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RELATIONSHIP OF CARDIOVASCULAR RISK WITH DIET QUALITY AND SLEEP QUALITY IN THE NIGHTTIME WORKING POPULATION. 2024

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Abstract: The number of workers working regular night shifts is increasing both in Costa Rica and internationally. However, the vulnerability and necessary adaptations are not sufficient due to the lack of information on the safety and risks for this population, which prevents timely intervention and protective measures for their health. To contribute to the solution of this problem, this research relates the quality of the diet, understood as the fulfillment of the basic principles of sufficiency, variety, balance, safety, completeness and adequacy in the food consumed by the population; the quality of sleep, that is, if the adequate state of relaxation is achieved in a period of time and the cardiovascular risk. These variables are important in the prevention, development or evolution of the consequences that this day can bring to the working population. **Methods:** Quantitative, correlational, cross-sectional, cross-sectional research in workers of ordinary night shifts between 18 and 65 years of age who have worked this shift for more than one month in San José, Costa Rica. Abdominal circumference was recorded as a method to establish cardiovascular risk and a questionnaire with the Pittsburgh Test and the Global Food Quality Index was applied to evaluate sleep quality and diet quality, respectively. **Results:** The population under study presented poor sleep quality, with 88.5% being classified as workers with sleep problems. Likewise, 95.9% of the population had a diet quality categorized as unhealthy or requiring changes. As for cardiovascular risk, 44.8% presented an increased or substantially increased risk. **Conclusion:** A relationship between diet quality and sleep quality is revealed. Likewise, an association between sleep quality and cardiovascular risk is identified with a significance level of 0.10.

INTRODUCTION

In recent decades, there has been an increase in the number of workers working night shifts, especially in industrialized countries, which represents a risk to their occupational health (Nogareda, sf.). Several studies have shown that night work affects the health of workers, increasing the probability of imbalances in glycemia, triglycerides and cholesterol levels, especially due to the high consumption of sodium, sugars, saturated fats and carbohydrates, and due to the imbalance in workers' sleep. A study conducted by Rigaud et al. (2022), in emergency health personnel of a university hospital located in Colombia, indicates that night work can cause imbalances in glycemia, triglycerides and cholesterol due to a deficient diet and poor sleep.

On the other hand, research conducted in Panama and Ecuador evidenced the association between poor sleep quality and a higher consumption of fats and carbohydrates, which increased the risk of developing overweight, obesity and metabolic syndrome (Herrera et al., 2021; Altamirano Valladares & Pacheco Quintana, 2022).

Likewise, in Argentina, a 2020 study revealed that 77% of the study population suffered from sleep disturbances, which resulted in a lower consumption of healthy foods. This translated into a greater tendency to overweight, obesity and increased cardiovascular risk since both BMI and abdominal circumference measurements exceeded the healthy limit ranges (Martinez, 2020).

Similarly, in Guanajato, Mexico, it was established that the majority of night workers presented a greater tendency of body mass indexes (BMI) and abdominal circumference outside the ranges determined as healthy (Cano Labrada, 2022).

In Costa Rica, 15% of the labor force works night shifts, representing 225,000 salaried workers (Instituto Nacional de Estadísticas y

Censos, 2022). Although this figure is considerable, not enough studies have been done to address their current situation.

In 2013, an investigation was carried out in hospitals of the Costa Rican Social Security Fund (Caja Costarricense del Seguro Social). Its results show that the most frequent diseases are gastritis, obesity, arterial hypertension and diabetes mellitus, most of which were diagnosed in personnel working at night, except for arterial hypertension. It should be noted that, in general, these diseases were developed by the type of food consumption of the population, especially by the time of intake, the quality of food they usually consume and the quality of sleep they have (Barahona et al., 2013) (Barahona et al., 2013).

Another national study focused on the relationship between sleep quality, eating habits and dietary practices of airline pilots in Alajuela. However, the results indicate that there is no statistical significance between the three variables (Vargas Villegas, 2022).

Given this scenario, the aim of this study was to relate cardiovascular risk to diet quality and sleep quality in a population of night shift workers in San José, Costa Rica.

METHODOLOGY

For this research, a sample of 96 people between the ages of 18 and 65, whose place of work is located in the province of San José, Costa Rica, was used. The participants are part of a branch of workers that constitute the health sector, security and telephone service centers characterized by offering services 24 hours a day, 7 days a week. The data collection is carried out from May 25 to June 07, 2024, which constitute the taking of anthropometric measurements corresponding to abdominal circumference. In addition, a survey is applied with the data collected through the Pittsburgh Test that assesses the quality of sleep and the Global Food Quality Index that assesses the quality of the diet.

The Chi-square test was used for the comparison, with a significance level of $P=0.10$, so that if the value is less than 0.10 it is said that there is no relationship, on the contrary, if it is greater there is a relationship between the variables.

RESULTS AND DISCUSSION

After recording the population data, we were able to establish the final results on diet quality, sleep quality and cardiovascular risk, which are detailed below:

DIET QUALITY

To classify diet quality according to the Global Food Quality Index, a score is assigned to each of the responses obtained in each of the categories that make up the index. Once the score has been assigned in each of the healthy and unhealthy food categories, the points must be added up. The final result classifies the diet in the following ranges: from 90 to 120 points, the diet is considered healthy; 60 to 89 points, it needs changes and below 60, it is classified as unhealthy eating (Morales & Flores, 2019).

From this information, it can be established that 52.1% of the population is categorized as a population that needs changes in their diet because their score was established within the range of 60 - 89 points. A 43.8% of the population are categorized as unhealthy diet because their score was below 60 points, while 4.1% reach a healthy diet quality with a score of 90 or more points.

SLEEP QUALITY

With respect to sleep quality, the Pittsburgh Test, a 19-question questionnaire that assigns a specific score to each answer, is used. When the score is obtained for each question, the results are added up and classified as follows: less than five points indicates sleep problems; between five and seven, medical attention is recommended; between eight and 14, medical

attention and treatment is required; greater than or equal to 15 indicates a serious sleep problem (Cajas, 2023).

With this information, we were able to determine that 44.8% of the participants deserve medical attention and medical treatment, because their score was between eight and 14 points. This was followed by the category “Deserves medical attention” which covers 22.9% of the participants with a final score between five and seven points. And the categories of “serious sleep problems” and “no sleep problems” with percentages of 20.8% and 11.5% respectively.

CARDIOVASCULAR RISK

In relation to the cardiovascular risk presented by the population, this was determined by taking the abdominal circumference and based on the gender of each of the participants.

With regard to the female gender, it was determined that, of the 28 participating women, 42.9% did not present a cardiovascular risk, given that their abdominal circumference was less than 80 cm; 35.7% presented a substantially increased risk, with an abdominal measurement of more than 80 cm but less than 88 cm; and 21.4% presented an increased risk.

On the other hand, 60.3% of the male population did not present a cardiovascular risk, since their measurement was below 94 cm. Followed by 25% of the total population had an increased risk, since their measurement was between 94 and 102 cm, and 14.7% had a substantially increased risk.

DIET QUALITY ACCORDING TO SLEEP QUALITY

When the relationship between the variables diet quality and sleep quality is analyzed, it can be inferred that there is a significant relationship between them.

According to Table 1, it can be determined that the quality of the diet shows a clear tendency to worsen as the quality of sleep deteriorates. In the group deserving medical attention, 6.3% of people have an unhealthy diet and 13.5% of people require changes. In those needing medical attention and treatment, 17.7% of people have an unhealthy diet and 26% of people require changes.

Finally, in the group with severe sleep problems, 13.5% of people have an unhealthy diet and 7.3% of people require changes. This suggests a strong correlation between poor sleep quality and poor diet.

Variable	Chi-square statistic	P-value	Interpretation
Diet quality	12.00	0.045	There is a relationship

Table 2. Relationship between diet quality and quality of in the nighttime working population.

San José Costa Rica 2024

Source: Own elaboration, 2024

This finding affirms with a significance level of 0.10 that better sleep quality may be associated with better diet quality. This finding underscores the importance of considering diet in turn as a potential factor in interventions designed to improve sleep quality in the population studied.

On the one hand, the data found are different from those of the study conducted in Costa Rica by Rojas, with nursing staff of a class A hospital performing night shifts, where 97.1% of this population presented sleep problems, 55.9% a diet quality categorized as “requires changes” and 17.64% an “unhealthy” diet, and no statistically significant relationship was found between the variables. Rojas describes this lack of relationship as an uncommon discrepancy, and highlights the need for further interventions to address common challenges that nursing staff may present (Rojas Gomez et al., 2023). The results found in the present research deepen the topic, making further inquiries.

Sleep quality	Diet quality					
	Unhealthy	%	Requires changes	%	Healthy	%
No sleep problems	6	6.3%	5	5.2%	0	0.00%
Deserves medical attention	6	6.3%	13	13.5%	3	3.1%
Deserves medical attention and treatment	17	17.7%	25	26%	1	1%
Severe sleep problems	13	13.5%	7	7.3%	0	0.00%

Table 1. Diet quality according to sleep quality according to the Pittsburgh test , in the working night shift population. San José Costa Rica 2024

Source: Own elaboration, 2024

The results obtained are in sync with a study of nurses in Lebanon, where night shifts were associated with poor dietary quality. The data show that the participants, in general, did not meet the minimum specifications for foods essential for the body's functioning, such as vegetables and fruits, and that they preferred to consume food groups considered unhealthy (cakes, cookies, sweets, sugary drinks and fried foods). In addition, they also presented disorders with meal times due to the changes in schedules resulting from their night shift, which aggravated their diet quality as they decreased the number of complete meals and substituted for snacks high in sugar and fat (Samhat et al., 2020).

Similarly, a relationship between the two variables is observed in the study conducted by Chauca, where it is determined that 65.8% of the population had sleep problems and in turn needed changes in their diet because this population, like the current one, had a lower consumption of fruits and vegetables and a higher consumption of fats, which were associated with poor sleep efficiency and sensitivity to awakenings (Chauca Toapanta, 2023) .

Complementary to Chauca's study, Cano found that participants with good sleep quality in his study consumed less fat and more fruit servings, suggesting that sleep contributes to better dietary decisions (Cano Labrada, 2022).

In a similar way, there is coincidence with a population of women participating in the Go Red (American Heart Association's American movement), where it was identified that poor sleep quality was associated with a higher food intake, key factor in weight gain among the participants. They also presented inadequate food intake, with a greater tendency to consume foods high in saturated fat, which increases the risk of developing cardiovascular disease (Zuraikat et al., 2020).

It should be noted that, in addition, this type of diet seems to create a negative cycle, since it has been shown that the consumption of calorie-dense foods, such as fats, as well as those rich in high-glycemic carbohydrates such as sugar, also affect the quality of sleep since it interferes with the duration of the hours of sleep (López Malque et al., 2023) .

In addition to these cardiovascular risks previously mentioned, the effects of a poor diet are also attributed to diseases such as anemia, overweight and obesity, type II diabetes and cancer. It also contributes to the deterioration of muscles, skin health, bones and teeth due to lack of nutrients. To this is added the weakness of the immune system and a greater susceptibility to infections, which conditions the life of the population (Ramos Ferreras, 2022)

Cardiovascular risk	Sleep quality							
	No sleep problems	%	Deserves medical attention	%	Deserves medical attention and treatment	%	Severe sleep problems	%
Healthy	4	4.2%	10	10.4%	31	32.3%	8	8.3%
Increased risk	6	6.3%	9	9.4%	3	3.1%	5	5.2%
Substantially increased risk	1	1%	3	3.1%	9	9.4%	7	7.3%

Table 3. Cardiovascular Risk according to Abdominal Circumference and Sleep Quality in the Night Worker Population. San José Costa Rica 2024

Source: Own elaboration, 2024

Variable	Chi-square statistic	P-value	Interpretation
Cardiovascular Risk	19.466	0.004	There is a relationship

Table 4. Relationship between cardiovascular risk and sleep quality

Source: Own elaboration, 2024

CARDIOVASCULAR RISK ACCORDING TO SLEEP QUALITY

A statistically significant relationship was found between cardiovascular risk **and** sleep quality.

In the group with a healthy cardiovascular risk, 32.3% of people were found to be in the category deserving medical attention and treatment, suggesting that, despite having a low cardiovascular risk, a significant number of people experience sleep problems that require medical intervention. Only 4.2% of people in this group have no sleep problems, while 10.4% warrant medical attention and 8.3% have severe sleep problems.

For those with an increased cardiovascular risk, a more equal distribution is observed. It is noted that 9.4% of people merit medical attention and that 6.3% selections have no sleep problems. This indicates that, although there is a moderate distribution in all categories of sleep quality, there is a notable number of people with increased cardiovascular risk without sleep problems.

In the group with substantially increased cardiovascular risk, the data indicate that 9.4% of the individuals merit medical attention and treatment, and 7.3% have severe

sleep problems. This trend suggests a strong association between very high cardiovascular risk and poorer sleep quality, evidenced by a greater number of individuals requiring medical treatment and those with severe sleep problems.

In summary, the table reveals that as cardiovascular risk increases, sleep quality also worsens. People with substantially increased cardiovascular risk are more likely to need medical attention and treatment for sleep problems, whereas those with a healthy risk also experience significant sleep problems, especially in the category of medically necessary treatment. This suggests a complex interaction between cardiovascular risk and sleep quality, indicating the need for integrated interventions that address both aspects of health.

The results found coincided with a population of teachers in Ecuador where it was found that 55% of the population presented a cardiovascular risk above the normal range, and in turn presented a quality of sleep classified as poor sleep quality, which were directly associated with the imbalance of calories presented by this study population (Chauca Toapanta, 2023) .

On the other hand, a study conducted in Panama on firefighters also highlights a population where 99% of those studied had a poor quality of sleep, of which 84.3% had a high cardiovascular risk when their abdominal circumference was known, which increased their occupational risks since it has been shown that abdominal obesity plus the constant contact with smoke during fires decreases the respiratory capacity of workers (Worrel et al., 2024) .

Likewise, the same trend was found in the study by López Malque, where the quality of sleep was positively related to cardiovascular risk and this relationship was attributed to dietary habits. Abdominal circumference, in this case, indirectly reflected the quality of eating habits. These findings are consistent with evidence supporting that fruits, vegetables, whole grains and nuts play an important role in reducing abdominal obesity due to their high water and fiber content (López Malque et al., 2023) .

It is important to note that, in addition to overall sleep quality, the number of hours of rest, accumulated years and frequency of night work should also be considered in relation to cardiovascular risk. A study of safety agents, where sleep hours were compared instead of sleep quality managed to also define relationship between subjects with abdominal obesity, overweight and obesity in relation to sleep hours (Herrera et al., 2021).

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The same was replicated in Chauca's study, where the causes were attributed to the fact that the reduction of sleep hours can generate hormonal changes. It has been evidenced that non-compliance plays an important role in the energy balance since it is responsible for the hormonal secretion of leptin, which corresponds to the appetite suppressor hormone, which directly influences the regulation of food intake (Chauca Toapanta, 2023) .

Likewise, as mentioned above, it is important to take into account the accumulation of years and days worked in a night shift because Samhat found that abdominal circumference increased even more when the worker had a greater accumulation of both (Samhat et al., 2020). This is worrying because the worldwide disposition assigns cardiovascular diseases as the first cause of death (World Health Organization, 2024) .

CONCLUSIONS

When diet quality and cardiovascular risk were related to sleep quality in adults with nighttime working hours, San Jose, 2024, with a significance level of 0.10, it was found that they are related; as sleep quality decreases, diet quality worsens, and cardiovascular risk increases.

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