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Original Article

Sleep Quality and Associated Factors Among Older Adults in Tabriz, Iran: Tabriz Older People Health Survey (TOPS-2019)

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Abstract

Objectives: The study aimed to investigate the sleep quality of aged people in Tabriz and identify its associated factors.

Design: Cross-sectional study.

Setting(s): Tabriz, the capital of the East Azerbaijan province in northwest Iran.

Participants: A total of 1362 participants were selected from a representative sample of community-dwelling older people aged ≥ 60 years who were living in Tabriz, using the probability proportional to size (PPS) sampling method.

Outcome measures: Blood pressure (BP), sleep quality, depression, anxiety, loneliness, physical activity, daily activities, living independently, and social support were assessed using a standard mercury sphygmomanometer, Pittsburgh Sleep Quality Index (PSQI), Hospital Anxiety and Depression Scale (HADS), the 6-item De Jong Gierveld Loneliness Scale, Physical Activity Scale for the Elderly (PASE), Activity of Daily Living (ADL), Instrumental Activity of Daily Living (IADL), respectively.

Results: The mean score of total PSQI was 5.39 ± 2.91. The multivariable logistic regression model showed that being female (Odds ratio [OR] = 1.68, 95% confidence interval [CI] = 1.29 to 2.18), hypertensive (OR = 2.12, 95% CI = 1.52 to 2.95), diabetes mellitus (DM) (OR = 1.29, 95% CI = 0.96 to 1.72), abnormal anxiety level (OR = 2.38, 95% CI = 1.67 to 3.38), and low PASE score (OR = 0.99, 95% CI = 0.99 to 1) were significantly associated with a higher risk of poor sleep quality.

Conclusions: Low physical activity is a modifiable risk factor for low sleep quality in older adults. Hence, the development of physical activity programs can be effective in improving sleep quality. Furthermore, women are the priority in designing interventions.

Keywords: Risk factors, Aging, Sedentary behavior, Sleep, Exercise

Introduction

Iran is facing a dramatic population change, and it will be experiencing one of the fastest population aging in the world.[1,2] Sleep disturbances are a common problem in older adults with a reported prevalence of over 71%,[3] and previous studies have shown that about 57% of older adults have complained of sleep problems.[4,5] Sleep quality is an important factor for physical and mental health which decreases with age,[6] and poor sleep quality is the third most common complaint of older adults. Additionally, it is one of the main reasons for visiting a physician by the elderly.[7] Sleep problems have been assumed to be one of the possible mechanisms by which risk factors affect health conditions,[8] and sleep disorders are one of the subgroups of mental disorders. More than 30% of people in the world suffer from sleep disorders, and 10% of these people report insomnia.[9] In the same way, more than 6 million Iranians have experienced sleep disorders.[9]

Poor sleep quality increases the risk of accidents, decreases job performance, and causes economic and social problems.[10] In short time, poor sleep quality results in high levels of stress and emotional distress, physical problems, lower quality of life, mood disorders, and other mental and behavioral problems.[11,12]

Several lines of research demonstrated strong links between psychiatric illnesses such as anxiety and depression. Findings reported that poor sleep is a risk factor in the development and maintenance of mood

disorders. It is reported that sleep problems may exacerbate symptom severity and may influence emotion regulation in general. Taken together, associations between anxiety, mood disorders, and sleep are multifaceted and bidirectional, and there is little information about the effect of sleep on emotion regulation in anxiety and depression.[13] Understanding the relationship between anxiety, depression, and sleep could help improve the interventions of both sleep problems, anxiety, and depression symptoms, which are considerable problems among community-dwelling elders.[14]

Long-term sleep disturbances have been linked to dyslipidemia, obesity, hypertension (HTN), diabetes, and metabolic syndrome.[12] Furthermore, insufficient sleep in older adults increases the risk of cardiovascular diseases which is significantly related to mortality.[15] Moreover, low sleep quality hurts cognitive functions, general health, and sense of well-being.[16]

Emerging evidence suggests that lifestyle and socio-demographic factors may contribute to sleep disturbances among older people.[17] Gender is one of the predictors of poor sleep quality, and poor sleep quality is higher in females.[18] In addition to gender, research evidence shows that anxiety, high blood pressure (BP), and cardiovascular diseases are risk factors for poor sleep quality.[12] In addition, physical activity can help improve sleep quality. Previous meta-analyses showed that older people who work out regularly have better sleep quality and less insomnia compared to older people who do not exercise regularly.[19,20]

It has also been found that physical activity can improve sleep quality. It is hypothesized that physical exercise constitutes a therapeutic behavior that can promote sleep. The research indicated that quantity and/or quality of sleep can affect physical exercise functions. Moreover, it was demonstrated that activity can improve neuropsychological performance and subjective sleep quality in older adults. The mechanism through which physical activity can affect sleep is the effect of rapid eye movement sleep. It has been found that physical activity can reduce rapid eye movement sleep and thereby help improve sleep.[21]

Loneliness is one of the most common and serious public health problems in modern societies, especially among older adults .Loneliness can be defined as a subjective perception resulting from an unpleasant or dissatisfactory lack of certain interpersonal relationships.

Loneliness is one of the most common and serious public health problems in modern societies, especially among older adults. Loneliness has been identified as one key aspect of social factors that influences health.[22] The relationship between loneliness and sleep disturbance has been observed in studies. In one study, lonely people reported lower sleep quality, higher levels of wakefulness after sleep onset, and less sleep efficiency compared to non-lonely people. It is argued that this sleep disturbance marked the loss of a fundamentally restorative behavior, thus affecting metabolic, neural, and hormonal processes.[8,22]

Despite the increasing speed of the aging population in Iran and the importance of sleep quality in old age, few studies have been conducted in this field in Iran. Investigating the state of sleep quality in the population and identifying its predictors will lead to targeting important variables for intervention to identify and improve the situation of people who are at risk of poor sleep quality. Therefore, the current study aimed to investigate sleep quality and its associated factors among aged people in Tabriz.

Methods

This cross-sectional analysis was embedded within the Tabriz Older People Health Survey (TOPS), which was conducted on a representative sample of community-dwelling older people in Tabriz, Iran.

The TOPS survey is a cross-sectional study that was conducted on a representative sample using the probability proportional to size (PPS) method among the aged people in Tabriz to examine socioeconomic variables, health behaviors, and the health profile of older adults.

Study Setting

The TOPS was conducted in Tabriz, East Azerbaijan Province, Iran, from July 2019 to January 2020. Tabriz is the capital and the most populated city in East Azerbaijan Province.

Study Population

The statistical population was community-dwelling people aged ≥ 60 years who were living in Tabriz, Iran.

Sample Size and Sampling Method

Details on the sampling methodology were described elsewhere.[23] In brief, a community-based representative sample (1362 participants including 594 males and 768 females) of free-living older people in Tabriz was randomly selected using the PPS sampling method. In the first stage, 140 blocks were randomly selected from the 11778 urban blocks in Tabriz. Following this, 10 older adults were randomly selected from each selected block.

Data Collection Tools

The data collection was undertaken by trained interviewers using a structured survey to investigate socio-demographic variables, and the standard scales were used to collect the specific data of the study as described below:

Pittsburgh Sleep Quality Index

The Pittsburgh Sleep Quality Index (PSQI) measures sleep quality and patterns in older people. It consists of 18 questions in 7 components. The PSQI total scores range from 0–21, classifying a global score of ≥ 5 as poor sleep quality, and the higher score shows a lower quality of

sleep.[24] The reliability and validity of the Iranian version of the PSQI have been confirmed in previous psychometric studies.[25,26]

Blood Pressure Measurement

Blood pressure measures were taken from the left and right arms using a standard mercury sphygmomanometer. HTN was defined as systolic BP ≥ 140 mm Hg and/or diastolic BP ≥ 90 mm Hg in the right and/or left arm.[27] This was done after a 5-minute rest, and participants were also classified as having HTN, regardless of their measured BP using anti-hypertensive medications.

The 6-Item De Jong Gierveld Loneliness Scale

This scale is a valid and reliable instrument for measuring overall, social, and emotional loneliness and is suitable for large surveys.[28] Due to the difficulty of using the 11-item version in large surveys, this 6-item version was created to evaluate the overall emotional and social loneliness. This scale consists of 6 questions with 5-point Likert answers. The scores range from 0-1 = not lonely to 2-6 = lonely. The scale has two subscales, including emotional and social loneliness. Based on psychometric research, the reliability and validity of the Persian version of this scale has been confirmed.[29]

Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS) was used for collecting depression and anxiety data. The HADS includes 14 items of which seven questions are related to the level of anxiety, and the rest questions measure the level of depression. Scores of 11 or above on either subscale are considered to be anxious and depressed individuals, while scores of 8–10 represent 'borderline' and 0–7 'normal'.[30] Furthermore, the validity and reliability of the Iranian version of the HADS have been evaluated in previous psychometric studies.[31,32]

Socioeconomic Status Questionnaire for Urban Households

This scale was developed in Iran and has been found as a valid and reliable index of socioeconomic status (SES).[33]

Physical Activity Scale for the Elderly

This tool was used to measure the level of physical activity. The components of this tool include leisure time, work-related, and household activities which are assessed in the previous week. Tool components include light, moderate, and intense sports and recreational activities, strength training, and endurance exercises. Work-related activities include walking and standing, garden care, caring for another person, home repairs, and heavy and light household activities. The total Physical Activity Scale for the Elderly (PASE) score ranges from 0 to 400 or more, and higher scores indicate better physical activity levels. The validity and reliability of this tool in the Iranian population have been confirmed in Keikavoosi-Arani and Salehi's study.[34]

Instrumental Activity of Daily Living

Lawton's Instrumental Activity of Daily Living (IADL) Questionnaire consists of 8 questions, the response range of which is based on a 5-point Likert scale. The score varies from 0 to 23 in which a higher score indicates a better situation. It is valid and reliable questionnaire as mentioned in Taheri et al 's study.[35]

Statistical Analysis

Descriptive data have been presented as frequencies and percentages for categorical data, and the median and the interquartile range were used for continuous variables. To select the statistical test, the normality of the data was checked based on the Kolmogorov-Smirnov test. Due to the distribution of the data, non-parametric tests were chosen to analyze the data. The chi-square test was used to examine the differences between categorical variables. The Mann-Whitney U test was also used to compare the means of two independent groups. Furthermore, multiple logistic regression analysis was employed to identify sleep quality-associated factors in the population aged ≥ 60 years. Confounding variables were selected by reviewing the previous sources and also checking the binary relationships between the variables. That is, if the binary relationship of two variables was shown to be statistically significant, it would be added to the model. Analyzes were performed using SPSS-23 software with the significance level of $P < 0.05$.

Results

Table 1 provides sample characteristics of the studied population. The mean age of the subjects was 70.1 ± 7.9 (70.7 ± 8.0 for men vs. 69.6 ± 7.8 for women) years, and they were 60-98 years old. Totally, 43.5% of participants were men, and 48.4% were illiterate.

The mean score of total PSQI was 5.39 ± 2.91, and the average night sleep time was 6.8 ± 1.6. Furthermore, 76% of participants wake up in the middle of the night at least once a week (42% for men and 58% for women, P value < 0.5), 38% cough or snore (60% for women, P value < 0.5), 36% feel too cold (67% for women, P value < 0.01), 66% feel too hot (61% for women, P value < 0.01), and 52% have pain at least once a week (72% for women, P value < 0.01) that are defined as sleep disturbances.

Good sleepers and poor sleepers were significantly different in terms of gender, marital status, level of education, loneliness scores, prevalence of HTN and diagnosed diabetes mellitus (DM), physical activity level, and IADL scores. As shown in Table 2, univariable logistic regression to identify the associated factors of sleep quality in older adults indicated that sleep quality is associated with gender, marital status, educational level, BP, DM, loneliness score, SES, anxiety, depression, PASE, and IADL scores.

Based on multivariate logistic regression analysis

Table 1. Basic Characteristics of Tabriz Older Adults by Sleep Quality Status

Characteristics		Sleep Quality		Total No. (%)	*P* Value
		Good Sleeper No. (%)	Poor Sleeper No. (%)		
Gender	Male	302 (56.9)	229 (43.1)	531 (43.2)	<0.001[a]
	Female	248 (35.6)	449 (64.4)	697 (56.8)	
Marital status	Single	117 (35.0)	217 (65.0)	334 (27.2)	<0.001[a]
	Married	433 (48.4)	461 (51.6)	894 (72.8)	
Education	Illiterate	235(39.7)	357 (60.3)	592 (48.2)	0.001[a]
	Primary education	156 (48.3)	167 (51.7)	323 (26.3)	
	Secondary education	121 (50.6)	118 (49.4)	239 (19.5)	
	Higher education	38 (51.4)	36 (48.6)	74 (6.0)	
SES	Very low	81 (34.2)	156 (65.8)	237 (19.9)	<0.001[a]
	Low	91 (40.8)	132 (59.2)	223 (18.7)	
	Middle	140 (53.0)	125 (47.0)	264 (22.2)	
	High	109 (47.7)	121 (52.6)	230 (19.3)	
	Very high	116 (48.9)	121 (51.1)	237 (19.9)	
BP	Normotensive	142 (60.2)	94 (39.8)	236 (19.2)	<0.001[a]
	Hypertensive	408 (41.1)	584 (86.1)	992 (80.8)	
DM	Non-diabetic	435 (48.1)	470 (51.9)	905 (73.7)	<0.001[a]
	Diabetic	115 (35.6)	208 (64.4)	323 (26.3)	
Age group	60-69	314 (46.9)	355 (53.1)	669 (54.4)	0.087[a]
	70-79	167 (42.9)	222 (57.1)	389 (31.7)	
	≥80	69 (40.6)	101 (59.4)	170 (13.8)	
Anxiety	Normal	367 (53.3)	322 (46.7)	689 (57.1)	<0.001[a]
	borderline case	105 (43.0)	139 (57.0)	244 (20.2)	
	Abnormal	72 (26.3)	202 (73.7)	274 (22.7)	
Depression	Normal	102 (53.4)	89 (46.6)	191 (15.8)	0.086[a]
	borderline case	182 (42.9)	242 (57.1)	424 (35.2)	
	Abnormal	261 (44.2)	330 (55.8)	591 (49.0)	
Loneliness	Not lonely	270 (41.9)	375 (58.1)	645 (52.6)	0.015[a]
	Lonely	280 (48.2)	301 (51.8)	581 (47.4)	
PASE (Median-IQR)		151.9 (91.0)	116.5 (100.9)	131.4 (104.2)	<0.001[b]
IADL (Median -IQR)		8.0 (1.0)	7.0 (2.0)	8.0 (2.0)	<0.001[b]

Note. SES: Socioeconomic status; BMI: Body mass index; IQR: Interquartile range; PASE: Physical activity Scale for the elderly; IADL: Instrumental activity daily living.
[a] *P* value calculated by the chi-square test; [b] *P* value calculated by the Mann-Whitney U test.

(Table 3), the risk of poor sleep quality increased by gender, HTN, DM, anxiety, and low PASE score. In the multivariable logistic regression model, the association between gender, HTN, DM, anxiety, and PASE score persisted. Moreover, the final multivariable logistic regression model showed that after adjusting the studied variables, being female (odds ratio [OR] = 1.68, 95% confidence interval [CI] = 1.29 to 2.18), HTN (OR = 2.12, 95% CI = 1.52 to 2.95), DM (OR = 1.29, 95% CI = 0.96 to 1.72), abnormal anxiety level (OR = 2.38, 95% CI = 1.67 to 3.38), and low PASE score were significantly associated with a higher risk of poor sleep quality (details in Table 3). The regression model of the present study explains about 17% of the changes in sleep quality (R^2 = 16.8%).

Discussion

The present study was conducted to investigate sleep quality and its associated factors among older adults in Tabriz, Iran. The results indicated the significant effect of gender on sleep quality. According to our results, women had poor sleep quality, so females were 1.6 times more likely to be located in the poor sleep quality group. In addition, the results of Zeng and colleagues' meta-analysis study showed that women suffer from sleep disorders about 1.6 times higher compared to men.[36] Another study among 8537 people confirmed that generally, women suffer from more disorders compared to men.[37]

Despite the consistent results of many studies regarding the unfavorable sleep quality of women compared to men, some others did not report a significant relationship

Table 2. Univariable Logistic Regression Analysis to Identify Sleep Quality-Associated Factors in Population Aged ≥ 60

Variable	Sleep Quality		OR (95% CI)	*P* Value
	Good Sleeper No. (%)	Poor Sleeper No. (%)		
Gender				
Male	302 (56.9)	229 (43.1)	Reference category	
Female	248 (35.6)	449 (64.4)	2.39 (1.89 to 3.01)	<0.001
Marital status				
Single	117 (35.0)	217 (65.0)	Reference category	
Married	433 (48.4)	461 (51.6)	0.57 (0.44 to 0.75)	<0.001
Education				
Illiterate	235(39.7)	357 (60.3)	Reference category	
Primary education	156 (48.3)	167 (51.7)	0.71 (0.54 to 0.93)	0.012
Secondary education	121 (50.6)	118 (49.4)	0.64 (0.47 to 0.87)	0.004
Higher education	38 (51.4)	36 (48.6)	0.62 (0.38 to 1.01)	0.056
SES				
Very low	81 (34.2)	156 (65.8)	Reference category	
Low	91 (40.8)	132 (59.2)	0.75 (0.52 to 1.10)	0.142
Middle	140 (53.0)	125 (47.0)	0.46 (0.32 to 0.66)	<0.001
High	109 (47.7)	121 (52.6)	0.58 (0.39 to 0.84)	0.004
Very high	116 (48.9)	121 (51.1)	0.54 (0.37 to 0.78)	0.001
BP status				
Normotensive	142 (60.2)	94 (39.8)	Reference category	
Hypertensive	408 (41.1)	584 (86.1)	2.16 (1.62 to 2.89)	<0.001
DM				
Non-diabetic	435 (48.1)	470 (51.9)	Reference category	
Diabetic	115 (35.6)	208 (64.4)	1.67 (1.28 to 2.18)	0.088
Anxiety				
Normal	367 (53.3)	322 (46.7)	Reference category	
Borderline	105 (43.0)	139 (57.0)	1.51 (1.12 to 2.03)	0.006
Abnormal	72 (26.3)	202 (73.7)	3.20 (2.35 to 4.35)	<0.001
Depression				
Normal	102 (53.4)	89 (46.6)	Reference category	
Borderline	182 (42.9)	242 (57.1)	1.52 (1.08 to 2.15)	0.016
Abnormal	261 (44.2)	330 (55.8)	1.45 (1.04 to 2.01)	0.026
PASE (Median-IQR)	151.9 (91.0)	116.5 (100.9)	0.99 (0.99 to 1.00)	<0.001
IADL (Median-IQR)	8.0 (1.0)	7.0 (2.0)	0.82 (0.76 to 0.88)	<0.001

Note. OD: Odds ratio; CI: Confidence interval; SES: Socio-economic status; BP: Blood pressure; DM: Diabetes mellitus; PASE: Physical Activity Scale for the Elderly; BMI: Body mass index; IQR: Interquartile range; PASE: Physical activity scale for the elderly; IADL: Instrumental activity daily living; The qualitative variables were presented as numbers (percent); The quantitative variables were presented as median (interquartile range).

between gender and sleep quality, and some found men to be at greater risk.[38-42]

According to past studies, in addition to high reports of diseases and depression in women that affect their sleep quality, hormonal cycles can also be influential factors. Some findings showed that the menstrual cycle

Table 3. Final Multiple Logistic Regression Analysis to Identify Sleep Quality-Associated Factors in Population Aged ≥ 60

Variable	Sleep Quality		OR (95% CI)	*P* Value
	Good Sleeper No. (%)	Poor Sleeper No. (%)		
Gender				
Male	302 (56.9)	229 (43.1)	Reference category	
Female	248 (35.6)	449 (64.4)	1.68 (1.29 to 2.18)	<0.001
BP Status				
Normotensive	142 (60.2)	94 (39.8)	Reference category	
Hypertensive	408 (41.1)	584 (86.1)	2.12 (1.52 to 2.95)	<0.001
DM				
Non-diabetic	435 (48.1)	470 (51.9)	Reference category	
Diabetic	115 (35.6)	208 (64.4)	1.29 (0.96 to 1.72)	0.088
Anxiety				
Normal	367 (53.3)	322 (46.7)	Reference category	
Borderline	105 (43.0)	139 (57.0)	1.27 (0.92 to 1.76)	0.146
Abnormal	72 (26.3)	202 (73.7)	2.38 (1.67 to 3.38)	<0.001
PASE (Median-IQR)	151.9 (91.0)	116.5 (100.9)	0.99 (0.99 to 1.00)	<0.001

Note. CI: Confidence interval; OR: Odds ratio; BP: Blood pressure; DM: Diabetes mellitus; PASE: Physical activity scale for the elderly; IQR: Interquartile range; The qualitative variables were presented as numbers percent); The quantitative variables were presented as median (interquartile range).

has a significant effect on the perceived quality of sleep in women, and most women suffer from sleep disorders. Women are in trouble falling asleep and maintaining sleep as the menstrual period and the levels of hormones involved in menstruation decrease. Moreover, painful menstrual syndrome and physical symptoms resulting from menstruation affect the evaluation of sleep quality. Therefore, it seems that the reduction of estrogen and progesterone hormones is effective in the quality of sleep.[43-46]

Later on, in their old age, the process of menopause begins which is accompanied by a decrease in hormone levels. The physical symptoms of this phenomenon such as hot flashes and changes in emotional states also affect the sleep cycle of women and cause a decrease in their sleep quality.[43,47] Therefore, it is assumed that lower quality of sleep in women can be explained by hormonal changes.

In the present study, HTN is one of the associated factors for poor sleep quality. According to Wang and colleagues' study, increasing or decreasing sleep duration can cause cardiovascular diseases.[48] In addition, the study of 827 participants aged 65 and above shows the effect of high BP on the quality of sleep, which is in line with the results of other studies, suggesting that the quality of sleep in hypertensives is poor compared with normotensives.[49,50] One of the reasons can be the side effects of the drugs used for HTN, which generally hurt sleep. Furthermore, the disruption of blood supply to the brain tissue as a controller of sleep function can be another reason for reducing the quality of sleep in hypertensive people.

The current study found that anxious people suffer

from poor sleep quality 2.4 times more than normal people. The results of another study revealed that anxiety symptoms are related to decreased sleep efficiency and the lack of sleep continuity.[14] Another study demonstrated that anxiety predicts insomnia. In this study, about 43.5% of people with insomnia reported symptoms of anxiety before suffering from insomnia.[51] The relationship between anxiety and sleep disorders is so important that sleep disorder is considered a criterion for diagnosing generalized anxiety disorder.[52]

In explaining the relationship between anxiety and sleep quality, it is possible to point out the hyperarousal caused by the disturbance in the regulation of neurotransmitter systems, including cholinergic and gamma-aminobutyric acid (GABA) mechanisms. Hyperarousal disrupts the function of corticolimbic circuits, leading to impaired emotional reactivity and regulation.[53]

In addition, it is proposed that increased inflammatory dysregulation in response to sleep disturbances could be a mechanism for explaining the association between anxiety and poor sleep.[14]

Although a previous systematic review has reported the relationship between loneliness and poor sleep quality,[54] no significant relationship was observed between loneliness and sleep quality in the present study. The inconsistency of the findings of these studies may be due to the difference in the set of confounding variables of the present study and the studies reviewed in the aforementioned systematic review.

Moreover, the result of this study showed that DM is significantly related to poor sleep quality. This finding is consistent with the results of other studies. The result of the study by Barakat et al showed that poor sleep quality is significantly associated with high HbA1c, poor glycemic control, and insulin use.[55] In another study, more than half of the patients with type 2 DM had poor sleep quality.[56] It was reported that there is an inverse correlation between HbA1c and sleep quality, and glycemic control improves when sleep quality becomes better.[57]

One explanation for this association may be that half of diabetic patients with poor glycemic control may suffer from painful diabetic neuropathy and osmotic diabetic symptoms, thus affecting their sleep quality by frequently visiting the bathroom during the night.[55] In addition, studies have proposed that poor sleep is associated with a decrease in GABA which is produced in significant levels in the pancreas. GABA has been shown to prevent apoptosis of rodent beta cells, and it is said that GABA is one of the neurotransmitters whose low levels can play a role in the quality of sleep in diabetic people.[58]

Previous meta-analyses displayed that older people who regularly exercise have better sleep quality and less insomnia compared to older people who do not exercise regularly.[19,20] Additionally, our results showed that physical activity affects the quality of sleep. The analysis of the PASE instrument as a questionnaire that represents physical activity indicated that the quality of sleep improves due to an increase in the physical activity score. Our findings are consistent with the results of Banno and colleagues' systematic review study. The impact of physical activity on sleep quality is so important that physical activity is prescribed as a non-pharmacological intervention to improve sleep.[59] Moreover, a study investigating the effect of physical activity on the treatment of apnea shows the effect of physical activity on the improvement of apnea through increasing the absorption of oxygen by the tissues.[60,61] Therefore, physical activity may create mechanisms to improve sleep quality by increasing blood supply and better nutrition of tissues.

Considering the different results of the studies and the importance of determining the causal factors responsible for poor sleep quality in older people, designing longitudinal studies will be useful as it can not only identify the causes and factors influencing sleep difficulties but also it will provide the basis for designing interventions to enhance sleep quality in older adults.

Strengths and Limitations of the Study

We can mention the high sample size and representative sampling of the community as strengths of this study. Since the data of this research was assessed using self-reported subjective questionnaires rather than standard objective measures such as actigraphy for assessing sleep disturbances, variables can be overestimated; hence, we should be cautious on this matter in explanation.

Conclusions

Findings highlight that low physical activity is a modifiable risk factor for low sleep quality in older adults. Accordingly, the development of physical activity programs can be effective in improving sleep quality. Women are the priority in designing interventions.

The current study found that gender, BP, anxiety, and physical activity are important associated factors for sleep quality, and being female, having an HTN, anxiety, and a sedentary lifestyle maximizes the chance of poor sleep quality. So, the development of physical activity programs can be effective in improving sleep quality.

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Data availability statement
The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical approval
This study was reviewed and approved by the Deputy of the Research Ethics Committee at the Tabriz University of Medical Sciences (Ethical ID: TBZMED.REC.1394.1069). Informed consent was obtained from all participants, and they were assured of the confidentiality of all provided information.

Consent for publication
Not applicable.

Conflict of interests
The authors declare that they have no competing interests.

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