



OPEN

Gender-specific link between sleep quality and body composition components: a cross-sectional study on the elderly

Ali Kohanmoo¹, Asma Kazemi², Morteza Zare³ & Masoumeh Akhlaghi^{1✉}

Sleep duration has been associated with overweight/obesity. Since sleep quality and body composition alter during aging, we conducted this study to determine if sleep quality is linked to body composition components in elderly people. This is a cross-sectional study conducted on 305 Iranian community-dwelling elderly aged ≥ 65 years. Sleep quality and body composition components were evaluated using Pittsburgh sleep quality index and bioelectric impedance analysis, respectively. The association of sleep quality and body composition components was examined using linear regression analysis. The prevalence of poor sleep quality and overweight/obesity was 48.9% and 54.4% in men and 77.0% and 79.3% in women, respectively. Women had significantly higher scores in most PSQI items than men, indicating their worse sleep quality compared to men. Women also had significantly higher body mass index (BMI), body fat percentage, and visceral adipose tissue and lower skeletal muscle and fat-free mass percentages than men. In the adjusted regression model, men showed positive associations between the third tertile of poor sleep quality and BMI ($B = 1.35$; 95% CI 0.08–2.61) and waist circumference ($B = 4.14$; 95% CI 0.39–7.89), but they did not demonstrate an association between sleep quality and body composition components. In the adjusted regression model for women, there were positive associations for BMI ($B = 1.21$; 95% CI 0.34–2.07), waist circumference ($B = 2.95$; 95% CI 0.99–4.91), body fat percentage ($B = 2.75$; 95% CI 1.06–4.45), and visceral adipose tissue ($B = 7.80$; 95% CI 1.73–13.87); also there were negative associations for skeletal muscle ($B = -1.40$; 95% CI -2.39 – -0.41) and fat-free mass ($B = -2.76$; 95% CI -4.46 – -1.07) percentages. Except for waist circumference, other variables differed between men and women ($P < 0.001$). Weight management, prevention of muscle wasting, and improvement of sleep quality should be considered in a consortium when designing healthcare strategies for the elderly.

Keywords Elderly, Sleep quality, Body composition, Skeletal muscle, Body fat percentage, Obesity, Gender

Sleep is a critical aspect of the biological life of humankind¹. It is necessary for replenishing the energy and alertness for everyday activities and maintaining homeostasis, metabolism, and proper function of the brain and other organs of the body^{2–4}. Not only sleep quantity, but also its quality has profound effects on our health⁵. Investigations in different parts of the world have shown that sleep deprivation is prevalent even among healthy individuals⁶. Reports show that adults have an average of 6.8 h sleep in weeknights and 7.8 h on weekends; 62% of adults do not feel they are getting enough sleep⁷. Poor or inadequate sleep has been associated with higher risks of cardiovascular diseases, depression, irritability, Alzheimer's disease, fall and bone fractures, and chronic pain³.

The rate of aging is on the rise worldwide, and Iran is no exception. In this country, the speed of aging is one of the fastest in the world and more than 22% of Iranians are predicted to be over 65 years in 2050⁸. Sleep disorders are common among the elderly⁹. Aging is associated with difficulties in falling asleep, staying asleep, and having a deep sleep⁹. Studies in Iran have demonstrated overall poor sleep quality in older adults¹⁰. Therefore, it seems beneficial to assess the sleep status alongside other health-related factors in this population.

¹Department of Community Nutrition, School of Nutrition and Food Sciences, Shiraz University of Medical Sciences, Razi Blvd, Shiraz 7153675541, Iran. ²School of Nutrition and Food Sciences, Nutrition Research Center, Shiraz University of Medical Sciences, Shiraz, Iran. ³Department of Clinical Nutrition, School of Nutrition and Food Sciences, Shiraz University of Medical Sciences, Shiraz, Iran. ✉email: msm.akhlaghi@gmail.com; akhlaghi_m@sums.ac.ir

65. Shochat, T., Shefer-Hilel, G. & Zisberg, A. Relationships between body mass index and sleep quality and duration in adults 70 years and older. *Sleep Health* **2**(4), 266–271. <https://doi.org/10.1016/j.sleh.2016.09.001> (2016).
66. López-García, E. *et al.* Sleep duration, general and abdominal obesity, and weight change among the older adult population of Spain. *Am. J. Clin. Nutr.* **87**(2), 310–316. <https://doi.org/10.1093/ajcn/87.2.310> (2008).
67. Kripke, D. F., Garfinkel, L., Wingard, D. L., Klauber, M. R. & Marler, M. R. Mortality associated with sleep duration and insomnia. *Arch. Gen. Psychiatry* **59**(2), 131–136. <https://doi.org/10.1001/archpsyc.59.2.131> (2002).
68. Fan, Y. *et al.* Gender differences in the association between sleep duration and body mass index, percentage of body fat and visceral fat area among Chinese adults: A cross-sectional study. *BMC Endocr. Disord.* **21**(1), 247. <https://doi.org/10.1186/s12902-021-00913-4> (2021).
69. Buchmann, N. *et al.* Sleep, muscle mass and muscle function in older people. *Dtsch. Arztebl. Int.* **113**(15), 253–260. <https://doi.org/10.3238/arztebl.2016.0253> (2016).
70. Nam, G. E., Han, K., Kim, D. H., Lee, J. H. & Seo, W. H. Sleep duration is associated with body fat and muscle mass and waist-to-height ratio beyond conventional obesity parameters in Korean adolescent boys. *J. Sleep Res.* **26**(4), 444–452. <https://doi.org/10.1111/jsr.12502> (2017).
71. Norton, M. C. *et al.* Is poor sleep associated with obesity in older adults? A narrative review of the literature. *Eat Weight Disord.* **23**(1), 23–38. <https://doi.org/10.1007/s40519-017-0453-2> (2018).
72. Fukuoka, Y. *et al.* Importance of physical evaluation using skeletal muscle mass index and body fat percentage to prevent sarcopenia in elderly Japanese diabetes patients. *J. Diabetes Investig.* **10**(2), 322–330. <https://doi.org/10.1111/jdi.12908> (2019).
73. Falsarella, G. R. *et al.* Body composition as a frailty marker for the elderly community. *Clin. Interv. Aging* **10**, 1661–1666. <https://doi.org/10.2147/CIA.S84632> (2015).

Acknowledgements

Hereby, the authors would like to express their gratitude to the General Welfare Organization for the arrangements needed to collect data in the affiliated senior centers. The authors also sincerely appreciate the hospitality and cooperation of the managers and personnel of Jahandidegan and Soroush elderly centers, Abolfazl Primary Health Care Center, and all the participants of this study. The authors would like to thank the Center for Development of Clinical Research of Nemazee Hospital and Dr. Nasrin Shokrpour for editorial assistance. The results presented were extracted from the thesis written by Mr. Ali Kohanmoo. The project was financially supported by Shiraz University of Medical Sciences, Grant Number 24239.

Author contributions

A. Kohanmoo and M. Akhlaghi contributed to the conception and design of the study, A. Kohanmoo collected data and performed the initial analysis. M. Akhlaghi and M. Zare completed the analysis. A. Kohanmoo and M. Akhlaghi drafted the manuscript. M. Akhlaghi, A. Kazemi, and M. Zare revised the manuscript critically for important intellectual content. All the authors approved the final version of the manuscript.

Competing interests

The authors declare no competing interests.

Additional information

Correspondence and requests for materials should be addressed to M.A.

Reprints and permissions information is available at www.nature.com/reprints.

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2024