Level of cardiovascular risk associated with sleep quality in adults in the Calera community, in Cotacachi, Ecuador

ADRIANA EDIT MINIET-CASTILLO, LENIN STEPHANO VACA-BRAVO, GRACE ANDREA HUACA-GUEVARA, CARMEN PACHECO-QUINTANA • IBARRA (ECUADOR)

DOI: https://doi.org/10.36104/amc.2024.3124

Abstract

Introduction: sleep quality is related to the risk of cardiovascular disease, which makes it a public health problem worldwide and, consequently, a substantial burden for healthcare systems and the economy.

Objective: to associate the level of cardiovascular risk (CVR) and sleep quality in 40-74-year-old adults in the Calera community, Cotacachi, between August and December 2023.

Methods: this cross-sectional, observational study applied non-probabilistic convenience sampling, considering inclusion and exclusion criteria. The enrolled population consisted of 40-74-year-old adults in the Calera community. Cardiovascular risk was assessed using Globorisk-1, and sleep quality using PSQI; since these were categorical variables, the Chi square test was applied.

Results: there was a predominance of females. As far as the level of CVR, 54.7 and 45.3% of the population had moderate and high cardiovascular risk, respectively. The sleep quality assessment reported that between 43.1 and 19.7% required medical care and treatment, while 37.02% did not have sleep problems. The relationship showed that 32.8 and 29.9% of those with moderate and high CVR had sleep disorders, and 21.9 and 15.3% of those with moderate and high CVR, respectively, did not have sleep disorders. The p value of 0.05 was used, and the result of the relationship reported a p value greater than 0.05 (0.460), so the null hypothesis was accepted. The level of cardiovascular risk is not significantly associated with sleep quality in adults in the Calera community, Cotacachi, Ecuador.

Conclusions: although there is a distinctive proportion of people with sleep disorders in the moderate and high cardiovascular risk groups, the global analysis showed no statistically significant relationship between these variables. **(Acta Med Colomb 2024; 49. DOI: https://doi.org/10.36104/amc.2024.3124).**

Keywords. *Cardiovascular risk, sleep quality.*

Dra. Adriana Edit Miniet-Castillo,: Especialista en Medicina General Integral; Lenin Stephano Vaca-Bravo: Interno rotativo de Medicina; MSc. Grace Andrea Huaca-Guevara: Gerencia y Liderazgo Institucional; Dra. Carmen Pacheco-Quintana: PhD, Especialista Medicina General Integral. **Universidad Técnica del Norte.** Ibarra (Ecuador).
Correspondencia: Dra. Adriana Edit Miniet-Castillo. Ibarra (Ecuador).
E-Mail: aeminiet@utn.edu.ec
Recibido: 06/II/2024 Aceptado: 04/VII/2024

Introduction

Cardiovascular health problems associated with poor sleep quality represent a significant burden for healthcare systems and the economy in general. Lack of sleep can increase the prevalence of cardiovascular diseases, leading to higher healthcare costs (1, 2).

Cardiovascular risk refers to the likelihood of developing heart and blood vessel disease due to factors like hypertension, hypercholesterolemia, obesity, smoking and diabetes. This risk is reduced by controlling the risk factors and adopting a healthy lifestyle (3, 4). The cardiovascular risk level (CVRL) is defined as the likelihood of experiencing a cardiovascular event over a period of 5 to 10 years, and its variability from one country to another is due to genetic and environmental factors (3). Various predictive models, like HEARTS and Framingham, are used to stratify cardiovascular risk. In Latin America, the Globorisk model has proven to be useful and provides solid evidence for evaluating cardiovascular risk (5, 6).

Sleep quality refers to the level of rest and recovery it provides. Good sleep quality is essential for physical and mental wellbeing, affecting people's cognitive function, mood and general health (7). It is achieved through adequate sleep in terms of quantity, efficiency and a feeling of restfulness on awakening, maintaining a regular sleep routine and adopting healthy habits before sleep (8).

In the context of cardiovascular diseases, which represent a significant burden in terms of morbidity and mortality worldwide, there is growing evidence suggesting a relationship between sleep quality and cardiovascular risk (1, 2).

Previous studies have indicated that sleep quality can affect the onset and progression of cardiovascular conditions, opening an area of interest for more detailed exploration and understanding (7, 9).

Given the above, the main objective of this study was to associate the level of cardiovascular risk with sleep quality in 40-74-year-old adults in the Calera community, through a cross-sectional, nonexperimental study. The data obtained will contribute to the design of specific interventions and the development of public health policies and strategies to reduce cardiovascular risk and improve the quality of life of the inhabitants. The feasibility of this study was based on the availability of adequate time, human resources and financial resources, as well as easy access to the study community. These factors allowed the study to be conducted more efficiently, ensuring data collection and effective analysis.

Materials and method

Type of study

This study adopted an observational, analytical-relational, cross-sectional design with a quantitative approach.

Population

The study population included adults between the ages of 40 and 74 in the community of Calera, Cotacachi, with no history of cardiovascular diseases such as acute myocardial infarction, stroke, sleep disorders or cognitive deficits that might interfere with the responses to the study questionnaire.

Procedure

Informed consent was obtained from the participants prior to data collection, ensuring that they understood the study procedures and their implications. Permission was also requested from the Calera authorities, respecting the established norms and guidelines. Data collection was done using two instruments: the Pittsburgh Sleep Quality Index (PSQI) and the Globorisk-1 calculator to estimate cardiovascular risk, both of which have been validated (10, 11). These instruments were applied to the study participants in the Calera community.

Survey segment

Age, classified according to the adult age groups established by WHO, was recorded by asking participants to provide their date of birth. The participants' sex was recorded by asking if they were male or female, and smoking was evaluated using a direct question.

As far as the Pittsburgh scale, a standardized questionnaire was used to evaluate sleep quality. The sum of its components provides a total score that ranges from 0 to 21 points, with a score less than 5 labeled "No sleep problems," between 5 and 7 "Warrants medical attention," 8 to 14 "Warrants medical attention and treatment" and 15 or more "A serious sleep problem" (10). The variables of <5 *"no sleep disorder" and* ≥ 5 "sleep disorder" were used to establish a dichotomy and enable the use of Chi square.

Procedural segment

Blood pressure was measured using a mercury sphygmomanometer and stethoscope, following the procedure recommended in the clinical practice guidelines. Height was measured with a stadiometer and weight was measured with a calibrated scale.

Data analysis

Data was collected using the Microsoft Excel 18.0, 2021 platform. Then, the data was processed using the specialized SPSS software, applying the Chi square test with a 95% confidence interval and a level of significance set at $p \leq 0.05$ to associate the variables, as well as descriptive statistics and percentages. The results are presented in descriptive graphs that show the findings clearly and concisely.

Ethical considerations

This study took into account the various ethical and legal considerations like the Declaration of Helsinki, the Ecuadorian Constitution of 2008, and the Organic Health Law. One of the fundamental aspects is respect for the autonomy of the participants, who provided written informed consent prior to being enrolled in the study. The confidentiality of the information collected was established, protecting participants' privacy and ensuring that only the investigators had access to the data obtained.

Results

This study is based on an evaluation of the relationship between cardiovascular risk and sleep quality in 137 adults between the ages of 40-74 in the Calera community. To achieve this, the cardiovascular risk level was evaluated using Globorisk-1, and the quality of sleep was evaluated using the PSQI.

In Figure 1, the demographic distribution of the adults revealed interesting dynamics. The 40-60-year-old group had homogenous groups with 47.9% men and 52.1% women, highlighting gender equality in the intermediate age group. However, there was a marked difference in the over 60 age group, as women accounted for 58.5%, surpassing the men who made up 41.5%. Overall, most of the adult population belonged to the 40-60-year-old group (70.1%); there was also a slight majority of women, representing 54.0%.

Figure 2 shows the level of cardiovascular risk, evaluated using the Globorisk-1 scale. Out of a total of 137 people, 54.7% were found to have moderate cardiovascular risk (75 individuals), and 45.3% of the population, amounting to 62 people, had high cardiovascular risk. These results indicated that more than half of the community had moderate cardiovascular risk and a considerable, though smaller, proportion was classified as high risk.

For the sleep quality assessment, Figure 3 presents the results of the PSQI, classifying the results in four categories. Notably, 51 people (37.2% of the population) had no

problems with sleep, which is a positive indicator for overall health. In descending order, 43.1% of the community had a potential need for medical attention, followed by 19.7% who required both medical attention and treatment to deal with their sleep problems. It is encouraging to note that no serious sleep problems were recorded.

Figure 4 shows the relationship between the level of cardiovascular risk and sleep quality in 137 people. Among those with moderate cardiovascular risk, 32.8% had sleep disorders and 21.9% did not report any. On the other hand, in the high cardiovascular risk group, 29.9% of the people had sleep disorders, compared to 15.3% who did not. Overall, 62.8% of the study subjects with moderate and high cardiovascular risk had sleep disorders. Based on this data, the Chi-square test, with a 95% confidence level, concluded that there is no statistically significant relationship between the level of cardiovascular risk and sleep quality, with a p = 0.460 (greater than 0.05).

Discussion

The majority of the adult population in Calera was 40 to 60 years old, and there was a slight female predominance. Although this difference is modest, it underscores the demographic diversity in this community. A distinctive point is that the proportion of men and women in the intermediate age group was homogenous, while there was a predominance of women among those over the age of 60. Comparing our results with the study by Oscar H. Del Brutto in Atahualpa, another rural Ecuadorian community, there were notable differences and similarities in the demographic dynamics. Regarding the gender distribution, there was a slight majority of women (54%), highlighting the local demographic diversity. In Atahualpa, there was also an even distribution, with the same percentage of women. However, in Calera, women over the age of 60 significantly outnumbered the men (58.5% versus 41.5%), suggesting greater female longevity, while no marked difference was found in this age group in Atahualpa. This coincides with the article published by Dr. Ermelinda Escudero, in which women made up 60.5% of the total sample (12, 13). According to the Instituto Nacional de Estadística y Censos (INEC) [National Institute of Statistics and Censuses], there is a higher male population in Cotacachi, which differs from the findings in Calera (14). These demographic differences emphasize the importance of considering the unique characteristics of each site when designing healthcare strategies, using personalized approaches in planning specific policies and programs for each region.

Comparing our findings with a study in a family medicine unit in Mexico that also used Globorisk, we found notable similarities. In Calera, 54.7% had moderate risk,

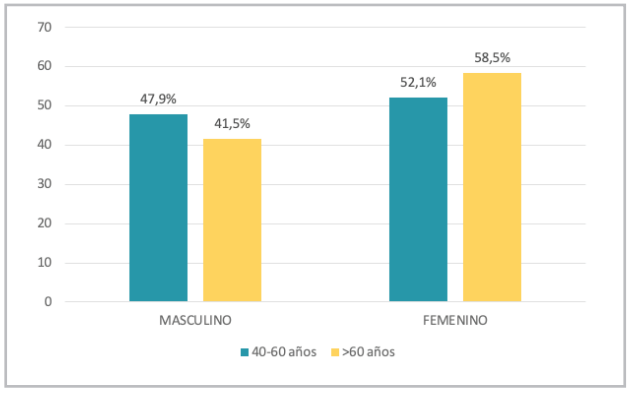

Figure 1. *Adults in the Calera community, by age and sex.*

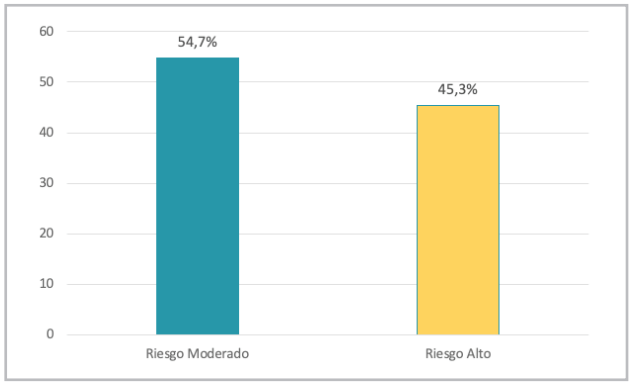

Figure 2. *Level of cardiovascular risk of adults in the Calera community, according to Globorisk-1.*

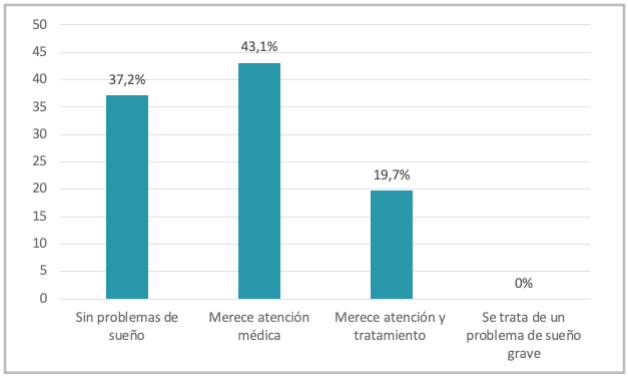

Figure 3. *Sleep quality of adults in the Calera community, according to the PSQI.*

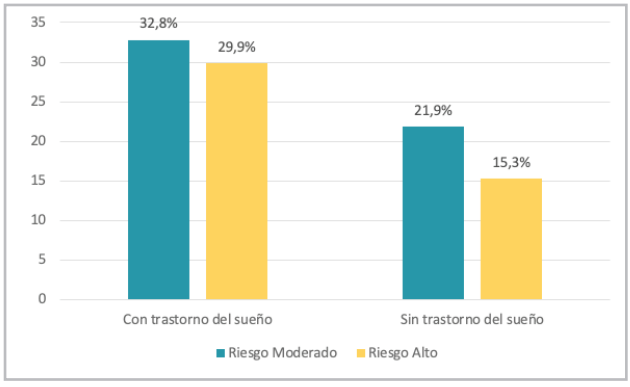

Figure 4. *Level of cardiovascular risk associated with sleep quality (no statistically significant relationship, p = 0.460).*

while in the Mexican study, moderate risk predominated in both men and women, with 47% and 56.5%, respectively. These similarities highlight the consistent cardiovascular risk trends between two geographically distinct areas, and the prevalence of moderate risk emerges as a common concern, with more than 50% of the population in both locations (15). According to Che Muhammad Nur Hidayat Che Nawi, the 10-year risk of fatal cerebrovascular event (CVE) was 29.3%, the combined 10-year risk of fatal and nonfatal cardiovascular disease was 73.0%, and the combined 10-year risk of fatal plus nonfatal CVE was 72.0%. These results are slightly different from our study's findings, noting that the CVR was estimated with different instruments (16).

In addition, a study in various African countries using the predetermined risk thresholds for low, moderate and high 10-year CVE risk, predicted the highest proportion of people with high or moderate risk using the Framingham desktop calculator, followed by the Globorisk calculator. This, in addition to coinciding with the results found in Calera, underscores the importance of implementing healthcare intervention and management strategies with early detection for preventative measures aimed at improving cardiovascular health. The Globorisk calculator emerges as an effective tool in different contexts, offering valuable information for designing interventions adapted to each site (17).

As far as sleep quality, a comparison of the overall results of the PSQI with those of a previous study of students at Universidad Técnica de Ambato showed that 43.1% of the population in Calera had a potential need for medical attention, while 69.8% of the university students warranted medical attention and treatment (18). Likewise, in their study of medical students, Handskhay Nieto showed that 100% of the participants had a deficient sleep quality (according to the PSQI), with no significant difference found between the sexes (19). Another study in Guayaquil, also looking at university students, found poor sleep quality in 68.7%, with a mean PSQI score of 7.2 ± 3.1 (20).

These discrepancies can be attributed to various factors, such as the different settings, lifestyles, and levels of stress between a rural community and university students, making it essential to consider these variables when interpreting the results. The findings highlight the importance of addressing sleep quality in the community, especially among those who indicate the need for medical attention and treatment.

This study determined that there is no statistically significant association between quality of sleep and CVRL ($p = 0.460$). In contrast, the findings of Adriana Monserrat Baeza-Martínez's study in adults in Calera, whose objectives included evaluating whether sleep quality was a risk factor for ischemic heart disease (also using the Chi-square test), underscored that patients who had poor sleep quality had a six times greater risk of ischemic heart disease than those who did not, emphasizing that sleep quality did have a statistically significant link with ischemic heart disease (21).

Comparing our results with the study by Andréa Bornhausen et al. in Brazil, who evaluated sleep quality in 43 volunteers with a clinical diagnosis of coronary artery disease (CAD), we found both similarities and differences. In Bornhausen's study, 60.47% of the participants were classified as having poor sleep quality, while in Calera, the percentage of people with moderate and high cardiovascular risk who had sleep disorders was 62.8%. These figures suggest a possible relationship between cardiovascular risk and sleep disorders, highlighting the importance of considering both aspects in clinical care. However, it is relevant to point out that our study focused on a population with no history of cardiovascular disease and evaluated their current level of risk, while Bornhausen's study focused specifically on individuals with CAD. These different target populations could explain some discrepancies in the results, although both studies suggest that sleep quality and cardiovascular risk are interrelated (22).

Other differences were found in the results published by Huang Tianyi et al., who studied irregular sleep and cardiovascular events. They concluded that the length of sleep and an irregular sleep schedule could be new CVE risk factors, independent of the traditional CVE risk factors and the quantity and/or quality of sleep. These findings coincide with the study titled "The Association of the Duration and Quality of Sleep with Subclinical Atherosclerosis," in which a very short duration of sleep was independently associated with a higher atherosclerotic burden, measured via three-dimensional vascular ultrasound, and therefore shorter sleep times and fragmented sleep were associated with a higher risk of subclinical atherosclerosis in multiple territories (23, 24).

Understanding these specific associations, derived from this statistical analysis, is essential for guiding future studies and intervention strategies focused on the complex relationship between CVRL and sleep quality.

Conclusion

An exploration of the association between the level of cardiovascular risk and sleep quality in adults 40-74 years old in the community of Calera revealed that, while there was a distinct proportion of people with sleep disorders in the moderate and high cardiovascular risk groups, the overall analysis showed no statistically significant relationship between these variables.

Recommendations

The results indicated a lack of statistical association; however, given the substantial proportion of people with cardiovascular risk who also have sleep disorders, we recommend implementing comprehensive health programs that address both aspects in the Calera population. Simultaneous care for cardiovascular risk factors and sleep problems may

offer a more holistic approach to improve cardiovascular health and overall wellbeing in the community.

References

1. **Fundación Española del Corazón**. ¿Cómo influye el sueño en tu salud cardiovascular? *Impulso Vital Blog*. 2019 [accedido 18 enero 2024]. Disponible en: https://fundaciondelcorazon.com/blog-impulso-vital/3337-como-influye-el-sueno-en-tu-salud-cardiovascular.html.
2. **Fundación Española del Corazón**. ¿Cuánto cuesta un enfermo cardiovascular? *Impulso Vital Blog*. 2019 [accedido 18 enero 2024]. Disponible en: https://fundaciondelcorazon.com/blog-impulso-vital/2208-cuanto-cuesta-enfermo-cardiovascular.html.
3. **The Texas Heart Institute.** Factores de riesgo cardiovascular. 2017. [accedido 18 enero 2024]. Disponible en: https://www.texasheart.org/heart-health/heart-information-center/topics/factores-de-riesgo-cardiovascular/.
4. **Vargas JE, Vásquez SM, Villar JC, Herrera VM.** Relación entre los atributos del sueño y el cambio en la presión arterial. Análisis de la cohorte CHICA-MOCHA. Rev Colomb Cardiol 2019;26:198–204. https://doi.org/10.1016/j.rccar.2018.09.005.
5. **Organización Mundial de la Salud.** Enfermedades cardiovasculares. *WHO*. 2021. [accedido 18 enero 2024]. Disponible en: https://www.who.int/es/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds).
6. **Carrillo-Larco RM, Stern D, Hambleton IR, Lotufo P, Di Cesare M, Hennis A, et al.** Derivation, internal validation, and recalibration of a cardiovascular risk score for Latin America and the Caribbean (Globorisk-LAC): A pooled analysis of cohort studies. *Lancet*. 2022;9:100258. doi: https://doi.org/10.1016/j.lana.2022.100258.
7. **Carrillo-Mora P, Barajas-Martínez KG, Sánchez-Vázquez I, et al.** Trastornos del sueño: ¿qué son y cuáles son sus consecuencias? *Rev Fac Med UNAM*. 2018;61(1):6-20. Disponible en: https://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=76904
8. **CDC.** Dormir bien. *CDC.gov*. [accedido 18 enero 2024]. Disponible en: https://www.cdc.gov/spanish/cancer/survivors/healthy-living-guides/physical-health/sleep.htm#:~:text=Aseg%C3%BArese%20de%20que%20su%20habitaci%C3%B3n,y%20alcohol%20antes%20de%20acostarse.
9. **Muñoz-Pareja M, Loch MR, Dos Santos HG, Sakay Bortoletto MS, Durán González A, Maffei de Andrade S.** Factores asociados a mala calidad de sueño en población brasilera a partir de los 40 años de edad: estudio VIGICARDIO. *Revista Chilena de Nutrición*. 2016;30(6):444-50. doi: https://doi.org/10.1016/j.gaceta.2016.04.011.
10. **YL Solis, Robles Y, Agüero Y.** Validación del índice de calidad de sueño de Pittsburgh en una muestra peruana. *Anales de Salud Mental*. 2015. Disponible en: https://openjournal.insm.gob.pe/revistasm/asm/article/view/91
11. **Gulayin P, Danaei G, Gutierrez L, Poggio R, Ponzo J, Lanas F, et al.** Validación externa de ecuaciones d riesgo cardiovascular en el Cono Sur de Latinoamérica: ¿Cuál predice mejor? *Revista Argentina de Cardiología*. 2018;86:14-9. Disponible en: https://www.redalyc.org/journal/3053/305362535004/html/.
12. **Del Brutto OH, Mera RM, Recalde BY, Rumbea DA, Sedler MJ.** Life's simple 7 and all-cause mortality. A population-based prospective cohort study in middle-aged and older adults of Amerindian ancestry living in rural Ecuador. *Prev Med Rep*. 2022;25:101668. doi: https://doi.org/10.1016/j.pmedr.2021.101668.
13. **Escudero E, Muñoz V, de la Cruz Claure M, Aprili L, Valda E.** Prevalencia del edentulismo parcial y total, su impacto en la calidad de vida de la población de 15 a 85 años de Sucre. *Revista de Ciencia, Tecnología e Innovación*. 2020; 18(21). Disponible en: https://revistas.usfx.bo/index.php/rcti/article/view/370.
14. **INEC.** Resultados de censo 2010 de la población y vivienda en Ecuador. *Ecuadorencifras*. 2010. [accedido 18 enero 2024]. Disponible en: https://www.ecuadorencifras.gob.ec/wp-content/descargas/Manu-lateral/Resultados-provinciales/imbabura.pdf.
15. **García-Jiménez Y, Soto-Ávila DA, Palacios-Tapia A, García-Morales G.** Estimación del riesgo cardiovascular con herramienta Globorisk en una Unidad de Medicina Familiar. *Atención Familiar*. 2023;24:212–8. doi: https://doi.org/10.22201/fm.14058871p.2023.3.85782.
16. **Che Nawi CM, Omar MA, Keegan T, Yu Y-P, Musa KI.** The ten-year risk prediction for cardiovascular disease for Malaysian adults using the laboratory-based and office-based (Globorisk) prediction model. *Medicina (Kaunas)*. 2022;58:656. doi: https://doi.org/10.3390/medicina58050656.
17. **Wagner RG, Crowther NJ, Micklesfield LK, Boua PR, Nonterah EA, Mashinya F, et al.** Estimating the burden of cardiovascular risk in community dwellers over 40 years old in South Africa, Kenya, Burkina Faso and Ghana. *BMJ Glob Health*. 2021;6:e003499. doi: https://doi.org/10.1136/bmjgh-2020-003499.
18. **Miniguano DF, Fiallos TJ.** Calidad de sueño y somnolencia en estudiantes universitarios de la Carrera de Enfermería de la Universidad Técnica de Ambato. *Revista de salud, ciencia y tecnología*. 2022; 2:80. doi: 10.56294/saludcyt202280.
19. **Nieto H.** Calidad del sueño en estudiantes de la carrera de medicina de quinto semestre de una universidad oficial de Panamá. *Revista Científica de la Universidad Especializada de las Américas (REDES)*. 2022;1(14).
20. **Zúñiga-Vera A, Coronel-Coronel M, Naranjo-Salazar C, Vaca-Maridueña R.** Correlación Entre Calidad de Sueño y Calidad de Vida en Estudiantes de Medicina. *Revista Ecuatoriana de Neurología*. 2021;30:77–80. doi: https://doi.org/10.46997/revecuatneurol30100077.
21. **Baeza-Martínez AM, Arias-Narcia JJ, Chávez-Flores A.** Nivel de estrés, calidad de sueño, ansiedad y depresión como factores de riesgo de cardiopatía isquémica en el Hospital Central Militar. *Revista de Sanidad Militar*. 2021;75. doi: https://doi.org/10.56443/rsm.v75i1.56.
22. **Bornhausen A, Giacchini RM, Iara S.** Calidad subjetiva del sueño en cardiopatía isquémica crónica. *Insuficiencia Cardíaca*. 2018;13:118-24.
23. **Huang T, Mariani S, Redline S.** Sleep irregularity and risk of cardiovascular events. *J Am Coll Cardiol*. 2020;75:991-9. doi: https://doi.org/10.1016/j.jacc.2019.12.054.
24. **Domínguez F, Fuster V, Fernández-Alvira JM, Fernández-Friera L, López-Melgar B, Blanco-Rojo R, et al.** Association of sleep duration and quality with subclinical atherosclerosis. *J Am Coll Cardiol*. 2019;73:134–44. doi: https://doi.org/10.1016/j.jacc.2018.10.060.

Pregunta Dione

Comparing our findings with a study in a family medicine unit in Mexico that also used Globorisk, we found notable similarities. In Calera, 54.7% had moderate risk, while in the Mexican study, moderate risk predominated in both men and women, with 47% and 56.5%, respectively. These similarities highlight the consistent cardiovascular risk trends between two geographically distinct areas, and the prevalence of moderate risk emerges as a common concern, with more than 50% of the population in both locations (15). According to Che Muhammad Nur Hidayat Che Nawi, the 10-year risk of fatal CVD was 29.3%, the combined 10-year risk of fatal and nonfatal cardiovascular disease was 73.0%, and the combined 10-year risk of fatal plus nonfatal CVD was 72.0%. These results are slightly different from our study's findings, noting that the CVR was estimated with different instruments (16).

In addition, a study in various African countries using the predetermined risk thresholds for low, moderate and high 10-year CVD risk, predicted the highest proportion of people with high or moderate risk using the Framingham desktop calculator, followed by the Globorisk calculator. This, in addition to coinciding with the results found in Calera, underscores the importance of implementing healthcare intervention and management strategies with early detection for preventative measures aimed at improving cardiovascular health. The Globorisk calculator emerges as an effective tool in different contexts, offering valuable

Dionne Line 20/2/25 17:15
Comentario [1]: Estas dos categorías parecieran referirse a lo mismo, solo que con porcentajes ligeramente diferente. Favor verificar que no haya duplicación.