higher frequency of chronic diseases compared to men. Furthermore, women are more prone to depression and anxiety.[35,36] There is evidence that supports the effect of sex hormones on rapid and slow movements of the eyes during sleep as well as circadian rhythm through its effects on estrogen and progesterone receptors in the brain.[37] Hence, older women suffer from sleep complications, including long sleep latency, frequent awakening during the night, and shorter sleep.[38]

In the present study, the frequency of poor sleep quality increased with age, although this difference was not statistically significant, which is consistent with the results of the Berhanu et al.[29] and Razali et al. studies.[26] However, Wu et al. and Luo et al.[24] reported an elevation in poor sleep quality with age. Growth hormone (GH) or somatotropin secretion has been proven to decrease with age.[39] Deep sleep also decreases markedly with age. In addition, a decrease in nighttime GH secretion and sleep disorders become a significant clinical problem in old age.[40] In fact, between the ages of 20-59, the level of GH in the body decreases by about 14% per decade, and at age 60, GH secretion is reduced to a greater extent.[41] In addition, with aging, melatonin levels decrease in comparison to younger individuals, which may lead to poor sleep quality.[42] Other causes include a decrease in testosterone levels by approximately 1% per year in men, which can lead to sleep consolidation aggravation and an increase in the frequency of awakening in the elderly.[43]

In this study, poor sleep quality in married elderly was significantly lower in comparison to unmarried individuals, which was consistent with the results of studies by Wu et al.[32] and Luo et al.[24] Nevertheless, no correlation between marital status and sleep quality in the elderly was reported in studies by Dehghankar et al.[33] and Razali et al.[26] Married people are supported by their family members; however, single people are deprived of this type of support, which can lead to stress and sleep problems.

In this research, there was a significant relationship between education level and sleep quality; individuals with higher education suffered from fewer sleep problems, which is concurrent with other studies conducted in this field.[24,32] However, in the study by Weerakorn et al. in Thailand, higher levels of education were associated with an increase in sleep disorder, which was considered to be related to job stress.[25] In the study by Dehghankar et al.[33] and Gouthman et al.,[27] no significant correlation was found. Lower education level is accompanied by manual occupations and long working hours, which may contribute to an increase in the occurrence of poor

sleep quality. In addition, individuals with higher education are associated with health-promoting activities that prevent activities leading to poor sleep quality. Moreover, lower literacy levels are associated with choosing an unhealthy lifestyle, which leads to lower sleep quality. In addition, higher literacy levels are associated with more prestigious jobs and, subsequently, higher income levels.[44]

In this study, the prevalence of poor sleep quality was significantly elevated with an increasing number of chronic diseases in the elderly, which fully coincides with the studies by Wang et al.[30], Luo et al.[24], Kumari et al.[45] and Razali et al.[26] The effect of any chronic illness on sleep disturbance may not be substantial enough; however, some synergistic and cumulative effects of pain and mental and physical disorders may result in poor sleep quality. In some diseases, such as hypertension, insomnia is caused by side effects of medications such as diuretics, which cause night awakening, or beta-blocker side effects on the central nervous system leading to insomnia, nightmares, and depression.[46]

The results of the present study showed that the poor sleep quality of the elderly is related to a number of factors relating to gender; poor sleep quality is more likely in diabetic men. Also, poor sleep quality in both elderly women and men has a significant relationship with depression and the number of chronic diseases. In the study of Hsu et al., depression and the number of chronic diseases were reported as the main risk factors for sleep disorders in the elderly.[47] Suffering from most chronic diseases through causing physical discomfort or biological mechanisms leads to movement problems, ADL limitation, chronic pain, depression, economic burden, and negative emotions, and finally, poor sleep quality in the elderly. The mutual relationship between poor sleep, chronic diseases, as well as depression, is a loop, and they influence each other.[48] Therefore, with an ever-increasing elderly population, public health attention and effective interventions for depression are necessary. This may be achieved by improving daily activities in the elderly with chronic diseases.

One of the strengths of the present study was its implementation as a cohort study with high participation of the elderly in Amirkola. Of 2135 older people under investigation in the second phase of the Amirkola cohort, 1675 were eligible to enter the study. This study suffered from some limitations. The first constraint was its cross-sectional entity, making it challenging to establish cause-and-effect relationships. Second, the diagnosis of some chronic diseases, such as heart and lung diseases, was based on self-report, which may or may not be biased, although the diagnosis of many, including hypertension and diabetes, was based on standard methods. Third, adjustments have been implemented for some variables; however, other factors, such as body mass index, physical activity, anxiety, and diet, have not been adjusted. Forth, the PSQI questionnaire employed in the present study had a sensitivity of 98% and a specificity of 55% in the diagnosis of primary poor sleep quality and its low specificity implies a risk of misclassifying normal individuals as poor sleepers and, therefore, leading to an overestimation of reported prevalence in this study. Fifth, self-reporting was employed instead of a more accurate methodology, i.e., polysomnography, to determine sleep quality in this study, although the latter was not feasible in a study of this extent.

Conclusion

This study demonstrated that two out of every five older people in Amirkola, especially older women, suffered from poor sleep quality. Poor sleep quality was more common among the elderly with lower education, living alone, suffering from chronic diseases, and being single.
Hence, comprehension of these factors can aid nurses and other treatment team members in planning to enhance sleep quality in the elderly. Another point worthy of consideration is the acquaintances and families of elderly suffering from poor sleep quality. By providing the necessary training to the family members (spouse and children) about the elderly's sleeping pattern, their illness and treatment, caring for them, treating and supporting them, and accompanying and

regularly referring them to health centers for examination, investigation, and disease control, positive measures can be taken to resolve or reduce this situation.

Moreover, considering the impact of poor sleep quality on health, healthcare providers should regularly monitor sleep quality and provide interventions for sleep health education and behavior change. Educational messages should include advising the elderly to go to bed at a certain time every night, wake up at a specific time every morning, and make their bedroom a peaceful, dark, mild environment. Psychosocial interventions with a non-pharmacological approach, such as social sports programs, should be emphasized to improve the sleep quality of the elderly.

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