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Research Article

Sleep quality and its associated factors among rural adults in Egypt: A community-based study

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Abstract

Background: sleep quality is essential for maintaining good mental and physical well-being and various factors influence sleep quality. However, there is limited research about sleep quality among the general population in Egypt, especially in rural areas. Our study aimed to assess sleep quality and its associated factors among rural Egyptian adults. **Methods:** We conducted a community-based cross-sectional study in Minia, Egypt, in 2023. A randomly selected rural area was chosen. During data collection, a systematic random sample was used and 325 adults (equal or above 18 years) were interviewed. Socio-demographic and health-related data were collected. The Pittsburgh Sleep Quality Index scale (PSQI) was utilized to assess sleep quality and anthropometric measurements were also taken. Independent predictors of poor sleep quality were identified using a multivariate binary logistic regression model. **Results:** Over 44% of the participants had poor sleep quality. The most prevalent abnormal sleep domains were sleep latency (43.3%) followed by sleep disturbance (40.3%). Factors such as gender, family income, chronic disease, and health perception were significantly associated with poor sleep. However, multiple regression analyses revealed that only fair (OR: 2.55; 95% CI: 1.13-5.75) and bad health perceptions (OR: 4.27; 95% CI: 1.59-11.43) were significant predictors for poor sleep quality. **Conclusion:** A sizeable proportion of rural adults suffer from poor sleep quality. It is crucial to prioritize regular screening for poor sleep and develop educational programs in rural communities to enhance sleep quality.

Keywords: Sleep Quality; Pittsburgh Sleep Quality Index (PSQI); Prevalence; risk factors; rural

Introduction

Sleep is one of the essential aspects of life, People spend one-third of their lives sleeping [1]. Therefore, there is a growing public health concern regarding sleep difficulties [2]. Sleep quality of an individual involves sleep duration, sleep latency, depth of sleep, and restfulness [3].

Sleep quality has been correlated with a variety of demographic characteristics such as age, gender, education level, marital status and employment [4]. Chronic diseases and smoking can also affect sleep quality [5].

Good quality of sleep supports mood, memory, and cognitive function [3]. While, poor sleep quality have many negative consequences including physical illness such as metabolic syndrome, type two diabetes, and cardiovascular diseases in addition to impaired concentration, depression and higher healthcare expenses [6-8].

International studies showed that sleep problems impact a far larger population than previously believed and that the issue is going to get worse [7, 9, 10]. However, little is known about the prevalence and factors associated with sleep quality among the general population in rural communities in Egypt. Previous studies on the burden of poor sleep quality in Egypt have been restricted to specific groups, such as students, elderly people, workers, or chronically ill patients [11-14].

Recognizing the burden of poor sleep quality and its associated factors can help in developing effective interventions to improve sleep quality and thus reducing the associated negative consequences among the affected populations. Therefore, this

community-based study aimed to determine the prevalence of poor sleep quality and to identify various factors associated with poor sleep quality.

Methods:

Study design and setting: A community-based cross-sectional study was conducted in Abyouha village that was randomly selected from rural villages of Minia governorate, Egypt using simple random method from July to September 2023. Abyouha village is located in Abo Qurqas district in the south of Minia Governorate with a total population of 14950.

Study population: The study was performed among individuals aged ≥ 18 years. Respondents who did not complete the questionnaire were also excluded.

Sample size: sample size was calculated using Epi Info software version 7.2. Using the following parameters: The total population of adults ≥ 18 years in the selected village was 11855, worldwide the prevalence of sleep problems in previous studies was 30% [9, 10], with alpha error= 5%, study power = 80% and at 95% confidence interval (CI). The minimum required sample size is 315. Accounting for a 5% non-response rate, the sample size was increased to be 330.

Sampling technique: Data were collected using a systematic random sample, the first house was chosen randomly, and then we entered every 30th house until we reached the desired sample size. This interval was calculated based on data obtained from the local council of the village as the total number of houses was 3330 with at least three adult individuals ≥ 18 years per house. If a house was found locked during the initial visit; we revisited it on the following day. If it was still locked on the second day, we excluded it from the study.

Data collection: A house-to-house visit was carried out by a team of faculty of medicine undergraduates and social workers under our supervision after training them on how to fill out the questionnaire and obtain anthropometric measurements. They explained the aim of the study to each participant. Participants were assured that all information gained from the study will be treated with confidentiality and privacy and verbal consent was obtained from each participant before data collection.

Anthropometric measurements in the form of weight and height were obtained. Height was measured to the nearest 1cm with participants in a standing position without shoes. Body weight was measured to the nearest 0.1 kg, with minimal clothing and without shoes. Data were collected using an Arabic pre-designed well-structured questionnaire. Five questionnaires were excluded due to missed data, so the final included number was 325 obtained from 160 houses. Data were collected during the period from July to September 2023.

Ethical considerations: This study was approved by the Ethical Committee of the Faculty of Medicine in Minia University, Egypt (approval number 807:6:2023). An official approval from the local council of Abyouha village was obtained. Verbal informed consent was obtained from each participant before data collection.

Data collection tools included the following:

1. A structured interview questionnaire: the questionnaire covered socio-demographic characteristics personal habits and health-related data in the form of history of chronic diseases, perceived health status and suffering from chronic pain defined as any pain that lasted more than three months and was either continuous or intermittent, in the past 30 days [15].

2. Sleep quality: sleep quality was assessed using the validated Arabic version of the Pittsburgh Sleep Quality Index (PSQI). The internal consistency of the score evaluated by Cronbach's alpha coefficient was 0.71 [16]. The PSQI is a self-rated scale that assesses sleep quality and disturbances over a 1-month time interval [17]. It is a 19- item questionnaire that involves seven domains including "subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction". The score of each item is from 0- 3. The total score is from 0 to 21; a higher score indicates worse sleep quality. A global score greater than 5 is diagnostic for sleep disorders and differentiates between people with good and bad sleep quality. A domain score of more than or equal to 2 indicates that this domain is of poor quality [17].

Statistical Analysis:

Data were analyzed using SPSS version 25. Analyses included descriptive statistics (in the form of proportions, means, and standard deviations [SDs]). A Chi-square test was performed to compare proportions. Binary logistic regression analysis was used to predict factors associated with poor sleep quality. Odds ratio (OR) and 95% CI were calculated and statistical significance was considered at $p < 0.05$.

Results:

Table 1 demonstrates that the mean age of the studied group was 41.11±15.67. There was no significant association between mean age and sleep quality (P=0.50). The prevalence of poor sleep was 36.6% among males compared to 50% among females (P =0.017). A higher prevalence of poor sleep quality (51.9%) was associated with having insufficient family income. Prevalence of poor sleep quality was significantly higher among persons who were not working (50.5%) compared to working persons (32.7%), (P=0.04).

Table 2 describes the distribution of PSQI domains. The overall prevalence of poor sleep quality was 44.6%. The most prevalent abnormal sleep domains were 43.4% for sleep latency, 40.3% for sleep disturbance, and 24.3% for daytime dysfunction.

Table 3 shows that having ≥ 3 chronic diseases was significantly associated with poor quality of sleep. In addition, fair, bad and very bad health perceptions were significantly higher among poor sleepers compared to good sleepers (71.2%, 66.7% compared to28.8% and 33.3% respectively). Among those who suffered from severe chronic pain 70 % had poor quality of sleep compared to 30 % had good quality. No significant associations were found between quality of sleep and smoking status, frequent tea/ coffee consumption, and internet use before bedtime. the prevalence of poor sleep was significantly higher among persons having hypertension, diabetes, asthma, hypercholesterolemia, peptic ulcer, back problems, depression, visual problems, and hearing problems (figure 1).

In table (4), Regarding gender, Females had higher percentages of poor sleep domains of (poor subjective sleep quality, poor sleep latency, sleep disturbance, and daytime dysfunction) than males. The difference was statistically significant.
Percentage of poor sleep efficiency was significantly higher among Older age (≥60) (42.1%) than other age groups (P=0.022). Persons having body mass index (BMI) ≥ 25 had significantly higher percentage of poor domain of sleep medications (79.2%) (P=0.035). The overall poor sleep quality was significantly higher among females (66.9%), (P=0.017).

Table 5 demonstrates that in univariate binary logistic model, females had higher odds of having poor sleep than males (OR: 1.73; 95% CI: 1.1-2.72). Being unemployed, having fair, bad, or very bad health, moderate or severe pain were also significantly associated with poor sleep. Additionally, having insufficient income was associated with significantly increased odds of having poor sleep (OR: 2.19; 95% CI: 1.26-3.80). While in the multivariable analysis, fair and bad health perception during the last month were the only significant predictors for poor sleep (OR: 2.55; 95% CI: 1.13-5.75 and OR: 4.27; 95% CI: 1.59-11.43 respectively.

Table 1: Association between sleep quality and socio-demographic characteristic among the study participants

	Good sleep (n=180)	Poor sleep (n= 145)	Total (N=325)	Significance
Age, mean (SD)	40.58 (15.08)	41.77 (16.39)	41.11 (15.67)	p=0.50 t =0.680
Gender, n (%)				
Male	83 (63.4)	48 (36.6)	131 (100.0)	p=0.017
Female	97 (50.0)	97 (50.0)	194 (100.0)	$\chi 2$=5.65
Family income, n (%)				
Enough and safe	75 (67.0)	37 (33.0)	112 (100.0)	p=0.009
Enough	55 (50.5)	54 (49.5)	109 (100.0)	$\chi 2$=9.39
Not Enough	50 (48.1)	54 (51.9)	104 (100.0)	
Education, n (%)				
Illiterate	48 (46.6)	55 (53.4)	103 (100.0)	P=0.13
Read and write	18 (52.9)	16 (47.1)	34 (100.0)	$\chi 2$=7.16
Basic education	24 (52.2)	22 (47.8)	46 (100.0)	
Secondary or technical education	76 (63.3)	44 (36.7)	120 (100.0)	
University or higher education	14 (63.6)	8 (36.4)	22 (100.0)	
Marital Status, n (%)				
Married	139 (56.7)	106 (43.3)	245(100.0)	P=0.06

Divorced	1 (12.5)	7 (87.5)	8 (100.0)	$\chi 2$=7.27
Widow	15 (48.4)	16 (51.6)	31 (100.0)	
Single	25 (61.0)	16 (39.0)	41 (100.0)	
Working status, n (%)				
Not working	108 (49.5)	110(50.5)	218 (100.0)	P=0.04
Working	72 (67.3)	35(32.7)	107 (100.0)	$\chi 2$=11.82

Table 2 Description of the PSQI domains among the study participants

Sleep domain	Good quality for domain	Poor quality for domain
Subjective sleep quality	268 (82.5)	57 (17.5)
Sleep latency	184 (56.5)	141 (43.3)
Sleep duration	295 (90.8)	30 (9.2)
Sleep efficiency	306 (94.2)	19 (5.8)
Sleep disturbance	194 (59.7)	131 (40.3)
Use of sleep medication	277 (85.2)	48(14.8)
Daytime dysfunction	246(75.7)	79(24.3)
Total PSQI score	180(55.4)	145(44.6)

Table 3: association between sleep quality and personal habits and health related data among the study participants

	Good sleep (n=180)	Poor sleep (n= 145)	Total (N=325)	Significance
Number of chronic diseases, n (%)				
0	2 (40.0)	3 (60.0)	5 (100.0)	p=0.0001
1	117 (66.5)	59 (33.5)	176 (100.0)	$\chi 2$=38.79
2	32 (51.6)	30 (48.4)	62 (100.0)	
≥ 3	29 (35.4)	53 (64.6)	82 (100.0)	
Perceived Health status, n (%)				
Excellent	38 (77.6)	11 (22.4)	49 (100.0)	p=0.0001
Very good	68 (70.1)	29 (29.9)	97 (100.0)	$\chi 2$=37.84
Fair	56 (47.5)	62 (52.5)	118 (100.0)	
Bad	15 (28.8)	37 (71.2)	52 (100.0)	
Very bad	3 (33.3)	6 (66.7)	9 (100.0)	
Chronic pain ≥ 3 months, n (%)				
No	118 (67)	58 (33)	176 (100.0)	p=0.0001
Moderate pain	50 (45.9)	59 (54.1)	109 (100.0)	$\chi 2$=24.11
Severe pain	12 (30.0)	28 (70.0)	40 (100.0)	
Smoking status, n (%)				
Smoker	38 (61.3)	24 (38.7)	62 (100.0)	p=0.50
Ex-smoker	7 (53.8)	6 (46.2)	13 (100.0)	$\chi 2$=1.40
Non-smoker	135 (54.0)	115 (46.0)	250 (100.0)	
Frequent tea/ coffee drinking, n				

(%)	127 (53.4)	111 (46.6%)	238 (100.0)	p=0.23
Yes	53 (60.9)	34 (39.1%)	87 (100.0)	$\chi 2$=1.47
No				
Internet use before bed time*, n (%)	48 (56.5)	37 (43.5)	85 (100.0)	p=0.44
Yes (n=85)	56 (62.2)	34 (37.8)	90 (100.0)	$\chi 2$=0.6
No (n=90)				

*This question was only applicable for participant who had access to internet

Table 4: Difference in the PSQI total and domain scores in relation to gender, age, and Body mass index

	Poor Subjective sleep quality	Poor Sleep latency	Poor Sleep duration	Poor Sleep efficiency	Poor Sleep disturbance	Poor domain of sleep medication	Daytime dysfunction	Poor Overall sleep quality
Gender								
Male	13(22.8%)	48(34%)	11(36.7%)	5(26.3%)	33(25.2%)	16(33.3%)	21(26.6%)	48(33.1%)
Female	44(77.2%)	93(66%)	19(63.3%)	14(73.7%)	98(74.8%)	32(6.7%)	58(73.4%)	97(66.9%)
p- value[1]	**0.003**	**0.04**	**0.67**	**0.2**	**0.001**	**0.29**	**0.004**	**0.017**
Age groups								
18-39	26(45.6%)	71(50.4%)	13(43.3%)	6(31.6%)	63(48.1%)	18(37.5%)	44(55.7%)	74(51%)
40-59	19(33.3%)	39(27.7%)	10(33.3%)	5(26.3%)	36(27.5%)	23(47.9%)	25(31.6%)	43(29.7%)
≥60	12(21.1%)	31(22%)	7(23.3%)	8(42.1%)	32(24.4%)	7(14.6%)	10(12.7%)	28(19.3%)
p-value*	**0.67**	**0.31**	**0.65**	**0.022**	**0.08**	**0.018**	**0.30**	**0.92**
BMI								
< 25	15(26.3%)	45(31.9%)	6(20%)	4(21.1%)	39(29.8%)	10(20.8%)	22(27.8%)	42(29%)
≥ 25	42(73.7%)	96(68.1%)	24(80%)	15(78.9%)	92(70.2%)	38(79.2%)	57(72.2%)	103(71%)
p-value[1]	**0.17**	**0.46**	**0.09**	**0.22**	**0.17**	**0.035**	**0.17**	**0.077**

Chi-square was used to compare different variables with sleep domains, only poor sleep domains percentages were mentioned in table

Table 5: Univariate and multivariate binary logistic regression for factors associated with poor sleep quality

	Univariate regression		Multivariate regression	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p-value**
Gender				
Male(Ref)	1	-	-	-
Female	1.73 (1.1-2.72)	0.02	1.08 (0.59-1.99)	0.80
Working status				
Working (Ref)	1	-	-	-
Not working	2.1 (1.29-3.4)	0.003	1.40 (0.73-2.67)	0.32
Perceived health Status				
Excellent (Ref)	1	-	-	-
Very good	1.47 (0.66-3.28)	0.34	1.24 (0.54-2.84)	0.61
Fair	3.83 (1.79-8.20)	0.001	2.55 (1.13-5.75)	0.02
Bad	8.52 (3.46-20.96)	0.001	4.27 (1.59-11.43)	0.004
Very bad	6.9 (1.48-32.22)	0.014	2.30 (0.42-12.49)	0.34
chronic pain ≥ 3months				
No (Ref)	1	-	-	-
Moderate	2.4 (1.47-3.62)	0.001	1.39 (0.78-2.45)	0.26
Severe	4.75 (2.25-10.01)	0.001	2.23 (0.96-5.18)	0.06
BMI				

< 25 (Ref)	1	-	-	-
≥ 25	1.52 (0.96-2.43)	0.08	1.19 (0.7-2.01)	0.52
Number of chronic diseases				
0 (Ref)	1	-	-	-
1	0.34 (0.06-2.07)	0.24	0.2 (0.03-1.34)	0.098
2	0.63 (0.1-4.01)	0.62	0.25 (0.03-1.75)	0.16
≥ 3	1.22 (0.16-7.77)	0.83	0.37 (0.05-2.63)	0.32
Family income				
Enough and safe (Ref)	1	-	-	-
Enough	1.99 (1.16-3.43)	0.013	1.56 (0.85-2.84)	0.148
Not Enough	2.19 (1.26-3.80)	0.005	1.57 (0.85-2.89)	0.15
Frequent tea/ coffee drinking,	1	-	-	-
No (ref)	1.36(0.83-2.25)	0.23	0.93(0.33-2.6)	0.89
Yes				
Internet use before bed time				
No (ref)	1	-	-	-
Yes	1.27(0.69-2.32)	0.44	1.73(0.69-4.3)	0.24
Smoking				
Smoker	0.72(0.42-1.25)	0.24	0.68(0.19-2.44)	0.56
Quit smoking	0.98(0.32-3.02)	0.98	0.07(0.004-1.25)	0.07
Never smoked (ref)	1	-	-	-

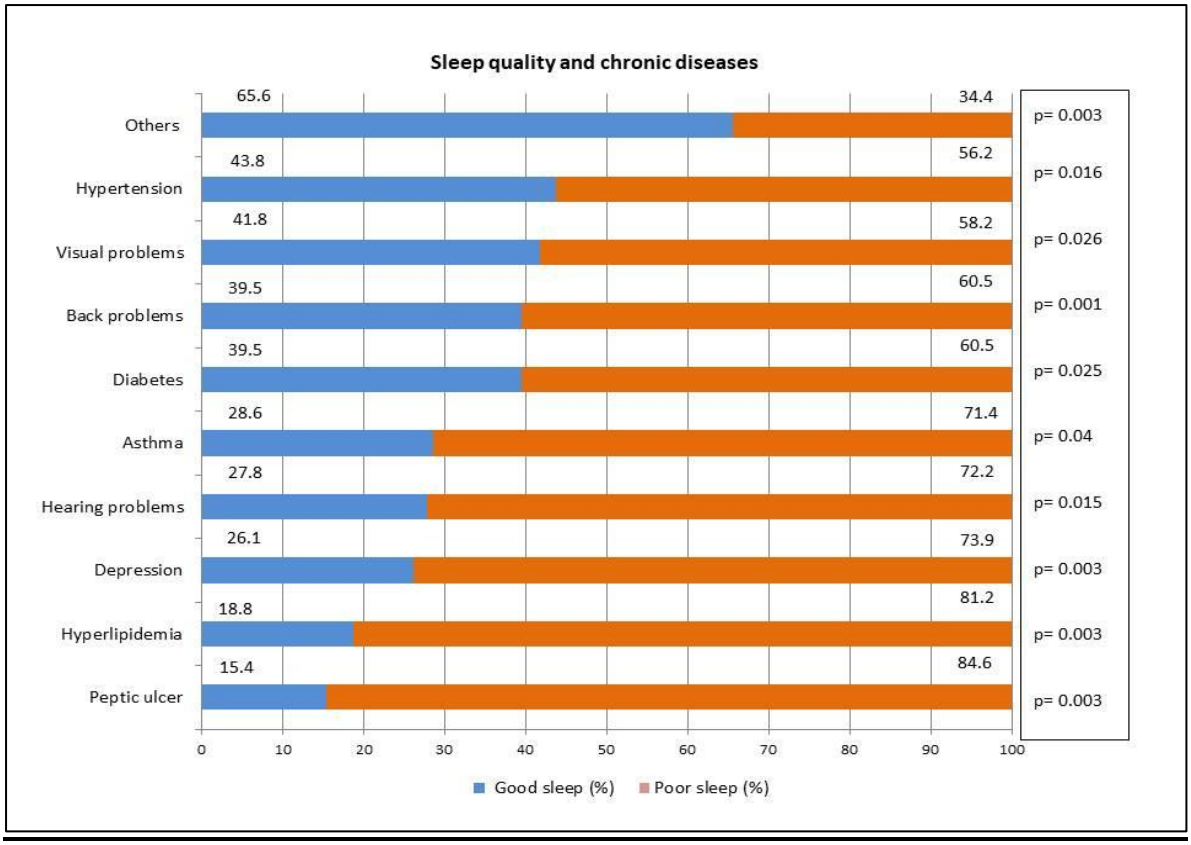

Figure 1 Association between sleep quality and presence of chronic disease

Discussion

In the present time, poor sleep quality is commonly experienced due to changing lifestyles and various life stresses. This community-based study aimed to assess sleep quality among 325 adults in Abyoha village, Minia, Egypt.

Our findings revealed that 44.6% of the participants had poor sleep quality. A previous

study conducted in Egypt during the COVID-19 pandemic reported that 68.4% of the population were poor sleepers [18].

In comparison to various international community-based studies in the USA, Saudi Arabia, India, and China, the prevalence of insomnia and poor sleep quality ranged from 26% to 46.6% [2, 3][19-21]. This difference can be attributed to several factors, including geographic setting, socioeconomic levels, lifestyle, and interviewing techniques.

Other Egyptian studies conducted among special populations revealed varying prevalence. In studies conducted among elderly, insomnia and poor sleep quality ranged from 33.4% to 62.1% [11, 22, 23]. Higher prevalence rates of 84.8% [24] and 72.4 % [12] were found among Egyptian secondary school students. In addition, the prevalence rates of poor sleep quality were > 60% among people with different comorbidities [13, 25].

In this study, females had a significantly higher prevalence of poor sleep quality compared to males. This association has also been observed in other community-based studies [2, 26, 27]. Studies conducted among secondary and high school students in Egypt as well as in Saudi Arabia and Japan found a similar association [12, 24, 28, 29]. The higher prevalence of poor quality of sleep among females may be attributed to social inequities and societal expectations placed on them by their communities. In addition to hormonal disturbances that can lead to mood swings and sleep disturbances. Our study also revealed that poor sleep quality was associated with unemployment which is usually more common among rural females.

Furthermore, this study found that poor sleep quality was significantly associated with factors such as insufficient family income, unemployment, bad perception of health, and the presence of comorbid conditions including hypertension, DM, asthma, peptic ulcer, depression, and chronic pain. However, no significant associations were observed between poor sleep quality and age, educational level, marital status, and smoking status.
According to El Gilany et al. and Wong and Fielding, a higher prevalence of insomnia was found among individuals with insufficient income [11, 30]. In addition, other studies have shown that unemployment is associated with poor sleep quality [26, 31, 32].

Our study aligns with various other studies from India, China, and Nigeria, which have shown significant associations between poor sleep quality and comorbid conditions [26, 33-35]. Depression and diabetes were significantly related to insomnia in rural residents in Poland [26]. Other studies also found an association between poor sleepers and diabetes, chronic respiratory disorders, and thyroid disorders [11, 23, 31, 32, 36].

Regarding the association between obesity and sleep quality, the results were controversial. Our results showed that BMI ≥ 25 only had significant effect on sleep medication domain. Some studies showed a significant relationship between poor sleep quality and obesity [37, 38], while others found no significant association [3, 5]. However, a large-scale study in China and India found that high sleep quality was associated with high BMI in males [39].

The univariate regression analysis in our study revealed several factors associated with higher odds of being poor sleepers including being female, unemployment, fair, bad or very bad health perception, moderate or severe pain, and insufficient income. Although having fair and bad health were the only significant predictors for poor sleep in multivariable analysis.

Various studies have also found that being female [2, 8, 27, 40], low income [27, 41] could increase the odds of poor sleep quality. Another study identified moderate perception of health as a risk factor for insomnia [42].
In our study, we didn't find age, comorbidities, BMI, or smoking status to be predictors of poor sleep quality. However, these factors have been identified as predictors in other studies [2, 27, 40]. This observed difference may be attributed to the inclusion of a population with diverse characteristics.

Regarding different sleep domains, the most prevalent abnormal sleep domain in our study were sleep latency (43.4%), sleep disturbance (40.3%), and daytime dysfunction (24.3%). According to ***Wong and Fielding***, the most

common abnormal sleep domain were prolonged sleep latency (39.7%), decreased sleep duration (31.0%), and reduced habitual sleep efficiency (28.8%) [30]**.** There were significant differences in the prevalence of poor domains of (subjective sleep quality, sleep latency, sleep disturbance, and daytime dysfunction) between males and females with females having higher percentage of poor domains. This finding is similar to a Chinese study, which also showed sex differences in five PSQI domains, except for sleep efficiency and use of sleep medication [41]**.**

The strength of the present study is that it is one of the few population-based studies on sleep quality conducted in Egypt, specifically in rural areas. However, there are limitations to consider. First, the study design was cross-sectional, which means we cannot establish a cause-effect relationship between poor sleep quality and related risk factors. Second, the assessment of sleep quality relied on a self-rating scale, which may introduce recall bias.

Conclusion and recommendations: The prevalence of poor sleep quality is high in the studied rural community. To address this issue, it is crucial to implement a public health strategy that involves screening all adults for sleep disorders and providing targeted interventions for high-risk groups. Additionally, conducting larger epidemiological studies is needed to gain a comprehensive understanding of the epidemiology of sleep problems.

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List of abbreviations:
PSQI: Pittsburgh Sleep Quality Index
CI: Confidence interval
OR: Odds ratio
SD: Standard deviation
BMI: body mass index

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