Cardiovascular risk in medical students: Is living alone a factor?

Cyrille Jane O. Barrion[1], Christine Gabrielle R. Bien[1], Arian Jaya B. Caballero[1], Julian John L. Cai[1], Jovinian Aji D. De La Cruz[1], Jerahmeel Matthew G. De Leon, Michelle Anne Maree Y. Del Pilar, Francis Charles L. Fernandez[2], MD, Jose Ronilo G. Juangco, MD, MPH[3]

Abstract

Introduction Cardiovascular diseases (CVD) are a leading global health concern. Modifiable behavioral risk factors are increasingly recognized in young adults, especially among medical students who often live independently. This study investigated the association between living alone and modifiable cardiovascular risk factors—sleep quality, sodium intake, physical activity, and body mass index (BMI)—among medical students at UERMMMCI during the 2022-2023 academic year.

Methods Researchers conducted an analytical cross-sectional study among 220 medical students. Validated tools were used: Pittsburgh Sleep Quality Index (PSQI), Scored Sodium Questionnaire, International Physical Activity Questionnaire (IPAQ), and BMI classification. Researchers performed statistical analyses using Chi-square tests and calculated relative risks (RR) with 95% confidence intervals.

Results A significant positive association was found between living alone and poor sleep quality (RR 2.132 p = 0.047). No significant associations were observed between living alone and sodium intake (RR 0.96 p = 0.6868), physical activity (RR 1.18 p = 0.2239), or BMI (RR 1.03 p = 0.7367).

Conclusion Among the studied cardiovascular risk factors, only poor sleep quality was significantly more prevalent among students living alone. These findings highlight the importance of interventions targeting sleep hygiene in this demographic.

Key words: Cardiovascular diseases, risk factors, medical students, sleep quality, dietary, living alone

Cardiovascular diseases (CVDs) encompass disorders of the heart and blood vessels, including hypertension, coronary heart disease, and cerebrovascular disease.[1] These conditions remain the leading cause of premature mortality both globally and in the Philippines.[2-4] Although symptoms often emerge in adulthood, the underlying risk factors typically begin in adolescence. Addressing these risk factors early is crucial.

Many young adults live independently while attending college or working, introducing new lifestyle challenges.[5] Research links social isolation to poorer cardiovascular health outcomes.[6] High-risk behaviors—smoking, excessive sodium consumption, and physical inactivity—are also more common among individuals who live alone.[7]

Correspondence:
Julian John Cai: caij4091@uerm.edu.ph
[1]College of Medicine, University of the East Ramon Magsaysay Memorial Medical Center Inc
[2]Department of Medicine, University of the East Ramon Magsaysay Memorial Medical Center Inc
[3]Department of Preventive and Community Medicine, University of the East Ramon Magsaysay Memorial Medical Center Inc

Modifiable cardiovascular risk factors such as poor diet, inadequate sleep, physical inactivity, and elevated BMI contribute to CVD development.[8] Preventing CVD by determining the prevalence of these modifiable risk factors among individuals who live alone is of importance, as it poses social, economic, and health burden, along with a reduction in their quality of life.[5]

The study sought to determine the association between living alone and the presence of modifiable cardiovascular risk factors among medical students enrolled in UERMMMCI in the school year 2022-2023.

Methods

The UERM Research Institute for Health Sciences Ethics Review Committee approved this analytical cross-sectional study (RIHS ERC Code: 1449/C/2023/021).

Participants

The study included regular first- to third-year medical students at UERMMMCI in 2022-2023. Eligible participants either lived alone or with family. Students who lived with non-family members or shared a space only on weekends were excluded. Researchers used non-probability, convenience sampling by distributing physical questionnaires during class visits.

Sample Size

A preliminary study of 30 participants informed the sample size calculation for comparing two proportions. At 95% confidence, 80% power, and assumed proportions of 0.60 and 0.366, a minimum of 218 participants was required.

Data Collection Tools

Researchers used four standardized tools:

1. Pittsburgh Sleep Quality Index (PSQI): This 19-item tool (plus 5 optional items) assesses sleep quality across 7 components. Its initial evaluation had α=.83 of internal reliability, test-retest reliability for the global scale of 0.85, 89.6% sensitivity, and 86.5% specificity. A global PSQI score >5 indicates poor sleep.[9]
2. Scored Sodium Questionnaire (SSQ): This 34-item tool evaluates sodium intake over the past 6 months. It has an AUC of 0.79, 61.5% sensitivity, and 90.0% specificity. Scores >65 denote high sodium consumption[10,11].
3. International Physical Activity Questionnaire (IPAQ): This self-report tool assesses moderate-to-vigorous physical activity. It has a test-retest reliability of 0.74, criterion validity of 0.41, and concurrent validity of 0.72. Category 1 reflects low activity; Categories 2-3 reflect moderate-to-high activity[12].
4. Body Mass Index (BMI): BMI was computed using self-reported height and weight, classified using Asia-Pacific cut-offs. BMI >23 kg/m^2 was considered above normal[13-15].

Researchers verified the completeness and validity of responses, tallied scores, and used SPSS for statistical analysis.; relative risk (RR) with 95% CI was calculated for association. Chi-square tests assessed for statistical significance.

Results

The demographic characteristics are summarized in Table 1. The final sample included 220 students: 112 lived alone and 108 with family. Among the 220 participants, 63.2% were female, and 84.6% were aged 23-26. First-year students made up the largest proportion (36.8%).

Sleep Quality

Living alone significantly increased the likelihood of poor sleep quality (RR = 2.132, 95% CI: 0.97–4.55, p = 0.0476) (Table 2).

Sodium Intake

Sodium intake did not differ significantly between those living alone and those living with family (RR = 0.9643, p = 0.6868) (Table 3).

Physical Activity

No significant association emerged between living arrangement and physical activity level (RR = 1.181, p = 0.2239) (Table 4).

Body Mass Index

BMI was not significantly associated with living alone (RR = 1.033, p = 0.7367) (Table 5).

Table 1. Demographic characteristics of the participants.

Demographic Factors		UERM Medical Students	
		Frequency	Proportion
Sex	Male	81	36.8
	Female	139	63.2
Age in years	19 – 22	21	9.5
	23 – 26	187	84.6
	27 – 30	10	4.6
	31 – 43	2	1
Year Level	Year 1	133	36.8
	Year 2	50	22.7
	Year 3	37	16.8

Table 2. Analysis on the effect of living alone on sleep quality.

Participants	Poor Sleep Quality	Good Sleep Quality	Relative Risk (95% Confidence Interval)	p-value
Living alone	100	12	2.132	0.0476
Living with family	86	22	0.9733 to 4.558	

Table 3. Analysis on the effect of living alone on sodium intake.

Participants	High Sodium Intake	Low Sodium Intake	Relative Risk (95% Confidence Interval)	p-value
Living alone	76	36	0.9643	0.6868
Living with family	76	32	0.8054 to 1.154	

Table 4. Analysis on the effect of living alone on physical activity.

	Low Physical Activity	Moderate to High Physical Activity	RR (95% Confidence Interval)	p value
Living alone	60	52	1.181	0.2239
Living with family	49	59	0.9038 to 1.553	

Table 5. Analysis on the effect living alone on body mass index (BMI).

	Above normal BMI	Normal BMI	RR (95% Confidence Interval)	p value
Living alone	75	37	1.033	0.7367
Living with family	70	38	0.8529 to 1.255	

Discussion

Sleep Quality and Living Alone

Among the cardiovascular risk factors, only sleep quality showed a significant association with living alone. Those living independently were over twice as likely to report poor sleep. Disrupted sleep may result from environmental factors—noisy dorms, irregular routines, or lack of emotional support.[16] An outcome-based recommendation by the National Sleep Foundation, a nonprofit organization based in the United States dedicated to improving health and well-being through sleep education and advocacy states that the appropriate amount of sleep duration for an adult is 7-9 hours.[17] Filipinos had one of the highest rates of sleep deprivation in Asia: national data show 46% of Filipinos report insufficient sleep, and 32% sleep less than six hours per night.[18] International and local studies among medical students also highlight prevalent poor sleep, but they seldom consider living arrangements.[19-21] Inadequate sleep duration—typically defined as fewer than 6 hours or more than 9 hours per night—has been consistently associated with an elevated risk of adverse cardiovascular outcomes, including hypertension and coronary heart disease. This association follows a U-shaped pattern, wherein both short and long sleep durations are linked to increased cardiovascular morbidity and mortality.[22-24] Among university students, particularly those living alone, irregular sleep patterns and poor sleep hygiene may be compounded by academic stress, social isolation, and lack of structured routines, further increasing their vulnerability to cardiovascular risk. Therefore, targeted interventions that promote healthy sleep behaviors, stress reduction techniques, and awareness of the health consequences of sleep deprivation may serve as important strategies in mitigating cardiovascular disease (CVD) risk in this population.

Sodium Intake and Living Arrangement

No statistically significant difference in sodium intake was observed between students based on their living arrangements. This finding suggests that individual dietary choices may play a more influential role in sodium consumption than residential status alone. Factors such as personal food preferences, cooking habits, cultural influences, and exposure to processed foods likely contribute to this variability. Additionally, disparities in affordability and access to healthy, low-sodium food options—particularly among students with limited financial resources—further complicate the ability to draw direct associations between living arrangement and sodium intake.[25-26] These results highlight the need for broader nutritional interventions that account for individual behavior and structural barriers to healthy eating.

Physical Activity and Living Alone

Contrary to previous studies, living alone was not associated with lower levels of physical activity among students.[27] Factors such as access to exercise facilities, digital fitness platforms, and peer influence may play a more significant role than living arrangement in shaping physical activity habits.[28]

Body Mass Index and Living Alone

Living alone did not significantly affect BMI. Although some literature links independent living to higher obesity risk; it has been suggested that poor lifestyle behaviors such as eating salty or sugary food and low physical activity have been associated with increasing BMI particularly among university students who are living alone.[25,29] In contrast, another study revealed that, although the BMI of university students increased from the start to the end of the same school year, the students living with their parents/relatives reported a greater increase in BMI.[30] The present findings align with literature suggesting other factors—diet, activity, stress—play larger roles.

Limitations

This study has several limitations. The use of self-reported data introduces the potential for recall and response bias. Additionally, non-modifiable cardiovascular risk factors such as family history and pre-existing medical conditions were not assessed. The use of convenience sampling further limits the generalizability of the findings to the broader student population.

Conclusion

Among the assessed modifiable cardiovascular risk factors, only poor sleep quality was significantly more

common in students living alone. No differences were found in sodium intake, physical activity, or BMI.

Recommendations

Institutions should promote proper sleep hygiene and stress management strategies, particularly for students living independently. Future research should include longitudinal data and account for non-modifiable risk factors.

References

1. Teo KK, Rafiq T. Cardiovascular risk factors and prevention: a perspective from developing countries. Can J Cardiol 2021 May;37(5):733-43. doi: 10.1016/j.cjca.2021.02.009.
2. Philippine Statistics Authority. 2022 causes of deaths in the Philippines (preliminary as of 31 July 2022) [Internet] Quezon City: PSA; 2022 Oct 1 [cited 2022 Nov 16]. Available from: https://psa.gov.ph/content/2022-causes-deaths-philippines-preliminary-31-july-2023
3. Philippine Statistics Authority. Causes of deaths in the Philippines (preliminary): January to December 2021 [Internet] Quezon City: PSA; 2022 Mar 29 [cited 2022 Nov 16]. Available from: https://psa.gov.ph/content/causes-deaths-philippines-preliminary-january-december-2021
4. Philippine Statistics Authority. Causes of deaths in the Philippines (preliminary): January to December 2020 [Internet] Quezon City: PSA; 2021 Mar 16 [cited 2022 Nov 16]. Available from: https://psa.gov.ph/content/causes-deaths-philippines-preliminary-january-december-2020-0
5. Choi SE, Lee Y. Comparison of meal skipping, snacking, and body weight perceptions among urban college students: on-campus living alone vs. off-campus living with parents in New York, USA. J Korean Soc Food Cult [Internet] 2022 Apr 30 [cited 2022 Nov 16];37(2):109-118. Available from: https://doi.org/10.7318/KJFC/2022.37.2.109
6. Udell JA, Steg PG, Scirica BM, et al. Living alone and cardiovascular risk in outpatients at risk of or with atherothrombosis. Arch Intern Med [Internet] 2012 Jul 23 [cited 2022 Nov 16];172(14):1086. Available from: https://doi.org/10.1001/archinternmed.2012.2782
7. Seungmin J, Sung IC. Effects of living alone versus with others and of housemate type on smoking, drinking, dietary habits, and physical activity among elderly people. Epidemiol Health [Internet] 2017 [cited 2022 Nov 16];39. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5675988/
8. Raeside R, Partridge S, Singleton A, Redfern J. Cardiovascular disease prevention in adolescents: eHealth, co-creation, and advocacy. Med Sci [Internet] 2019 [cited 2022 Nov 16];7:34. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6410225/
9. Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh sleep quality index: a new instrument for psychiatric practice and research. Psychiatr Res 1989 May;28(2):193-213. doi: 10.1016/0165-1781(89)90047-4. 10. Faghri PD, Blozie E, Gustavesen S, Kotejoshyer R. The role of tailored consultation following health-risk appraisals in employees' health behavior. J Occup Environ Med 2008 Dec;50(12):1378-85. doi: 10.1097/JOM.0b013e3181862471.
11. Mason B, Ross L, Gill E, Healy H, Juffs P, Kark A. Development and validation of a dietary screening tool for high sodium consumption in Australian renal patients. J Ren Nutr 2014 Mar;24(2):123-34.e1-3. doi: 10.1053/j.jrn.2013.10.004.
12. Craig CL, Marshall AL, Sjostrom M, Bauman AE, Booth ML, Ainsworth BE, et al. International physical activity questionnaire: 12-country reliability and validity. Med Sci Sports Exerc 2003 Aug;35(8):1381-95. doi: 10.1249/01.MSS.0000078924.61453.FB.
13. World Health Organization. The Asia-Pacific perspective: redefining obesity and its treatment [Internet]. Geneva: WHO; 1970 [cited 2022 Nov 24]. Available from: https://apps.who.int/iris/handle/10665/206936
14. Pagsisihan D, Sandoval MA, Paz-Pacheco E, Jimeno C. Low indices of overweight and obesity are associated with cardiometabolic diseases among adult Filipinos in a rural community. 2016 Sep 7; e-ISSN 2308-1.
15. Jih J, Mukherjea A, Vittinghoff E, Nguyen TT, Tsoh JY, Fukuoka Y, et al. Using appropriate body mass index cut points for overweight and obesity among Asian Americans. Prev Med 2014 Aug;65:1-6. doi: 10.1016/j.ypmed.2014.04.010.
16. Dockery AH. Examining sleep and sleep hygiene in a sample of college students and differences between on and off-campus housing [Internet] [thesis]. Murfreesboro (TN): Middle Tennessee State University; 2022 [cited 2022 Nov 16]. Available from: https://jewlscholar.mtsu.edu/handle/mtsu/6701
17. Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, DonCarlos L, et al. National Sleep Foundation's sleep time duration recommendations: methodology and results summary. Sleep Health 2015 Mar;1(1):40-3. doi: 10.1016/j.sleh.2014.12.010.
18. Adlawan ZA. Sleep deprivations [Internet]. Zamboanga City: National Nutritional Council; 2021 [cited 2022 Nov 16]. Available from: https://nnc.gov.ph/regional-offices/mindanao/region-ix-zamboanga-peninsula/5846-sleep-deprivations-health-effects-on-people-s-lives
19. Paudel K, Adhikari TB, Khanal P, Bhatta R, Paudel R, Bhusal S, et al. Sleep quality and its correlates among undergraduate medical students in Nepal: a cross-sectional study. PLoS Glob Public Health 2022 Feb 18;2(2):e0000012. doi: 10.1371/journal.pgph.0000012.
20. Sundas N, Ghimire S, Bhusal S, Pandey R, Rana K, Dixit H. Sleep quality among medical students of a tertiary care hospital: a descriptive cross-sectional study. J Nepal Med Assoc 2020 Feb;58(222):76-9. doi: 10.31729/jnma.4813.

21. Nagai M, Hoshide S, Kario K. Sleep duration as a risk factor for cardiovascular disease: a review of the recent literature. Curr Cardiol Rev 2010 Feb;6(1):54-61. doi: 10.2174/157340310790231635.
22. Covassin N, Singh P. Sleep duration and cardiovascular disease risk: epidemiologic and experimental evidence. Sleep Med Clin 2016 Mar;11(1):81-9. doi: 10.1016/j.jsmc.2015.10.007.
23. Lao XQ, Liu X, Deng HB, Chan TC, Ho KF, Wang F, et al. Sleep quality, sleep duration, and the risk of coronary heart disease: a prospective cohort study with 60,586 adults. J Clin Sleep Med 2018 Jan 15;14(1):109-17. doi: 10.5664/jcsm.6894.
24. Sharma M, Sawhney JP, Panda S. Sleep quality and duration - potentially modifiable risk factors for coronary artery disease? Indian Heart J 2014 Nov-Dec;66(6):565-8. doi: 10.1016/j.ihj.2014.10.412.
25. Haghighian Roudsari A, Vedadhir A, Amiri P, Kalantari N, Omidvar N, Eini-Zinab H, et al. Psycho-socio-cultural determinants of food choice: a qualitative study on adults in social and cultural context of Iran. Iran J Psychiatr 2017 Oct;12(4):241-50.
26. Hanna KL, Collins PF. Relationship between living alone and food and nutrient intake. Nutr Rev 2015 Sep;73(9):594-611. doi: 10.1093/nutrit/nuv024.
27. Diehl K, Hilger J. Physical activity and the transition from school to university: a cross-sectional survey among university students in Germany. Sci Sports 2016;31(3):223-6.
28. Reed JA, Phillips DA. Relationships between physical activity and the proximity of exercise facilities and home exercise equipment used by undergraduate university students. J Am Coll Health 2005 May-Jun;53(6):285-90. doi: 10.3200/JACH.53.6.285-290.
29. Yamamoto R, Shinzawa M, Yoshimura R, Taneike M, Nakanishi K, Nishida M, et al. Living alone and prediction of weight gain and overweight/obesity in university students: a retrospective cohort study. J Am Coll Health 2023 Jul;71(5):1417-26. doi: 10.1080/07448481.2021.1927052.
30. Vinuela A, Criado-Alvarez JJ, Aceituno-Gomez J, Durantez-Fernandez C, Martin-Conty JL, Martin-Rodriguez F, et al. How relevant is the place where first-year college students live in relation to the increase in body mass index? Healthcare (Basel). 2021 Nov 26;9(12):1638. doi: 10.3390/healthcare9121638.