Original Research

Prevalence and Risk Factors of Sleep Quality among Older Adults in Varamin, Iran

Hasan Ahmadi Gharaei[1], Fatemeh Ghorbani[2*], Sara Naderpoor[3], Vida Alizad[4], Soodabeh Ghasemi[3], Zahra Hasanalizadeh[5], Foozieh Noori[3], Elham Momen Baghsiyahi[6]

[1.] *Vice Chancellery of Education and Research, Torbat Heydariyeh University of Medical Sciences, Torbat Heydariyeh, Iran*
[2.] *Department of Deputy of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran*
[3.] *Department of Epidemiology, School of Public Health, Iran University of Medical Sciences, Tehran, Iran*
[4.] *Department of Movement Neuroscience Team, Queensland University of Technology, Queensland, Australia*
[5.] *Department of Aging Health, Iranian Research Centre on Ageing, University of Social Welfare and Rehabilitation Sciences, Tehran, Iran*
[6.] *Department of Surgical Technology Group, Razi Hospital, Torbat Heydariyeh, Iran*

Received: 25 Oct. 2023 Accepted: 30 Nov. 2023

Abstract

Background and Objective: The global aging population is increasing. Aging is associated with a gradual decrease in physiological activities and an increased risk of chronic diseases and sleep disorders. This study aimed to determine the prevalence and risk factors of sleep quality among elderly people.

Materials and Methods: This cross-sectional study was conducted on 894 elderly individuals aged 60 years or older, selected using a multistage sampling method in Varamin City, Tehran Province, Iran. Data were collected using the Pittsburgh Sleep Quality Index (PSQI). Mean and frequency were used for descriptive analysis, and multivariable logistic regression was used to identify risk factors for poor sleep quality. P-value < 0.05 was considered statistically significant, and Stata software was used for data analysis.

Results: Of the participants, 509 (56.5%) were women, and the mean age was 69.1 ± 7.5 years. The overall prevalence of poor sleep quality was 39.8%. Multivariable logistic regression analysis showed that poor sleep quality was significantly associated with female sex [male odds ratio (OR)=0.5, 95% confidence interval (CI): 0.4-0.7], coronary heart disease (CHD) (OR=1.9, 95% CI: 1.5-3.0), gastrointestinal (GI) disease (OR=1.8, 95% CI: 1.5-3.0), and depression (OR=3.6, 95% CI: 2.1-6.2). There was no relationship between age, marital status, occupation, education, financial status, and other diseases with sleep quality (P > 0.05).

Conclusion: Poor sleep quality among elderly individuals was relatively common and more prevalent among women. Moreover, comorbidities such as depression, CHD, and GI diseases were identified as factors affecting the quality of sleep in elderly people.

Keywords: Sleep quality; Elderly; Depression; Aging; Coronary heart disease

Citation: Ahmadi Gharaei H, Ghorbani F, Naderpoor S, Alizad V, Ghasemi S, Hasanalizadeh Z, et al. **Prevalence and Risk Factors of Sleep Quality among Older Adults in Varamin, Iran.** J Sleep Sci 2023; 8(3-4): 82-89.

Introduction

The number of people aged 60 years and older is increasing worldwide due to increased life expectancy and reduced mortality rates (1). According to the World Health Organization (WHO), the proportion of people over 60 years will rise from 12% to 22% between 2015 and 2050 (2). The same trend is observed in Iran, where 9.3% of the population (7414091 people) were elderly in 2016, a figure projected to increase to 25% by 2040 (3, 4). Aging is a global phenomenon characterized by decreasing physical and psychological capacities, which may consequently lead to

** **Corresponding author**: F. Ghorbani, Department of Deputy of Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran*
Tel: +98 9214378104, Fax: +98 21 66744119
Email: f.ghorbani18300@gmail.com

disability (5). The gradual accumulation of molecular and cellular damage over time contributes to aging, comorbidities, and decline in physical and mental capacities (6, 7). One of the most common problems associated with aging is sleep disorders (8). Sleep disorders have serious negative effects on the physical, mental, and social health of elderly individuals (9). These disorders are more prevalent among elderly people with aging-related functional decline and underlying chronic conditions such as cancer and stroke (10, 11).

Poor sleep quality causes significant adverse effects on mobility, fatigue, and the risk of falls in older adults (8, 12). It is also associated with reduced activities of daily living and cognitive impairment in this population (13). The prevalence of poor sleep quality varies according to baseline characteristics. For example, a study in China demonstrated that 50% of elderly individuals experienced poor sleep quality, attributed to older age, poor nutrition, and reduced physical and mental health (14). In another study, the prevalence of poor sleep quality was 41%, with age, illiteracy, living alone, anxiety, and arthritis identified as risk factors (12).

Park et al. reported that about 60% of individuals aged 65 years and older in Korea had poor sleep quality, which was associated with age, pain, and depression (15). In a study conducted in Thailand, the prevalence of poor sleep quality among elderly people in the outpatient department of Songklanagarind Hospital was 71%. The main complaints included short sleep duration (99.7%), poor sleep efficiency (61.6%), and daytime dysfunction (51.6%) (16).

In Iran, the prevalence of sleep disorders among older adults has been reported in a limited number of studies. One study found that 73.3% of Iranian elderly people experienced sleep disorders, which were associated with marital status, occupational status, place of residence, gender, and education (17). Another study conducted in Ilam City, Iran, showed that 59.7% of the elderly people had poor sleep quality, with a significant relationship between sleep quality and age, gender, marital status, history of hospitalization, and smoking (18). In addition, another study reported that 39.8% of Iranian elderly people had moderate and 24.5% had severe sleep disorders (19). Factors contributing to poor sleep quality include nocturnal or early morning awakenings, chronic pain (20), reduced physical activity, hot flashes, anxiety, inability to enjoy with family and friends, and psychological factors (19).

Given the growing elderly population in Varamin City, Tehran Province, Iran, the lack of sufficient epidemiological evidence regarding factors affecting sleep quality among elderly individuals, and the limited number of studies conducted in this geographical area, the current study aimed to determine the prevalence and risk factors of poor sleep quality among Iranian elderly people living in Varamin City.

Materials and Methods

Study design: This cross-sectional study was conducted to investigate sleep quality and its associated factors among elderly individuals in Varamin City, in 2019. The study was conducted in accordance with the tenets of the Declaration of Helsinki. The target population consisted of 21452 elderly individuals in 2016. Of these, 16804 were registered in the health system and referred to primary health care centers in Varamin City to receive elderly care services.

Outcome measures: The required sample size was calculated as 752 participants ($\alpha = 0.05$, $P = 0.39$, $d = 0.03$). After accounting for a 15% attrition rate, the final sample size was increased to 885 participants (19). The exclusion criteria included age younger than 60 years, having Alzheimer's disease (AD), and a history of stroke. Participants were selected using multistage random sampling. Varamin City has 49 primary health care centers, of which 15 centers were randomly selected for data collection. Given the elderly population of each primary health care center, 900 individuals were selected using random sampling (60 participants per stratum).

Questionnaires were completed through face-to-face interviews at the health care centers. The data collection tool was a two-part questionnaire completed via the self-report method through in-person interviews. The first part included baseline characteristics, and the second part consisted of the Pittsburgh Sleep Quality Index (PSQI) to assess sleep quality.

The PSQI has 19 items scored on a 4-point Likert scale as "No problem in sleeping = 0", "Moderate sleep problem = 1", "Serious sleep problem = 2", and "Very serious sleep problem = 3". A total score > 5 on all questions means poor sleep quality, whereas a score ≤ 5 is considered good sleep quality.

The questionnaire includes seven subscales ranging from 0 to 21 scores:

1- Subjective sleep quality
2- Sleep latency
3- Sleep duration
4- Sleep efficiency
5- Sleep disturbances
6- Use of sleep medication
7- Daytime dysfunction.

The Persian version of PSQI has demonstrated acceptable reliability and validity, with a Cronbach's alpha of 0.65 and a validity coefficient of 0.90 (21).

Data preparation and statistical analysis: Data analysis was performed using Stata software (version 14, Stata Corporation, College Station, TX, USA). Descriptive analysis, including means and standard deviations (SDs) as well as frequencies (%), was used to summarize data. Multivariable logistic regression with forward-looking likelihood ratio (LR) was also conducted at the 95% confidence level to find risk factors of poor sleep quality.

Ethical considerations: This study was approved by the Ethics Committee of Iran University of Medical Sciences, Tehran (ethical code: IR.IUMS.1397.826).

Results

A total of 894 individuals (43.5% men) aged 60 years and older were investigated. The mean age of participants was 69.1 ± 7.5 years. Six hundred and thirty-one (70.5%) elderly individuals lived with their spouses.

Poor sleep quality was more prevalent among women than men (46.3% vs. 31.4%) (Table 1). Higher rates of poor sleep quality were also observed among participants living in rural areas (40.5%) and widowed or divorced individuals (46.7%). Moreover, poor sleep quality was more prevalent among illiterate participants (46.3%), those with high education levels (37.3%), those with a dependent financial status (43.8%), those with sufficient income (47.4%), and housewives (43.9%) (Table 1).

Table 1 also presents the results of univariate logistic regression analysis. The odds of poor sleep quality were lower among men [odds ratio (OR) = 0.52, 95% confidence interval (CI): 0.40-0.60, P < 0.001], individuals with reading and writing (OR = 0.58, 95% CI: 0.39-0.84, P = 0.005), those with primary school education (OR = 0.60, 95% CI: 0.42-0.85, P = 0.005), and those with insufficient income (OR = 0.66, 95% CI: 0.48-0.90, P = 0.009) in contrast to the reference group (Table 1).

Table 1. Univariate logistic regression analysis of baseline characteristics associated with sleep quality

Characteristics		Good sleep quality [n (%)]	Poor sleep quality [n (%)]	OR (95% CI)	P-value
Age group (year)	60-64	191 (59.7)	129 (40.3)	1.00	0.890
	65-69	118 (62.1)	72 (37.9)	0.90 (0.62-1.30)	0.580
	70-74	110 (61.8)	68 (38.2)	0.91 (0.62-1.33)	0.640
	75-79	53 (56.4)	41 (43.6)	1.41 (0.72-1.82)	0.560
	≥ 80	66 (59.5)	45 (40.5)	1.01 (0.65-1.56)	0.960
Gender	Women	271 (53.7)	234 (46.3)	1.00	
	Men	267 (68.6)	122 (31.4)	0.52 (0.40-0.69)	< 0.001
Place of residence	Urban	325 (60.6)	211 (39.4)	1.00	
	Rural	213 (59.1)	145 (40.5)	1.04 (0.79-1.37)	0.730
Marital status	Single	23 (63.9)	13 (36.1)	1.00	0.050
	Married	394 (62.4)	237 (37.6)	1.06 (0.52-2.14)	0.860
	Widowed/divorced	121 (53.3)	106 (46.7)	1.55 (0.74-3.21)	0.230
Education level	Illiterate	211 (53.7)	182 (46.3)	1.00	0.005
	Reading and writing	110 (66.7)	55 (33.3)	0.58 (0.39-0.84)	0.005
	Primary school	138 (65.7)	72 (34.3)	0.60 (0.42-0.85)	0.005
	Middle school and higher	79 (62.7)	47 (37.3)	0.69 (0.45-1.04)	0.070
Financial status	Independent	421 (61.4)	265 (38.6)	1.00	
	Dependent	117 (56.2)	91 (43.8)	1.23 (0.90-1.69)	0.180
Income	Sufficient	123 (52.6)	111 (47.4)	1.00	0.020
	Insufficient	330 (62.6)	197 (37.4)	0.66 (0.48-0.90)	0.009
	More than sufficient	85 (63.9)	48 (36.1)	0.62 (0.40-0.96)	0.030
Employment status	Unemployed	40 (59.7)	27 (40.3)	1.00	0.040
	Housewife	231 (56.1)	181 (43.9)	1.16 (0.68-1.96)	0.570
	Retired or employee	152 (61.5)	95 (38.5)	0.92 (0.53-1.60)	0.780
	Other	115 (68.5)	53 (31.5)	0.68 (0.38-1.22)	0.200

OR: Odds ratio; CI: Confidence interval

Table 2. Frequency and mean scores of sleep quality domains among elderly individuals in Varamin City, Iran

Domains of sleep quality	Sleep quality status				
	Good	Poor	Moderate	Severe	Mean ± SD (0-3)
Subjective sleep quality	161 (17.9)	625 (69.4)	90 (10.0)	24 (2.7)	0.97 ± 0.62
Sleep latency	241 (26.8)	359 (39.9)	210 (23.3)	89 (9.9)	1.16 ± 0.93
Sleep duration	553 (61.4)	157 (17.4)	1 (0.1)	189 (21.1)	0.80 ± 1.19
Sleep efficiency	652 (72.6)	130 (14.5)	57 (6.3)	59 (6.6)	0.46 ± 0.87
Sleep disturbances	90 (10.0)	593 (65.9)	207 (22.7)	10 (1.1)	1.14 ± 0.59
Use of sleep medication	741 (82.3)	54 (6.0)	20 (2.2)	85 (9.4)	0.38 ± 0.92
Daytime dysfunction	645 (71.7)	176 (19.6)	62 (6.9)	17 (1.9)	0.39 ± 0.69

SD: Standard deviation

Age, place of residence, and financial and occupational status were not significantly associated with sleep quality.

The highest prevalence of poor sleep quality was observed in domains of subjective sleep quality (69.4%), sleep latency (39.9%), and sleep disturbances (65.9%). In contrast, most participants reported no difficulty or sleep problem across sleep medication use (82.3%), sleep duration (61.4%), sleep efficiency (72.6%), and daytime dysfunction (71.7%) domains (Table 2). Overall, 538 participants (60.2%) reported good sleep quality (mean ± SD: 3.1 ± 1.3), while 356 (39.8%) reported poor sleep quality (mean ± SD: 8.74 ± 2.68).

Table 3 demonstrates the results of univariate logistic regression analysis. There was a significant relationship between participants' sleep quality and their chronic diseases. The odds of poor sleep quality were 2.1 times higher among elderly individuals with coronary heart disease (CHD) (OR = 2.1, 95% CI: 1.5-3.0), and 1.4 times higher among those with musculoskeletal disorders (OR = 1.4, 95% CI: 1.0-2.1). Participants with arthritis, gastrointestinal (GI) diseases, respiratory diseases, or depression had significantly higher odds of poor sleep quality (Table 3).

Multivariate logistic regression analysis indicated that, after adjustment for potential confounders, men had a 44% lower likelihood of poor sleep quality than women (OR = 0.56, 95% CI: 0.40-0.70). The odds of poor sleep quality were 1.9 times higher among elderly people with CHD compared with those without CHD (OR = 1.9, 95% CI: 1.5-3.0). Similarly, elderly individuals with GI disease had 1.8 times higher odds of poor sleep quality than those without GI disease (OR = 1.8, 95% CI: 1.5-3.0). In addition, the odds of poor sleep quality were 3.6 times higher among elderly individuals with depression compared with those without depression (OR = 3.6, 95% CI: 2.1-6.2) (Table 4).

Discussion

The purpose of this study was to evaluate sleep quality and its associated factors among elderly people in Varamin City. We found that female gender, depression, CHD, and GI diseases were related to poor sleep quality in this population.

Table 3. Univariate logistic regression analysis of the association between chronic diseases and sleep quality

Chronic disease		Good sleep quality [n (%)]	Poor sleep quality [n (%)]	OR (95% CI)	P-value
CHD	No	466 (63.5)	268 (36.5)	1.00	
	Yes	72 (45.0)	88 (55.0)	2.12 (1.50-3.00)	< 0.001
HTN	No	254 (62.7)	151 (37.3)	1.00	
	Yes	284 (58.1)	205 (41.9)	1.21 (0.92-1.59)	0.150
Musculoskeletal	No	472 (61.5)	295 (47.2)	1.00	
	Yes	66 (52.0)	61 (48.0)	1.47 (1.01-2.15)	0.040
Type 2 DM	No	394 (62.1)	240 (37.9)	1.00	
	Yes	144 (55.4)	116 (44.6)	1.32 (0.98-1.77)	0.060
Arthritis	No	411 (63.2)	239 (36.8)	1.00	
	Yes	127 (52.0)	117 (48.0)	1.58 (1.17-2.13)	0.002
Gastrointestinal disease	No	509 (61.7)	316 (38.3)	1.00	
	Yes	29 (42.0)	40 (58.0)	2.22 (1.35-3.65)	0.002
Respiratory disease	No	499 (61.9)	307 (38.1)	1.00	
	Yes	39 (44.3)	49 (55.7)	2.04 (1.31-3.18)	0.002
Depression	No	514 (63.1)	302 (36.9)	1.00	
	Yes	22 (28.9)	54 (71.1)	4.19 (2.50-7.02)	< 0.001

CHD: Coronary heart disease; HTN: Hypertension; DM: Diabetes mellitus; OR: Odds ratio; CI: Confidence interval

Table 4. Multivariate logistic regression analysis using a forward-looking likelihood ratio (LR) method to identify factors associated with sleep quality

Variable		OR (95% CI)	P-value
Gender	Women	1.00	
	Men	0.56 (0.00-42.75)	< 0.001
CHD	No	1.00	
	Yes	1.97 (1.20-37.82)	< 0.001
Gastrointestinal disease	No	1.00	
	Yes	1.85 (1.30-10.11)	0.020
Depression	No	1.00	
	Yes	3.67 (2.60-17.21)	< 0.001

CHD: Coronary heart disease; OR: Odds ratio; CI: Confidence interval

The aging process leads to functional decline, including a gradual reduction in physiological reserves, an increased risk of multiple diseases, and a decline in the individual's overall capacity. It has been well documented that one of the most important problems during aging is sleep disorders, which affect multiple dimensions of health in elderly individuals (22).

Previous studies have demonstrated that poor sleep quality among elderly people is associated with several consequences, including pain and depression. Factors such as age, gender, marital status, living conditions with their family, history of hospitalization, and smoking have also been related to poor sleep quality (15, 18). In addition, socioeconomic status, chronic diseases, and occupational status have been suggested as determinants of sleep quality in elderly populations (18, 20). The results of the present study indicated that the mean total PSQI score was 5.34 ± 3.40, and 39.8% of individuals reported poor sleep quality, suggesting relatively poor sleep quality among this population. In comparison, Sheikhy et al. reported that 39.8% of elderly participants had moderate sleep disorders, and 24.5% of them had severe sleep disorders (19). Similarly, a study conducted in China found that 41.5% of participants experienced poor sleep quality (12), consistent with our findings. In contrast, another study in Iran reported that only 27.8% of the elderly people had experienced a poor sleep quality (23). These discrepancies may be attributed to differences in mean age, prevalence of chronic diseases, gender, and educational level of the study populations.

Some studies have reported a higher prevalence of poor sleep quality than observed in the current study. For example, a study conducted in Yazd City, Iran, reported a mean sleep quality score of 7.76, with 75% of elderly participants experiencing poor sleep quality (20). Likewise, 59.7% of elderly individuals in Ilam City, were reported to have poor sleep quality (18). In international studies, Park et al. reported that 60% of Korean elderly individuals had poor sleep quality (15).

Sleep disorders increase with aging, particularly affecting sleep latency, sleep duration, and sleep efficiency (14). Poor sleep quality is therefore a key feature of chronic insomnia and one of the most common problems experienced by elderly individuals (24). Approximately 38% of the global population suffers from insomnia, which increases with age (25). Discrepancies in the findings of previous studies might be due to differences in participant characteristics, sample size, prevalence of chronic diseases, gender distribution, race, and cultural factors.

The findings of this study showed that poor sleep quality was associated with gender, with women experiencing poorer sleep quality than men. Sleep quality of elderly individuals was not significantly associated with age, employment status, income, education, marital status, or place of residence. Consistent with our findings, Safa et al. showed a significant relationship between gender and sleep quality score, with women having poorer sleep quality (23). Similarly, a study conducted in Mashhad City, Iran, found that the likelihood of good sleep quality was 42% higher in men than in women (26). Li et al. indicated that poor sleep quality was present in approximately 43% of men and 56% of women (14). Sex-related differences in sleep have been suggested to emerge after puberty, and differences in the prevalence of sleep disorders such as obstructive sleep apnea (OSA), insomnia, and restless legs syndrome (RLS) may be related to pathophysiological mechanisms, clinical presentation, and response to treatment (27). Menstrual cycles, pregnancy, and menopause may also influence sleep quality and architecture, including non-rapid eye movement (NREM) and rapid eye movement (REM) sleep.

Regarding other factors related to sleep quality, a study reported significant associations between sleep quality and marital status, education, employment, and economic status (20). Sleep quality has been reported to be better among married individuals, possibly due to spousal and psychological support (17, 20, 28). Higher educational attainment has also been associated with better sleep quality, potentially mediated by higher income and

better living conditions, although this was not observed in the present study (17, 20). In contrast to our findings, Borji et al. (18) and Izadi Avanji et al. (28) reported associations between poor sleep quality and both older age and marital status.

Multiple logistic regression analysis in this study demonstrated that depression was related to poor sleep quality in elderly people. Similar findings have been reported in previous studies. Haseli-Mashhadi et al. found that elderly individuals with depression had higher odds of poor sleep quality than healthy older adults (OR = 4.05, 95% CI: 3.12-5.26) (29). The other positive finding was that the elderly people with depression were three times more likely to have sleep disturbance compared with those who had no depression (26). In addition, depression has been associated with poor sleep quality in patients undergoing hemodialysis (30). While these findings are consistent with the results of another study (15), Chien and Chen reported that depression was not associated with sleep quality among elderly individuals (31). Psychological disorders, especially depression, are considered major contributors to sleep disorders (24), a finding also supported by Li et al. (14). Other factors, such as retirement, loneliness, and social support from spouses or family members, may further contribute to depressed mood and impaired sleep quality (32, 33).

Cardiovascular disease (CVD) was another factor associated with poor sleep quality in the present study. We found that elderly individuals with heart disease had poor sleep quality compared to those without heart disease. Tel indicated that sleep quality was better among individuals without any physical disease compared with those who had more than two physical diseases, particularly heart diseases (34). Another study showed a significant relationship between the presence of CVD and poor sleep quality after age adjustment (35). Likewise, a study conducted in China found that heart disease was associated with a higher prevalence of poor sleep quality (12).

Several mechanisms have been proposed to explain the adverse effects of sleep disorders on CVDs. Poor sleep may result in reciprocal changes in circulating levels of leptin and ghrelin (36, 37), which can accelerate the development of obesity (37) and impair glycemic control (38). In addition, sleep disorders may lead to increased cortisol secretion and alterations in growth hormone metabolism (39, 40).

Depression may further exacerbate poor sleep quality in people with CVD. The prevalence of post-stroke depression ranges from 47% to 66.7% (41). Depressive disorders are also common among patients with ischemic heart disease (IHD). In Iran, the prevalence of depressive disorders has been reported to be as high as 47% (95% CI: 38%-56%) (42).

Evidence also suggests reduced sleep quality among elderly individuals with chronic GI diseases (30). Studies by Soenen et al. (43) and Merchant et al. (44) identified GI diseases as another common chronic condition in elderly populations that worsen with aging and negatively affect sleep quality (45, 46). These findings are consistent with the results of present study, which showed poorer sleep quality among elderly people with GI disease. Dickman et al. reported lower sleep quality among elderly people with GI problems, such as gastroesophageal reflux disease (GERD) (47). In accordance with our findings, other studies have shown that patients with inflammatory bowel disease (IBD) experience poor sleep quality (48, 49). A recent study has demonstrated a strong relationship between sleep disorders and GI diseases (50). Proinflammatory cytokines, including tumor necrosis factor (TNF), interleukin (IL)-1, and IL-6, are associated with sleep dysfunction and are known to be altered in GI diseases, such as GERD, IBD, liver disorders, and colon cancer (50).

Study limitations and strengths: This study offers several strengths, including a large sample size and the use of multivariate regression analysis to control for potential confounding variables. However, certain limitations remain. The cross-sectional design precludes temporal interpretation of associations; therefore, further longitudinal cohort studies are recommended. In addition, several relevant variables, including daytime sleep, physical activity, glycolytic glucose, lipid profile, and body mass index (BMI), were not assessed.

Conclusion

The results of this study indicate that poor sleep quality is common among elderly individuals, affecting nearly 40% of this population, and is more prevalent among women. Despite its high prevalence, poor sleep quality is often underdiagnosed and untreated. Notable qualitative and quantitative changes in sleep occur with aging, and chronic diseases, such as depression, CVD,

and GI disorders, may adversely affect the sleep quality in elderly individuals. Therefore, it is recommended that health care providers in primary health care centers screen elderly populations for mental diseases, particularly depression, as well as CVD and GI diseases. Further, population-based and longitudinal studies with larger sample sizes are suggested to better determine factors associated with sleep quality in this population.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

The authors gratefully acknowledge the financial support provided by the Student Research Committee of Iran University of Medical Sciences (Grant No. 13250). The authors also express their gratitude to the management and the Family Health Group of the Varamin Health Network for their cooperation.

References

1. Crimmins EM, Zhang YS. Aging populations, mortality, and life expectancy. Annu Rev Sociol 2019; 45: 69-89.
2. World Health Organization. Aging and Health [Online]. [cited 1 Oct 2025]. Geneva, Switzerland: World Health Organization; Available from: URL: https://www.who.int/en/news-room/fact-sheets/detail/ageing-and-health.
3. Heidari Z, Feizi A. The Isfahan Comprehensive Elderly Study: Objectives, research design, methodology, and preliminary results. J Res Med Sci 2017; 22: 85.
4. Statistical Center of Iran. Selected Findings of the 2016 National Population and Housing Census [Online].Tehran: Iran: Statistical Centre of Iran; 2016. Available from: URL: https://irandataportal.syr.edu/wp-content/uploads/Iran_Census_2016_Selected_Results.pdf.
5. Khodamoradi A, Hassanipour S, Khotbesara RD, et al. The trend of population aging and planning of health services for the elderly: A review study. J Torbat Heydariyeh Univ Med Sci 2018; 6: 81-95. [In Persian].
6. Marengoni A, Angleman S, Melis R, et al. Aging with multimorbidity: a systematic review of the literature. Ageing Res Rev 2011; 10: 430-9.
7. Steves CJ, Spector TD, Jackson SH. Ageing, genes, environment and epigenetics: what twin studies tell us now, and in the future. Age Ageing 2012; 41: 581-6.
8. Sagayadevan V, Abdin E, Binte Shafie S, et al. Prevalence and correlates of sleep problems among elderly Singaporeans. Psychogeriatrics 2017; 17: 43-51.
9. Roepke SK, Ancoli-Israel S. Sleep disorders in the elderly. Indian J Med Res 2010; 131: 302-10.
10. Ancoli-Israel S, Cooke JR. Prevalence and comorbidity of insomnia and effect on functioning in elderly populations. J Am Geriatr Soc 2005; 53: S264-71.
11. Beck SL, Schwartz AL, Towsley G, et al. Psychometric evaluation of the Pittsburgh Sleep Quality Index in cancer patients. J Pain Symptom Manage 2004; 27: 140-8.
12. Luo J, Zhu G, Zhao Q, et al. Prevalence and risk factors of poor sleep quality among Chinese elderly in an urban community: results from the Shanghai aging study. PLoS One 2013; 8: e81261.
13. Duclos C, Beauregard MP, Bottari C, et al. The impact of poor sleep on cognition and activities of daily living after traumatic brain injury: a review. Aust Occup Ther J 2015; 62: 2-12.
14. Li J, Yao YS, Dong Q, et al. Characterization and factors associated with sleep quality among rural elderly in China. Arch Gerontol Geriatr 2013; 56: 237-43.
15. Park JH, Yoo MS, Bae SH. Prevalence and predictors of poor sleep quality in Korean older adults. Int J Nurs Pract 2013; 19: 116-23.
16. Aunjitsakul W, Pitanupong J, Werachattawan N, et al. Sleep quality among elderly people within the outpatient department of Songklanagarind Hospital, Thailand: a cross-sectional study. J Health Sci Med Res 2017; 35: 195-204.
17. Torabi S, Shahriari L, Zahedi R, et al. A survey the prevalence of sleep disorders and their management in the elderly in Jahrom City, 2008. J Jahrom Univ Med Sci 2013; 10: 35-41.
18. Borji M, Jahani S, Shiri P, et al. Assessing sleep quality among the elderly people in Ilam city in 2015. J Geriatr Nurs 2016; 2: 44-53. [In Persian].
19. Sheikhy L, Karami-Mattin B, Chupani J, et al. Evaluation the status of sleep quality in elderly people in Kermanshah city. J Rehab Med 2015; 3: 81-8. [In Persian].
20. Mirzaei M, Gholamrezaei E, Bidaki R, et al. Quality of sleep and methods of management of sleep disorders in elderly of Yazd city in 2016. J Shahid Sadoughi Univ Med Sci 2017; 25: 467-75. [In Persian].
21. Mohammad Gholi Mezerji N, Naseri P, Omraninezhad Z, et al. The Reliability and Validity of the Persian Version of Pittsburgh Sleep Quality Index in Iranian People. Avicenna J Neuro Psycho Physiology 2017; 4: 95-102.
22. Wang P. Self-Reported Sleep Quality, Duration And Health-Related Quality Of Life In Older Chinese. Value Health 2016; 19: A905.
23. Safa A, Adib-Hajbaghery M, Fazel-Darbandi A. The relationship between sleep quality and quality of life in older adults. Iran J Psychiatr Nurs 2015; 3: 53-62. [In Persian].
24. Gulia KK, Kumar VM. Sleep disorders in the elderly: a growing challenge. Psychogeriatrics 2018; 18: 155-65.

25. Zhang Y, Ren R, Lei F, et al. Worldwide and regional prevalence rates of co-occurrence of insomnia and insomnia symptoms with obstructive sleep apnea: A systematic review and meta-analysis. Sleep Med Rev 2019; 45: 1-17.
26. Abbasi A, Bahrami H, Beygi B, et al. Risk Factors of Sleep Disorders in Elderly: A Population-Based Case-Control Study. Iran J Epidemiol 2019; 15: 172-8. [In Persian].
27. Krishnan V, Collop NA. Gender differences in sleep disorders. Curr Opin Pulm Med 2006; 12: 383-9.
28. Izadi Avanji FS, Adib Hajbaghery M, Afazel MR. Quality of sleep and it's related factors in the hospitalized elderly patients of Kashan hospitals in 2007. Feyz Med Sci J 2009; 12: 52-60. [In Persian].
29. Haseli-Mashhadi N, Dadd T, Pan A, et al. Sleep quality in middle-aged and elderly Chinese: distribution, associated factors and associations with cardio-metabolic risk factors. BMC Public Health 2009; 9: 130.
30. Turkmen K, Erdur FM, Guney I, et al. Sleep quality, depression, and quality of life in elderly hemodialysis patients. Int J Nephrol Renovasc Dis 2012; 5: 135-42.
31. Chien MY, Chen HC. Poor sleep quality is independently associated with physical disability in older adults. J Clin Sleep Med 2015; 11: 225-32.
32. Smagula SF, Stone KL, Fabio A, et al. Risk factors for sleep disturbances in older adults: Evidence from prospective studies. Sleep Med Rev 2016; 25: 21-30.
33. Kishimoto Y, Okamoto N, Saeki K, et al. Bodily pain, social support, depression symptoms and stroke history are independently associated with sleep disturbance among the elderly: a cross-sectional analysis of the Fujiwara-kyo study. Environ Health Prev Med 2016; 21: 295-303.
34. Tel H. Sleep quality and quality of life among the elderly people. Neurol Psychiatry Brain Res 2013; 19: 48-52.
35. Hayashino Y, Yamazaki S, Takegami M, et al. Association between number of comorbid conditions, depression, and sleep quality using the Pittsburgh Sleep Quality Index: results from a population-based survey. Sleep Med 2010; 11: 366-71.
36. Spiegel K, Leproult R, L'Hermite-Balériaux M, et al. Leptin levels are dependent on sleep duration: relationships with sympathovagal balance, carbohydrate regulation, cortisol, and thyrotropin. J Clin Endocrinol Metab 2004; 89: 5762-71.
37. Taheri S, Lin L, Austin D, et al. Short sleep duration is associated with reduced leptin, elevated ghrelin, and increased body mass index. PLoS Med 2004; 1: e62.
38. Schultes B, Schmid S, Peters A, et al. Sleep loss and the development of diabetes: a review of current evidence. Exp Clin Endocrinol Diabetes 2005; 113: 563-7.
39. Whitworth JA, Williamson PM, Mangos G, et al. Cardiovascular consequences of cortisol excess. Vasc Health Risk Manag 2005; 1: 291-9.
40. Isgaard J. Cardiovascular disease and risk factors: the role of growth hormone. Horm Res 2004; 62: 31-8.
41. Poynter B, Shuman M, Diaz-Granados N, et al. Sex differences in the prevalence of post-stroke depression: a systematic review. Psychosomatics 2009; 50: 563-9.
42. Ghaemmohamadi MS, Behzadifar M, Ghashghaee A, et al. Prevalence of depression in cardiovascular patients in Iran: A systematic review and meta-analysis from 2000 to 2017. J Affect Disord 2018; 227: 149-55.
43. Soenen S, Rayner CK, Jones KL, et al. The ageing gastrointestinal tract. Curr Opin Clin Nutr Metab Care 2016; 19: 12-8.
44. Merchant HA, Liu F, Orlu Gul M, et al. Age-mediated changes in the gastrointestinal tract. Int J Pharm 2016; 512: 382-95.
45. Goldacre MJ. Demography of aging and the epidemiology of gastrointestinal disorders in the elderly. Best Pract Res Clin Gastroenterol 2009; 23: 793-804.
46. Bilski J, Mazur-Bialy A, Magierowski M, et al. Exploiting Significance of Physical Exercise in Prevention of Gastrointestinal Disorders. Curr Pharm Des 2018; 24: 1916-25.
47. Dickman R, Green C, Fass SS, et al. Relationships between sleep quality and pH monitoring findings in persons with gastroesophageal reflux disease. J Clin Sleep Med 2007; 3: 505-13.
48. Zhao W, Jin H, Xu M, et al. Sleep Quality of Functional Gastrointestinal Disorder Patients in Class-Three Hospitals: A Cross-Sectional Study in Tianjin, China. Biomed Res Int 2018; 2018: 3619748.
49. Habibi F, Mahdavi SB, Khaniabadi BM, et al. Sleep quality and associated factors in Iranian inflammatory bowel disease patients. J Res Med Sci 2019; 24: 59.
50. Khanijow V, Prakash P, Emsellem HA, et al. Sleep Dysfunction and Gastrointestinal Diseases. Gastroenterol Hepatol (N Y) 2015; 11: 817-25.