Preplanned Studies

Sleep Quality and the Influencing Factors in Older Adults Aged 65 Years and Above — 6 PLADs, China, 2025

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Summary

What is already known about this topic?

Sleep quality is a critical health determinant among older adults.

What is added by this report?

The prevalence of poor sleep quality among community-dwelling older adults aged 65 years and above was 48.39% [95% confidence interval (*CI*): 46.95%, 49.83%]. Sleep problems across all dimensions were more pronounced in females, rural residents, and individuals with depressive symptoms.

What are the implications for public health practice?

Sleep quality screening and intervention efforts should be strengthened, particularly for high-risk groups such as women, rural residents, and older adults with depression or chronic diseases.

ABSTRACT

Introduction: Sleep quality among older adults is an important determinant of overall health, yet research on this topic in China remains limited. This study presents the 2025 survey findings on sleep quality across various subgroups of older adults in China.

Methods: This study used data from the 2025 follow-up of the Healthy Aging and Elderly Longevity Survey (HAELS), covering six provincial-level administrative divisions (PLADs) in China. Subgroup differences were compared using chi-square tests, and multivariable logistic regression analysis was performed to identify factors associated with poor sleep quality.

Results: A total of 4,631 participants were included in the analysis. The overall prevalence of poor sleep quality was 48.39% [95% confidence interval (*CI*): 46.95%, 49.83%]. Independent risk factors included female sex [odds ratio (*OR*)=1.45, 95% *CI*: 1.26, 1.68], rural residence (*OR*=1.33, 95% *CI*: 1.16, 1.52), hypertension (*OR*=1.24, 95% *CI*: 1.10, 1.40), chronic digestive system diseases (*OR*=1.85, 95% *CI*: 1.55, 2.20), chronic urinary system diseases (*OR*=1.44, 95%

CI: 1.19, 1.74), and depressive symptoms (*OR*=2.35, 95% *CI*: 2.03, 2.72) (all *P*<0.001). Among the multidimensional sleep problems, total sleep duration had the highest detection rate (41.44%, 95% *CI*: 40.01%, 42.87%), followed by sleep onset latency (35.95%, 95% *CI*: 34.57%, 37.35%) and sleep efficiency (30.79%, 95% *CI*: 29.46%, 32.14%).

Conclusion: Poor sleep quality is highly prevalent among older adults in China, with significant disparities across demographic and health subgroups. Strengthening sleep quality screening and intervention is essential, particularly for high-risk groups such as women, rural residents, and older adults with depression or chronic diseases.

Sleep quality, particularly among older adults, is a critical determinant of health and is associated with elevated risks of mortality, physical illness, and mental disorders (*1*). Given the rapid growth of the aging population, this issue poses a major public health challenge. A recent meta-analysis estimated the overall pooled prevalence of poor sleep quality among older adults at 50% [95% confidence interval (*CI*): 45%, 55%] (*2*). In recent years, research on sleep quality among older adults in China has been limited, focusing primarily on localized regions or clinical samples. This study presents the 2025 follow-up findings of the Healthy Aging and Elderly Longevity Survey (HAELS) on sleep quality across different subgroups of older adults in six provincial-level administrative divisions (PLADs) in China.

This study used data from the third round of the HAELS, which was initiated in 2019 across 6 PLADs (Beijing, Shandong, Jilin, Jiangxi, Ningxia, and Guangxi) to evaluate trends in healthy aging among community-dwelling older adults aged 65 years and above (*3*). These 6 PLADs were selected based on their level of economic development. From each province or municipality, two counties or urban districts were

randomly chosen. Within each county or urban district, two towns or subdistricts were selected using a multistage stratified probability-proportional-to-size (PPS) sampling approach. Two villages or communities were then chosen from each town or subdistrict, again employing PPS sampling. In the final stage, 100 participants were randomly drawn from residents aged 65 and above within each selected village or community. Overall, the HAELS recruited 4,800 participants, yielding a final sample of 4,690 in 2019 (3). Two rounds of follow-up were conducted in 2022 and 2025. In the 2025 round, to account for mortality, loss to follow-up, and shifts in age structure, additional subjects were recruited alongside continued tracking of the original cohort. This ensured that at least 100 surviving participants were surveyed in each village or community and that adults aged 65–70 years constituted at least 50% of the newly added subjects. In total, 4,775 eligible participants were enrolled, including 1,805 newly added subjects (37.8%), and 4,769 completed the survey. After excluding cases with missing sleep data, the final analytic sample comprised 4,631 participants (97.0%).

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a validated self-report instrument (4). The questionnaire comprises 19 items grouped into seven domains: subjective sleep quality, sleep onset latency, total sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Each domain is scored from 0 to 3, yielding a global PSQI score ranging from 0 to 21, with higher scores reflecting poorer sleep quality and greater severity of sleep-related problems. In this study, a score of ≥2 on any PSQI dimension was considered indicative of a problem in that dimension, and a total PSQI score >5 was classified as poor sleep quality. At this cutoff, the diagnostic sensitivity was 89.6% and the specificity was 86.5% (4). Demographic and health-related variables included age, sex, household registration, education level, hypertension, diabetes, chronic obstructive pulmonary disease (COPD), chronic digestive system diseases, chronic urinary system diseases, current smoking, alcohol consumption, physical activity, and depressive symptoms. Depression was assessed using the 15-item Geriatric Depression Scale (GDS-15), with scores ≥5 indicating depression.

Continuous variables were reported as means standard deviation (SD), and categorical variables as percentages with 95% CIs. The prevalence of overall PSQI scores and individual dimensions among older adults was presented as point estimates with 95% CIs. Subgroup differences were assessed using χ^2 tests, and multivariable logistic regression analysis was performed to identify factors associated with poor sleep quality. Radar charts were used to illustrate the multidimensional characteristics of sleep quality across age, sex, urban–rural residence, and depression status. All statistical analyses were conducted using R software (version 3.62, R Project for Statistical Computing, Vienna, Austria). Tests were two-tailed, with statistical significance defined as $P<0.05$.

Among the 4,631 older adults included in the analysis, the mean age was 74.3 years, with males accounting for 42.13% and urban residents for 33.56%. Table 1 presents the characteristics of participants stratified by sleep quality. The overall prevalence of poor sleep quality was 48.39% (95% CI: 46.95%, 49.83%), with higher rates observed among participants who were older, female, residing in rural areas, had lower educational attainment, had comorbid chronic diseases (hypertension, COPD, chronic digestive system diseases, and chronic urinary system diseases), or had depressive symptoms ($P<0.05$). Notably, among older adults with chronic digestive system diseases and those with depressive symptoms, the prevalence of poor sleep quality reached 64.49% (95% CI: 60.86%, 67.97%) and 65.90% (95% CI: 63.10%, 68.60%), respectively. Multivariable logistic regression analysis (Table 2) revealed that female sex (OR=1.45, 95% CI: 1.26, 1.68), rural residence (OR=1.33, 95% CI: 1.16, 1.52), hypertension (OR=1.24, 95% CI: 1.10, 1.40), chronic digestive system diseases (OR=1.85, 95% CI: 1.55, 2.20), chronic urinary system diseases (OR=1.44, 95% CI: 1.19, 1.74), and depressive symptoms (OR=2.35, 95% CI: 2.03, 2.72) were independent risk factors for poor sleep quality (all $P<0.001$). Conversely, middle school education (vs. primary school or below) and low physical activity (<150 min/week) were associated with better sleep quality.

Table 3 presents the detection rates of sleep problems across different PSQI dimensions among older adults. The highest detection rate was observed for total sleep duration at 41.44% (95% CI: 40.01%, 42.87%), followed by sleep onset latency at 35.95% (95% CI: 34.57%, 37.35%) and sleep efficiency at 30.79% (95% CI: 29.46%, 32.14%). The lowest detection rate was for use of sleep medication at 3.89% (95% CI: 3.35%, 4.48%).

Figure 1 displays the detection rates of sleep problems across various dimensions by subgroup.

TABLE 1. Characteristics of participants and prevalence of poor sleep quality among older adults from 6 PLADs of China, 2025.

Subgroup	N	Poor sleep quality % (95% CI)	χ^2	P
Age, years			7.609	0.022
65–74	2,628	46.88 (44.98, 48.79)		
75–84	1,754	49.77 (47.44, 52.11)		
≥85	249	54.62 (48.41, 60.69)		
Sex			55.071	<0.001
Male	1,951	41.98 (39.78, 44.21)		
Female	2,680	53.06 (51.15, 54.96)		
Residence			43.985	<0.001
Urban	1,554	41.51 (39.05, 44.01)		
Rural	3,077	51.87 (50.09, 53.65)		
Education level*			53.395	<0.001
Primary school or below	2,950	52.44 (50.62, 54.26)		
Middle school	1,105	41.45 (38.53, 44.42)		
High school or above	576	40.97 (36.94, 45.12)		
Hypertension			21.308	<0.001
Yes	2,447	51.61 (49.61, 53.61)		
No	2,184	44.78 (42.68, 46.9)		
Diabetes			0.445	0.505
Yes	859	49.48 (46.08, 52.87)		
No	3,772	48.14 (46.54, 49.75)		
COPD			12.15	0.001
Yes	342	57.60 (52.16, 62.87)		
No	4,289	47.66 (46.15, 49.16)		
Chronic digestive system diseases			87.898	<0.001
Yes	721	64.49 (60.86, 67.97)		
No	3,910	45.42 (43.85, 47.00)		
Chronic urinary system diseases			33.201	<0.001
Yes	595	59.50 (55.42, 63.45)		
No	4,036	46.75 (45.21, 48.31)		
Current smoking			23.692	<0.001
Yes	749	40.19 (36.67, 43.81)		
No	3,882	49.97 (48.39, 51.56)		
Drinking			18.081	<0.001
Yes	557	39.86 (35.79, 44.07)		
No	4,074	49.56 (48.01, 51.11)		
Physical activity per week*			2.521	0.284
<150 min	1,666	46.94 (44.52, 49.37)		
150–600 min	1,525	49.70 (47.17, 52.24)		
≥600 min	1,439	48.71 (46.10, 51.33)		
Depression symptom*			191.919	<0.001
No	3,423	42.42 (40.76, 44.10)		
Yes	1,173	65.90 (63.10, 68.60)		
Total	4,631	48.39 (46.95, 49.83)		

Abbreviation: PLADs=provincial-level administrative divisions; CI=confidence interval; COPD=chronic obstructive pulmonary disease.
* 1 case of physical activity information is missing, and 35 cases of depression information are missing.

TABLE 2. Multivariable logistic regression analysis of poor sleep quality in older adults from 6 PLADs of China, 2025.

Subgroup	OR (95% CI)	P
Age, years		
65–74	1	
75–84	1.04 (0.91, 1.18)	0.573
≥85	1.19 (0.90, 1.58)	0.214
Sex		
Male	1	
Female	1.45 (1.26, 1.68)	<0.001
Residence		
Urban	1	
Rural	1.33 (1.16, 1.52)	<0.001
Education level*		
Primary school or below	1	
Middle school	0.83 (0.71, 0.96)	0.015
High school or above	0.87 (0.71, 1.07)	0.181
Hypertension		
No	1	
Yes	1.24 (1.10, 1.40)	<0.001
Diabetes		
No	1	
Yes	0.98 (0.83, 1.15)	0.783
COPD		
No	1	
Yes	1.33 (1.05, 1.69)	0.020
Chronic digestive system diseases		
No	1	
Yes	1.85(1.55, 2.20)	<0.001
Chronic urinary system diseases		
No	1	
Yes	1.44 (1.19, 1.74)	<0.001
Current smoking		
Yes	1	
No	1.14 (0.95, 1.38)	0.159
Drinking		
Yes	1	
No	1.02 (0.83, 1.25)	0.880
Physical activity per week		
150–600 min	1	
<150 min	0.79 (0.68, 0.92)	0.002
≥600 min	0.94 (0.81, 1.09)	0.407
Depression symptom*		
No	1	
Yes	2.35 (2.03, 2.72)	<0.001

Abbreviation: PLADs=provincial-level administrative divisions; OR=odds ratio; CI=confidence interval; COPD=chronic obstructive pulmonary disease.
* 1 case of physical activity information is missing, and 35 cases of depression information are missing.

TABLE 3. Prevalence of multidimensions problem of the PSQI among older adults from 6 PLADs of China, 2025.

Dimension	Mean score (SD)	Sleep problem % (95% CI)
Subjective sleep quality	1.03 (0.76)	23.62 (22.41, 24.87)
Sleep onset latency	1.29 (1.03)	35.95 (34.57, 37.35)
Total sleep duration	1.15 (0.96)	41.44 (40.01, 42.87)
Sleep efficiency	0.85 (1.14)	30.79 (29.46, 32.14)
Sleep disturbances	1.06 (0.53)	15.78 (14.75, 16.87)
Use of sleep medication	0.12 (0.54)	3.89 (3.35, 4.48)
Daytime dysfunction	0.73 (0.90)	18.57 (17.46, 19.72)

Note: A score of ≥2 in any PSQI dimension indicates a problem in that dimension.
Abbreviation: PLADs=provincial-level administrative divisions; CI=confidence interval. SD=standard deviation.
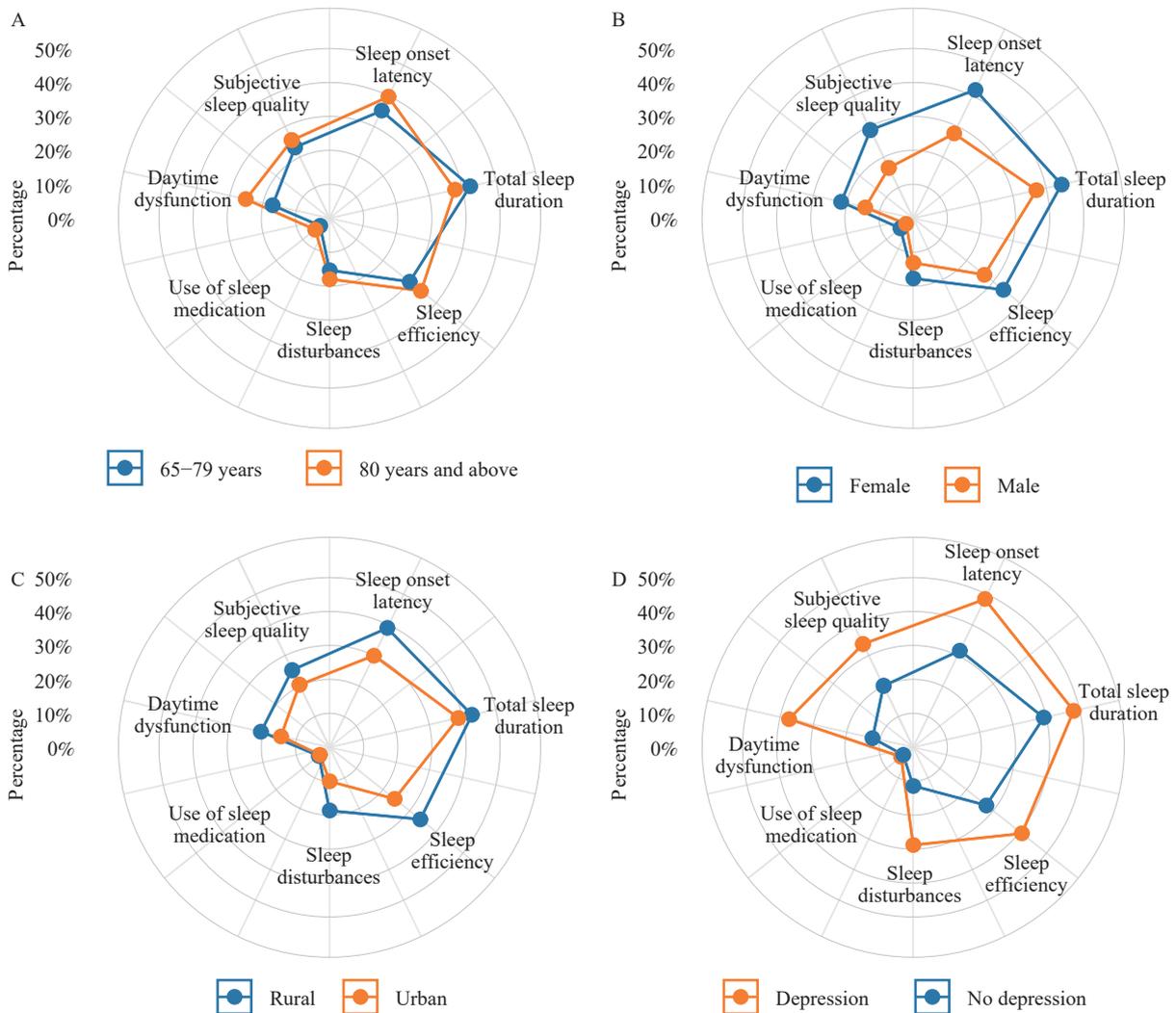
FIGURE 1. Radar chart of multidimensional PSQI assessment. (A) by age; (B) by sex; (C) by residence; (D) by depression status.
Abbreviation: PSQI=Pittsburgh Sleep Quality Index.

Across age, sex, urban–rural residence, and depression status, detection rates for each sleep dimension were consistently higher among females than males, higher in rural than urban areas, and higher among individuals with depressive symptoms than those without. With the exception of total sleep duration,

detection rates for all other sleep problems were higher among adults aged 80 years and above compared with those aged 65–79 years.

DISCUSSION

Sleep disturbances represent a prevalent and multifaceted health concern among older adults, profoundly affecting their overall well-being and daily functioning. Against this backdrop, the present study offers a comprehensive analysis of sleep quality among older adults using validated multidimensional assessments, describing the prevalence and distribution of sleep impairments across subpopulations defined by demographic and health-related characteristics. Our findings revealed that the prevalence of poor sleep quality among older adults was 48.39% (95% *CI*: 46.95%, 49.83%), consistent with the estimated global prevalence of 50.0% (*2*) and substantially higher than the rate of 28.2% reported in younger Chinese populations (*5*). These results underscore the need to integrate sleep problem screening and assessment into national basic public health services and the comprehensive geriatric evaluations conducted by medical institutions, thereby enabling earlier identification and more effective health management.

This study observed marked disparities in sleep quality among subgroups, with particularly poorer outcomes among the oldest-old adults, rural residents, and those with lower educational attainment. These populations may have lower health literacy, fewer adaptive coping strategies, and more limited access to healthcare resources, thereby perpetuating maladaptive sleep hygiene practices and dysfunctional beliefs about sleep (*6*). Female sex was identified as an independent risk factor for poor sleep quality (*OR*=1.45, 95% *CI*: 1.26, 1.68), a finding consistent with survey data from Shanghai (*7*). Sleep problems in women may be influenced by both biological and psychosocial factors (*8*). This study also found that chronic comorbidities — including hypertension, COPD, digestive disorders, and urinary diseases — as well as depressive symptoms adversely affected sleep quality. When developing sleep health promotion plans, particular attention should be directed toward women, rural residents, and populations at high risk for depression. Efforts should focus on disseminating sleep hygiene knowledge, expanding screening programs, improving healthcare accessibility, providing psychosocial support, and actively preventing and managing chronic diseases to improve sleep quality and overall health. Physical

activity is widely recognized as an effective strategy for promoting sleep. However, this study found no evidence that engaging in ≥150 minutes of moderate-to-vigorous physical activity per week conferred better sleep quality compared with being insufficiently active. A meta-analysis demonstrated that moderate-intensity physical activity positively affected sleep quality, whereas high-intensity activity had no significant effect (*9*). Further research is needed to clarify the types and parameters of exercise that benefit sleep among older adults, including duration, intensity, optimal timing, and other relevant factors.

Analysis of individual sleep dimensions revealed that the most common problems involved total sleep duration, sleep onset latency, and sleep efficiency. These patterns were consistent across subgroups, with more pronounced impairments among women, rural residents, and individuals with depression. Additionally, adults aged 80 years and above and those with depressive symptoms experienced greater daytime dysfunction. A study conducted in Shandong found that poor subjective sleep quality, prolonged sleep onset latency, reduced sleep efficiency, sleep disturbances, daytime dysfunction, and the use of hypnotic medications were all associated with depressive symptoms in older adults (*10*). These findings highlight the multidimensional and population-specific nature of sleep problems, which may share a close bidirectional relationship with mental health — particularly depression. Future research should further explore the mechanisms linking various sleep dimensions to physiological and psychological outcomes, thereby providing evidence for the development of targeted intervention strategies.

This study has several limitations. First, the cross-sectional design precludes causal inference regarding the relationship between sleep quality and other factors. Second, the questionnaire-based approach may be subject to recall bias and influenced by subjective reporting. Third, this study did not incorporate objective sleep monitoring measures or additional biological data. Finally, the generalizability of the findings is constrained by the recruitment of participants from only 6 PLADs in China.

In summary, this study highlights the widespread problem of poor sleep quality among older adults and identifies significant associated risk factors, underscoring the need for individualized intervention strategies. These findings provide valuable insights for enhancing quality of life and health management in the aging population. Going forward, strengthening

sleep screening, evaluation, and targeted intervention for relevant risk factors will be essential to improving the effectiveness of comprehensive geriatric health management.

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REFERENCES

1. Souza ÂMND, Fernandes DPDS, Castro IS, Gróla FG, Ribeiro AQ. Sleep quality and duration and frailty in older adults: a systematic review. Front Public Health 2025;13:1539849. https://doi.org/10.3389/fpubh.2025.1539849.
2. Kavousi P, Mali E, Seifhashemi N, Souri M, Pakravan L, Khalili F. Worldwide prevalence of poor sleep quality in older adults: a systematic review and meta-analysis. Iran J Psychiatry 2025;20(2):265 – 80. https://doi.org/10.18502/ijps.v20i2.18207.
3. Yin ZX, Gao X, Zhang XC, Si X, Zhu XL, Ma JX. Prevalence and correlates of healthy aging among elderly aged 65 years and over — 6 PLADs, China, 2019. China CDC Wkly 2021;3(4):69 – 73. https://doi.org/10.46234/ccdcw2021.019.
4. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. Psychiatry Res 1989;28(2):193 – 213. https://doi.org/10.1016/0165-1781(89)90047-4.
5. Chen P, Lam MI, Si TL, Zhang L, Balbuena L, Su ZH, et al. The prevalence of poor sleep quality in the general population in China: a meta-analysis of epidemiological studies. Eur Arch Psychiatry Clin Neurosci 2024;274(7):1 – 14. https://doi.org/10.1007/s00406-024-01764-5.
6. Sella E, Cellini N, Borella E. How elderly people's quality of life relates to their sleep quality and sleep-related beliefs. Behav Sleep Med 2022;20(1):112 – 24. https://doi.org/10.1080/15402002.2021.1895792.
7. Wan Y, Qian XM, Zhang WL, Dong Y, Huang YX, Qin W, et al. Survey and analysis of sleep status among community-dwelling elderly diabetics: a cross-sectional study in Shanghai, China. Glob Health Med 2025;7(6):432 – 8. https://doi.org/10.35772/ghm.2025.01119.
8. Baldi E, Cerolini S, Meneo D, Baglioni C, Palagini L. Insomnia disorder: gender issues over the lifespan. J Sleep Res 2025;34(5):e70110. https://doi.org/10.1111/jsr.70110.
9. Zhao HT, Lu CT, Yi CX. Physical activity and sleep quality association in different populations: a meta-analysis. Int J Environ Res Public Health 2023;20(3):1864. https://doi.org/10.3390/ijerph20031864.
10. Ding R, Liu XY, Ding Y, Leng MM, Yang LJ, Zhang AH. Correlation analysis between sleep quality and depressive symptoms among rural elderly in China: an observational study. World J Psychiatry 2025;15(12):112672. https://doi.org/10.5498/wjp.v15.i12.112672.