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Dietary Habits, Physical Activity, and Sleep Quality in COVID-19 Patients in Primary Care Centers

Hábitos alimentarios, actividad física y calidad de sueño en pacientes con covid-19 en centros de atención primaria

Ruth M. Ticona-Chino[1], Eric Torres-Cruzate[1], Liset Z. Sairitupa-Sanchez[2] ✉, Mardel Morales-García[2] ✉, Alcides Flores-Paredes[3], Wilter C. Morales García[4] ✉

[1]Escuela de Nutrición Humana, Facultad de Ciencias de la Salud, Universidad Peruana Unión. Lima, Perú.
[2]Universidad Peruana Unión. Lima, Perú.
[3]Escuela Profesional de Educación Física, Universidad Nacional del Altiplano Puno. Perú.
[4]Dirección General de Investigación, Universidad Peruana Unión. Lima, Perú.

ABSTRACT

Introduction: since its emergence in December 2019, the COVID-19 pandemic, triggered by SARS-CoV-2, has posed an unprecedented global challenge, deeply affecting public health and various aspects of daily life. The primary objective of this study was to explore how lifestyle factors impact the recovery and overall well-being of patients, highlighting the need to integrate improvement strategies into treatment and recovery plans.
Method: we adopted a quantitative descriptive cross-sectional design, selecting a non-probabilistic sample of convenience comprising 345 adults diagnosed with COVID-19. Participants, aged between 18 and 60 years, were evenly distributed across highland and coastal regions. We used questionnaires to assess eating habits, physical activity (using the IPAQ), and sleep quality (using the Pittsburgh Sleep Quality Index).
Results: it was found that 52,8 % of participants had inadequate eating habits, while 94,2 % exhibited low physical activity. Additionally, 60,9 % of subjects reported poor sleep quality. No statistically significant relationship was found between eating habits and physical activity (p > 0,234), nor between these factors and sleep quality (p > 0,169).
Conclusions: the research reveals a concerning trend towards inadequate eating habits and low levels of physical activity among COVID-19 patients, which, combined with poor sleep quality, could compromise their recovery and quality of life.

Keywords: COVID-19; Dietary Habits; Physical Activity; Sleep Quality.

RESUMEN

Introducción: la pandemia de COVID-19, desencadenada por el SARS-CoV-2 desde diciembre de 2019, ha emergido como un desafío global sin precedentes, afectando profundamente la salud pública y diversos aspectos de la vida cotidiana. El objetivo principal fue explorar cómo estos factores de estilo de vida influyen en la recuperación y bienestar general de los pacientes, enfatizando la necesidad de integrar estrategias de mejora en los planes de tratamiento y recuperación.
Método: adoptamos un diseño transversal descriptivo cuantitativo, seleccionando una muestra no probabilística por conveniencia de 345 adultos diagnosticados con COVID-19. Los participantes, con edades comprendidas entre 18 y 60 años, se distribuyeron equitativamente entre las regiones de la sierra y la costa. Utilizamos cuestionarios para evaluar los hábitos alimentarios, la actividad física (mediante el IPAQ) y la calidad del sueño (mediante el índice de calidad de sueño de Pittsburgh).

Resultados: se identificó que el 52,8 % de los participantes presentaban hábitos alimentarios inadecuados, mientras que un 94,2 % mostraba una baja actividad física. Además, el 60,9 % de los sujetos informó de una mala calidad de sueño. No se encontró una relación estadísticamente significativa entre los hábitos alimentarios y la actividad física (p > 0,234), ni entre estos factores y la calidad de sueño (p > 0,169).
Conclusiones: la investigación revela una tendencia preocupante hacia la adopción de hábitos alimentarios inadecuados y niveles bajos de actividad física entre los pacientes con COVID-19, lo cual, combinado con una mala calidad de sueño, podría comprometer su recuperación y calidad de vida.

Palabras clave: Covid-19; Hábitos Alimentarios; Actividad Física; Calidad de Sueño.

INTRODUCTION

The COVID-19 pandemic, caused by SARS-CoV-2, has been an unparalleled global challenge, significantly impacting both public health and various aspects of daily life since December 2019. This health crisis has underscored the importance of lifestyle factors, particularly eating habits, physical activity, and sleep quality, in the recovery process of affected patients. Scientific literature has shown that a proper diet can strengthen the immune system, reducing the risk of infectious diseases like COVID-19 (Calder et al., 2020), while regular physical activity improves immune function and reduces the incidence of respiratory infections (Simpson et al., 2015). Moreover, sleep quality plays a crucial role in the efficiency of the immune system and overall health (Besedovsky et al., 2019).

During the pandemic, a significant decline in physical activity was observed, mainly due to mobility restrictions, the closure of sports facilities, and an increase in remote work, negatively affecting mental health, increasing the risk of chronic diseases, and complicating the recovery from COVID-19 (Jiménez-Pavón et al., 2020). Concurrently, a deterioration in sleep quality was reported, with an increase in insomnia prevalence and disruptions in sleep patterns (Voitsidis et al., 2020), as well as changes in eating habits, affecting the body's resilience to the virus (Nieman & Wentz, 2019).

This study focuses on exploring the interrelation between these three pillars of a healthy lifestyle in COVID-19 patients treated in primary care centers. The goal is to provide insights into how these factors can influence the recovery and general well-being of patients, underlining the importance of integrating strategies for healthy eating, promoting physical activity, and improving sleep quality into treatment and recovery plans (Pilotto et al., 2020). Additionally, it contextualizes the pandemic's magnitude, highlighting the number of people affected globally and the specific consequences in regions like Latin America and the Caribbean, as well as the particular situation in Peru, reflecting the relevance and urgency of addressing these aspects to combat the effects of COVID-19 (CEPAL & OPS, 2021; Huarcaya et al., 2022).

Before the pandemic, Peru was already facing significant public health challenges. The National Institute of Health (INS) report in 2019 revealed that a shocking 70 % of adults, both men and women, were overweight or obese. This situation was exacerbated by unhealthy dietary patterns characterized by high consumption of ultra-processed foods and fried items, along with excessive salt intake and insufficient fiber consumption (Araque et al., 2020). Additionally, factors such as stress and anxiety, as well as excessive use of electronic devices, were identified as causes of sleep disorders in various populations. The pandemic has further complicated the situation, with government-imposed restrictions severely limiting daily and physical activities, fostering sedentarism, and altering eating patterns and sleep quality, affecting both the emotional and physical aspects of the population. Physical inactivity, for example, became more prevalent among women and in the age group of 41 to 60 years, highlighting the relationship between physical activity, stress management, and mental well-being during the pandemic (Rico-Gallegos, Carina et al., 2020). Sleep quality, a critical component for adequate quality of life, has also been negatively impacted by factors such as social isolation and stress. Recent research indicates that a large proportion of adults evaluated during the pandemic exhibited poor sleep quality, raising significant concerns about the general well-being of the affected population. Interestingly, studies focused on specific populations, like students, suggest that while COVID-19 itself did not directly alter sleep patterns, the associated pandemic factors, such as increased academic workload, did. Moreover, it has been documented that stress can disrupt the body's homeostasis, increasing the risk of sleep disorders and exacerbating pre-existing conditions, especially in women and individuals with comorbidities (Gualano et al., 2020; Lujan, 2020).

In this context, the COVID-19 pandemic has highlighted and exacerbated pre-existing challenges related to eating habits, physical activity, and sleep quality in Peru, revealing the imperative need for comprehensive approaches that promote healthy lifestyles. These findings underscore the importance of organizing information about COVID-19 diagnosed patients in relation to their eating habits, physical activity, and sleep quality, thereby allowing an understanding of the effects in relation to the variables. Therefore, the research aimed to determine the relationship between eating habits, physical activity, and sleep quality in COVID-19 patients in primary care centers.

METHOD
Design and Participants
A quantitative, descriptive approach was utilized, employing a cross-sectional design for the study. For the sample selection, a non-probabilistic convenience sampling method was used, resulting in a diverse representation of participants. The research focused on a population of 345 adults, ranging in age from 18 to 60 years, who were diagnosed with COVID-19 and received care at two specific health centers. In terms of age distribution, the largest segment, accounting for 39,1 %, fell within the 29 to 39-year-old range, indicating a predominance of individuals in this age group. Moreover, the study featured a majority of female participants, who made up 73,9 % of the sample, highlighting a significant female participation. Regarding the regional origin of the participants, a balanced distribution was observed, with 47 % coming from the highlands and 46,7 % from the coastal areas, reflecting an almost uniform representation of these two geographical regions. On the other hand, the most common marital status among participants was cohabiting, comprising 45,8 % of the sample. As for the educational level, more than half of the participants, specifically 53 %, reported having completed secondary education, thus providing a general overview of the educational profile of the studied population (table 1).

Table 1. Demographic Characteristics of the Study Population			
		N	%
Age Group	18 - 28 years	91	26,4
	29 - 39 years	135	39,1
	40 - 50 years	73	21,2
	51 - 60 years	46	13,3
Gender	Male	90	26,1
	Female	255	73,9
Region of Origin	Coast	161	46,7
	Highlands	162	47,0
	Jungle	22	6,4
Marital Status	Single	105	30,4
	Married	67	19,4
	Divorced	11	3,2
	Widowed	4	1,2
	Cohabiting	158	45,8
Level of Education	Primary	39	11,3
	Secondary	183	53,0
	Technical	70	20,3
	Higher	53	15,4

Procedure
Initially, approval was obtained from the ethics committee of the Peruvian Union University, under code CEUPeU-006. Data collection was conducted from November 2021 to July 2022, following the requisite authorization from the involved health centers. This phase of the study included requesting patients' phone numbers diagnosed with COVID-19, which facilitated direct communication and subsequent survey administration. Notably, the surveys were conducted on the health centers' premises, where participants were duly informed about the informed consent process, and it was indicated that each survey would last approximately 5 minutes. It's important to emphasize that throughout this study, the bioethical principles set forth in the Declaration of Helsinki (2013) were rigorously followed.

Instruments
Demographic Characteristics Registration Form
The collection of demographic data was carried out through a registration form designed to capture essential information about participants' age, sex, place of origin, marital status, and educational level. This demographic information allows for comparative analysis and a better understanding of the context and needs of the studied population.

Dietary Habits Questionnaire

Based on the recommendations from the dietary guidelines relevant to overweight and obesity in the Mexican and Peruvian populations (Chávez & Moreno, 2015; Lázaro & César, 2019), this 16-item questionnaire investigated the consumption frequency of different food groups (such as meats, dairy, legumes, cereals, tubers, fruits, and vegetables), the recommended portions, and certain eating habits. This approach allowed for assessing adherence to a balanced diet and its relationship with health during the pandemic (Cruz & Sánchez, 2011).

Physical Activity Questionnaire

Physical activity was assessed using the International Physical Activity Questionnaire (IPAQ), a tool developed in Geneva for global use in adults aged 18 to 65 years. This questionnaire, validated by an international consortium of researchers, measures physical activity in three dimensions: intensity (classified as light, moderate, or vigorous), frequency (days per week), and duration (minutes or hours per day). The short version of the IPAQ, with a reliability of 0,65, was used to facilitate its implementation and analysis. Moderate activity is defined as that which increases respiratory rate, heart rate, and sweating for at least 10 continuous minutes, while vigorous activity increases these variables to a greater extent during the same time period (Mantilla & Gómez-Conesa, 2007).

Sleep Quality Questionnaire

For sleep quality, an instrument adapted and validated in Metropolitan Lima and Callao in 2016, based on the work of Buyss et al. (1989) with a reliability level of 0,56, was used. This questionnaire covers 19 items distributed across seven dimensions, including subjective sleep quality, sleep latency, sleep duration, usual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. Items are answered using a Likert scale from 0 to 4, and the total score ranges from 0 to 21, where a score lower than 5 indicates good sleep quality and a score of 15 or more suggests serious sleep problems (Romero, 2021).

Analysis

The analysis was conducted through descriptive analysis, which included the use of frequency tables, both absolute and relative, to detail the demographic characteristics of the sample. In addition, cross tables were used to elucidate the relationship between the investigated variables. For the recording and organization of the collected data, Microsoft Excel version 2019 was chosen, a tool that facilitates the manipulation and preliminary analysis of large data sets. This preliminary step was essential to ensure that the data were well organized and ready for more complex analyses.

A deep statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS), version 27. Within this environment, the Pearson Chi-square test, a key statistical tool for assessing the relationship between categorical variables, was applied.

RESULTS

Characteristics of Eating Habits, Physical Activity, and Sleep Quality

Table 2 shows that 52,8 % of participants have inadequate eating habits. Similarly, regarding physical activity, 94,2 % exhibited a high percentage of low activity levels. However, only 4,6 % engage in high or intense activity. As for sleep quality, 60,9 % reported poor sleep quality.

Table 2. Characteristics of Eating Habits, Physical Activity, and Sleep Quality		n	%
Eating Habits	Inadequate	182	52,8
	Adequate	163	47,2
Physical Activity	Low	325	94,2
	Moderate	4	1,2
	High	16	4,6
Sleep Quality	Poor	210	60,9
	Good	135	39,1

Demographic Characteristics Related to Eating Habits, Physical Activity, and Sleep Quality

Table 3 indicates that individuals aged 29 to 39 years show the highest incidence of inadequate eating habits, accounting for 47,4 %, of which 51,4 % are female, showing a higher prevalence. In terms of regional origin, the coast reports 56,5 %. It's worth mentioning that the cohabiting group presents 48,7 % with inadequate habits, and concerning educational level, secondary education accounts for 49,7 %.

Regarding the age group of 29 to 39 years, 94,8 % have low physical activity, of which 96,1 % are women, showing a higher incidence. Additionally, the highlands, compared to other regions, were predominant with 95,1 %, while cohabitants had 98,1 %, and as for the level of education, secondary level stands out with 95,1 %. Similarly, it was observed that in the age group of 29 to 39 years, 63,7 % of respondents reported poor sleep quality, in the same way, 61,2 % were female, the coast with 66,5 %, cohabitants showed 64,6 %, and regarding secondary education level, 59 % have poor sleep quality. Only gender shows a statistically significant relationship.

Table 3. Demographic Characteristics Related to Eating Habits, Physical Activity, and Sleep Quality in COVID-19 Patients			Eating Habits		Total	p valor
			inadequate	adequate		
Age Group	18 - 28 years	n	52	39	91	2,927
		%	57,1 %	42,9 %	100,0 %	
	29 - 39 years	n	64	71	135	
		%	47,4 %	52,6 %	100,0 %	
	40 - 50 years	n	42	31	73	
		%	57,5 %	42,5 %	100,0 %	
	51 - 60 years	n	24	22	46	
		%	52,2 %	47,8 %	100,0 %	
Total %		n	182	163	345	
		52,8 %	47,2 %	100,0 %	100,0 %	
Gender	Male	n	51	39	90	0,748
		%	56,7 %	43,3 %	100,0 %	
	Female	n	131	124	255	
		%	51,4 %	48,6 %	100,0 %	
Total %		n	182	163	345	
		52,8 %	47,2 %	100,0 %	100,0 %	
Region of Origin	Coast	n	91	70	161	1,723
		%	56,5 %	43,5 %	100,0 %	
	Highlands	n	80	82	162	
		%	49,4 %	50,6 %	100,0 %	
	Jungle	n	11	11	22	
		%	50,0 %	50,0 %	100,0 %	
Total %		n	182	163	345	
		52,8 %	47,2 %	100,0 %	100,0 %	
Marital Status	Single	n	61	44	105	6,661
		%	58,1 %	41,9 %	100,0 %	
	Married	n	33	34	67	
		%	49,3 %	50,7 %	100,0 %	
	Divorced	n	7	4	11	
		%	63,6 %	36,4 %	100,0 %	
	Widowed	n	4	0	4	
		%	100,0 %	0,0 %	100,0 %	

	Cohabiting	n	77	81	158	
		%	48,7 %	51,3 %	100,0 %	
Total %		n	182	163	345	
		52,8 %	47,2 %	100,0 %		
Level of Education	Primary	n	20	19	39	2,189
		%	51,3 %	48,7 %	100,0 %	
	Secondary	n	91	92	183	
		%	49,7 %	50,3 %	100,0 %	
	Technical	n	39	31	70	
		%	55,7 %	44,3 %	100,0 %	
	Higher	n	32	21	53	
		%	60,4 %	39,6 %	100,0 %	
Total %		n	182	163	345	100,0 %
		52,8 %	47,2 %	100,0 %	100,0 %	

			Physical Activity			Total	p Valor
			Low	Moderate	High		
Age Group	18 - 28 years	n	85	0	6	91	
		%	93,4 %	0,0 %	6,6 %	100,0 %	
	29 - 39 years	n	128	3	4	135	
		%	94,8 %	2,2 %	3,0 %	100,0 %	
	40 - 50 years	n	70	1	2	73	6,773
		%	95,9 %	1,4 %	2,7 %	100,0 %	
	51 - 60 years	n	42	0	4	46	
		%	91,3 %	0,0 %	8,7 %	100,0 %	
Total			325	4	16	345	
		94,2 %	1,2 %	4,6 %	100,0 %		
Gender	Male	n	80	0	10	90	
		%	88,9 %	0,0 %	11,1 %	100,0 %	
	Female	n	245	4	6	255	12,77
		%	96,1 %	1,6 %	2,4 %	100,0 %	
Total			325	4	16	345	
		94,2 %	1,2 %	4,6 %	100,0 %		
Region of Origin	Coast	n	149	2	10	161	
		%	92,5 %	1,2 %	6,2 %	100,0 %	
	Highlands	n	154	2	6	162	
		%	95,1 %	1,2 %	3,7 %	100,0 %	2,595
	Jungle	n	22	0	0	22	
		%	100,0 %	0,0 %	0,0 %	100,0 %	
Total			325	4	16	345	
		94,2 %	1,2 %	4,6 %	100,0 %	100,0 %	
Marital Status	Single	n	93	2	10	105	14,082
		%	88,6 %	1,9 %	9,5 %	100,0 %	
	Married	n	63	2	2	67	
		%	94,0 %	3,0 %	3,0 %	100,0 %	
	Divorced	n	10	0	1	11	
		%	90,9 %	0,0 %	9,1 %	100,0 %	
	Widowed	n	4	0	0	4	
		%	100,0 %	0,0 %	0,0 %	100,0 %	

						Total	
	Cohabiting	n	155	0	3	158	
		%	98,1 %	0,0 %	1,9 %	100,0 %	
Total			325	4	16	345	
			94,2 %	1,2 %	4,6 %	100,0 %	100,0 %
Level of Education	Primary	n	38	0	1	39	7,334
		%	97,4 %	0,0 %	2,6 %	100,0 %	
	Secondary	n	174	2	7	183	
		%	95,1 %	1,1 %	3,8 %	100,0 %	
	Technical	n	67	1	2	70	
		%	95,7 %	1,4 %	2,9 %	100,0 %	
	Higher	n	46	1	6	53	
		%	86,8 %	1,9 %	11,3 %	100,0 %	
Total		n	325	4	16	345	
%			94,2 %	1,2 %	4,6 %	100,0 %	100,0 %

			Sleep quality		Total	p Valor
			Bad	Good		
Age Group	18 - 28 years	n	54	37	91	1,314
		%	59,3 %	40,7 %	100,0 %	
	29 - 39 years	n	86	49	135	
		%	63,7 %	36,3 %	100,0 %	
	40 - 50 years	n	41	32	73	
		%	56,2 %	43,8 %	100,0 %	
	51 - 60 years	n	29	17	46	
		%	63,0 %	37,0 %	100,0 %	
Total			210	135	345	
			60,9 %	39,1 %	100,0 %	100,0 %
Gender	Male	n	54	36	90	0,039
		%	60,0 %	40,0 %	100,0 %	
	Female	n	156	99	255	
		%	61,2 %	38,8 %	100,0 %	
Total			210	135	345	
			60,9 %	39,1 %	100,0 %	100,0 %
Region of Origin	Coast	n	107	54	161	4,062
		%	66,5 %	33,5 %	100,0 %	
	Highlands	n	90	72	162	
		%	55,6 %	44,4 %	100,0 %	
	Jungle	n	13	9	22	
		%	59,1 %	40,9 %	100,0 %	
Total			210	135	345	
			60,9 %	39,1 %	100,0 %	100,0 %
Marital Status	Single	n	59	46	105	2,253
		%	56,2 %	43,8 %	100,0 %	
	Married	n	41	26	67	
		%	61,2 %	38,8 %	100,0 %	
	Divorced	n	6	5	11	
		%	54,5 %	45,5 %	100,0 %	
	Widowed	n	2	2	4	
		%	50,0 %	50,0 %	100,0 %	

	Cohabiting	n	102	56	158	
		%	64,6 %	35,4 %	100,0 %	
Total			210	135	345	
		60,9 %	39,1 %	100,0 %	100,0 %	
	Primary	n	22	17	39	1,789
		%	56,4 %	43,6 %	100,0 %	
Level of Education	Secondary	n	108	75	183	
		%	59,0 %	41,0 %	100,0 %	
	Technical	n	47	23	70	
		%	67,1 %	32,9 %	100,0 %	
	Higher	n	33	20	53	
		%	62,3 %	37,7 %	100,0 %	
Total			210	135	345	
%		60,9 %	39,1 %	100,0 %	100,0 %	

Relationship between Eating Habits and Physical Activity

Table 4 reveals that 49,3 % have more inadequate eating habits and low physical activity. Furthermore, 44,9 % have adequate habits but low activity. When associating eating habits and physical activity variables, no statistically significant relationship was found.

Table 4. Relationship Between Eating Habits and Physical Activity in COVID-19 Patients						
		Physical Activity				
		Low	Moderate	High	Total	p valor
Eating Habits	Inadequate	170	1	11	182	
	%	49,3 %	0,3 %	3,2 %	52,8 %	
	Adequate	155	3	5	163	0,234
	%	44,9 %	0,9 %	1,4 %	47,2 %	
Total	n	325	4	16	345	
	%	94,2 %	1,2 %	4,6 %	100 %	

Relationship between Eating Habits and Sleep Quality

Table 5 reports that 33,9 % have poor sleep quality and inadequate eating habits, while 27 % have adequate healthy habits but poor sleep quality. When associating eating habits and sleep quality variables, no statistically significant relationship was found.

Table 5. Relationship Between Eating Habits and Sleep Quality in COVID-19 Patients					
		Sleep Quality			
		Bad	Good	Total	p valor
Eating Habits	Inadequate	117	65	182	0,169
	%	33,9 %	18,8 %	52,8 %	
	Adequate	93	70	163	
	%	27 %	20,3 %	47,2 %	
	n	210	135	345	
Total	%	60,9 %	39,1 %	100 %	

Relationship between Physical Activity and Sleep Quality

Table 6 shows that 95,7 % have low physical activity and poor sleep quality, however, 91,9 % have good sleep quality but low physical activity. When associating physical activity and sleep quality variables, no statistically significant relationship was found.

Table 6. Relationship Between Physical Activity and Sleep Quality in COVID-19 Patients

		Sleep Quality			
		Bad	**Good**	**Total**	**P valor**
	Low	201	124	325	0,317
	%	95,7 %	91,9 %	94,2 %	
Physical Activity	Moderate	2	2	4	
	%	1 %	1,5 %	1,2 %	
	High	7	9	16	
	%	3,3 %	6,7 %	4,6 %	
Total	N	210	135	345	
	%	100 %	100 %	100 %	

DISCUSSION

The COVID-19 pandemic, caused by SARS-CoV-2 since December 2019, has generated a global health crisis, underscoring the importance of lifestyle in the recovery of those affected. It has been shown that proper nutrition, regular physical activity, and good sleep quality strengthen the immune system and reduce the risk of infections, including COVID-19. However, the restrictions imposed to contain the pandemic have led to a decrease in physical activity and deteriorations in sleep quality and eating habits, which in turn affects mental health and complicates recovery from the disease. In Peru, there were significant public health challenges before the pandemic, with high rates of overweight and obesity, excessive consumption of ultra-processed foods and fried foods, as well as insufficient fiber intake. The pandemic has exacerbated these problems, encouraging sedentary lifestyles and further altering sleep and eating patterns, affecting the physical and emotional well-being of the population. This study focuses on the interrelation between diet, physical activity, and sleep quality in patients with COVID-19 treated in primary care centers in Peru.

The results indicated a relationship between dietary habits and physical activity in patients with COVID-19, identifying that 49,3 % of the participants had inadequate eating habits and low physical activity, without finding a statistically significant relationship between these variables, in line with the findings of Villareal (2022). Despite this, a predominance of unhealthy eating habits (64,4 %) and an increase in stress levels (38 %) were observed, factors that, according to other studies, impact health. For instance, Gonzales et al. (2020) did not find a direct relationship between adequate dietary habits and physical activity in a group of 34 students. Additionally, a concerning trend toward the consumption of ultra-processed foods and the lack of natural foods in different studied populations was shown in the work of Ticse (2023) and García Inga et al. (2022), who reported an increase in carbohydrate and "builder" food consumption during confinement. On the other hand, Ammar et al. (2020) highlighted how confinement negatively affected physical activity and promoted the consumption of unhealthy foods and beverages globally. Similar results were observed by Muñoz et al. (2022), who, despite noting weight maintenance in the majority of respondents from 58 countries, reported a reduction in physical activity and changes in eating habits. Interestingly, studies like those of Yancan et al. (2020) and Bautista et al. (2021) emphasize the prevalence of low physical activity and inadequate eating habits, contrasting with the recommendations of the Pan American Health Organization and WHO on the importance of maintaining an adequate level of physical activity. Varied results were observed regarding the practice of physical activity and sleep patterns during the pandemic, with studies like Skotnicka et al. (2021) showing a decrease in physical activity, while Di Renzo et al. (2020) reported an increase in Italy. Moreover, studies focused on sleep quality and mental health, such as those by Ramos-Padilla et al. (2021) and Valiensi et al. (2022), evidenced an increase in sleep problems and a decrease in anxiety and depression symptoms, respectively, during the pandemic.

The results indicated that sleep quality and eating habits found similar outcomes in terms of the prevalence of sleep problems, although no statistically significant relationship (p > 0,169) was established between these aspects in our study. The work of Arriola et al. (2021)revealed an alarming prevalence of sleep problems of 89,7 % among participants, with a higher percentage of women (54,6 %) and 13,1 % who had been diagnosed with COVID-19. Interestingly, these sleep problems were significantly associated (p < 0,001) with a higher tendency to consume simple carbohydrates. This finding reflects how the challenging context of the pandemic, characterized by work stress, emotional pressure, risk of contagion, family isolation, and physical fatigue, can influence eating and sleep patterns. Additionally, the study highlighted that individuals with a higher educational level showed significant differences in their sleep patterns compared to those with a secondary education level. Another relevant finding was the predominance of females (61,2 %) in the prevalence of sleep problems, suggesting that factors such as psychological stress can lead to depressive and anxious symptoms, which, in turn, can disturb and deteriorate sleep quality (Vilchez-Cornejo et al., 2016).

Additionally, the results indicated an association between physical activity and sleep quality. Although most studies show a trend towards low physical activity and poor sleep quality in patients with COVID-19, findings regarding the statistical significance of this relationship vary. For instance, our research observed that 95,7 % of participants exhibited low physical activity and poor sleep quality, although no statistically significant relationship was found between these two variables. Comparatively, the study by Huamán et al. (2021), focused on teachers during the pandemic, reported statistical significance in their variables, noting that 42,5 % of participants experienced poor sleep quality and low physical activity. Similarly, Chávez (2022) found that 100 % of their sample showed physical inactivity and 60 % had poor sleep quality, highlighting the prevalence of these issues in patients with COVID-19.

Sleep, being fundamental for bodily repair and quality of life, when affected, can trigger a range of problems, from short-term sleep disorders to long-term neurological complications, such as Parkinson's and Alzheimer's (Silva et al., 2022). Other studies, like that of Taboada (2022), have explored the relationship between physical activity, sleep quality, and eating habits, finding that a large proportion of university students showed poor sleep quality, despite displaying high physical activity and healthy eating behavior. On the other hand, Ulfe (2021) assessed the sleep quality in medical technology graduates during the pandemic using the Pittsburgh Sleep Quality Index, where 76 % showed poor sleep quality. In line with these findings, our study revealed that affected sleep quality was evident in 60,9 % of participants. Finally, Escalante (2021) found no significant relationship between sleep quality and physical activity during the pandemic, with 92,6 % of participants reporting poor sleep quality.

Lastly, poor sleep quality is a prevalent issue in the country according to the Spanish Neurology Society (SEN), with more than 4 million suffering from chronic and severe sleep disorders (Poza et al., 2022). The Ministry of Health in 2021 mentioned that due to the COVID-19 pandemic, the number of insomnia cases increased in the population, with a higher incidence in the U.S. at 42,8 % and China at 56 %. Likewise, the WHO states that 40 % of the global population suffers from this disorder (Araque et al., 2020).

Implications

This study highlights the need for a comprehensive approach in the treatment and recovery of COVID-19 patients, where healthcare professionals should consider not only direct medical care but also promoting healthy eating habits, encouraging appropriate physical activity, and improving sleep quality. Evidence suggests that these lifestyle aspects can play a crucial role in modulating the immune system and, therefore, in the response to treatment and recovery from COVID-19.

Public health policies should, therefore, include programs and educational campaigns that encourage healthy lifestyles as an integral part of COVID-19 prevention and management. These initiatives could be directed not only at confirmed or recovered COVID-19 patients but also at the general population, to improve resilience against future pandemics or outbreaks of infectious diseases. Practically, it is recommended that primary care centers implement multidisciplinary programs that jointly address nutrition, physical activity, and sleep management. These programs could include educational workshops, personalized follow-up, and the integration of digital technologies to monitor and promote healthy behaviors. Moreover, it is imperative that health policies incorporate considerations for equitable access to healthy foods, spaces for safe physical activity, and support programs for mental health and stress management, which can directly influence sleep quality. Future research should explore in greater depth the relationships between eating habits, physical activity, and sleep quality, using longitudinal designs that allow for establishing causality and long-term effects. Additionally, expanding the diversity of the study population to include COVID-19 patients at different stages of the disease and recovery, as well as assessing the impact of specific interventions aimed at improving these lifestyle aspects, would be relevant.

Limitations

One of the main limitations lies in the cross-sectional nature of the study, which restricts the ability to establish causal relationships between the examined variables. Since data is collected at a single point in time, it is challenging to determine whether inadequate eating habits, low physical activity, or poor sleep quality precede or are a consequence of COVID-19 infection. Moreover, this design does not allow observing the evolution of these factors over time, which is crucial for better understanding their impact on patient recovery. Future research should consider longitudinal designs that allow for following participants over time to establish the direction and causality of relationships between eating habits, physical activity, sleep quality, and COVID-19 recovery. Additionally, the use of probabilistic sampling techniques to ensure sample representativeness is recommended. Finally, the improvement and validation of measurement instruments in the Peruvian context will contribute to the precision and reliability of the collected data, thus strengthening the evidence on the interaction between these important lifestyle factors and health during and after the COVID-19 pandemic.

CONCLUSIONS

In our research on the relationship between dietary habits, physical activity, and sleep quality in COVID-19 patients treated in primary care centers, a concerning trend towards poor nutrition and low levels of physical activity has been identified, with no statistically significant association found between these two factors. This suggests that, regardless of their level of physical activity, the studied population group tends to maintain unhealthy eating patterns, which could be influenced by factors such as a lack of time and proper nutritional education. Additionally, the findings indicate that a large proportion of the study population are poor sleepers, which is directly linked to decreased quality of life. This discovery underscores the importance of considering sleep quality as a critical factor in the overall well-being of patients with COVID-19.

BIBLIOGRAPHIC REFERENCES

1. Ammar, A., Brach, M., Trabelsi, K., Chtourou, H., Boukhris, O., Masmoudi, L., Bouaziz, B., Bentlage, E., How, D., Ahmed, M., Müller, P., Müller, N., Aloui, A., & Hammouda, O. (2020). Effects of covid-19 home confinement on eating behaviour and physical activity : Results of the. Nutrients, 12(1583), 13.

2. Araque, F., Bermudez, V., Medina, O., Riaño, M., & Ruiz, L. C. (2020). Trastornos del sueño a consecuencia de la pandemia por Covid-19. Revista Peruana de Medicina Experimental y Salud Pública, 37(4), 761.

3. Arriola Torres, L. F., Palomino Taype, K. R., & Quintana Castro, L. (2021). Quality of sleep and sugar craving among resident physicians during the COVID-19 pandemic in Peru. Neurologia Argentina, 13(1), 7–13. https://doi.org/10.1016/j.neuarg.2021.01.004

4. Bautista, L. A., & Florián, J. J. (2021). Relación de actividad física y hábitos alimentarios con el éstres académico en pandemi por COVID-19. 47.

5. Besedovsky, L., Lange, T., & Haack, M. (2019). The sleep-immune crosstalk in health and disease. Physiological Reviews, 99(3). https://doi.org/10.1152/physrev.00010.2018

6. Calder, P. C., Carr, A. C., Gombart, A. F., & Eggersdorfer, M. (2020). Optimal nutritional status for a well-functioning immune system is an important factor to protect against viral infections. In Nutrients (Vol. 12, Issue 4). https://doi.org/10.3390/nu12041181

7. CEPAL, & OPS. (2021). La prolongación de la crisis sanitaria y su impacto en la salud, la economía y el desarrollo social. COvid-19 Respuesta, 39.

8. Chávez, A., & Moreno, M. C. (2015). Guías alimentarias y de actividad física en contexto de sobrepeso y obesidad en la población mexicana. In Academia Nacional de Medicina (ANM).

9. Chávez, M. (2022). Actividad física y la calidad de sueño en los pacientes post covid hospitalizados en el marco de la pandemia. 0–2.

10. Cruz, F., & Sánchez, F. (2011). Hábitos alimentarios, estado nutricional y su asociación con el nivel socioeconómico del adulto mayor que asiste al Programa Municipal de Lima Metropolitana, 2011. Universidad Nacional Mayor de San Marcos, 47.

11. Di Renzo, L., Gualtieri, P., Pivari, F., Soldati, L., Attinà, A., Cinelli, G., Cinelli, G., Leggeri, C., Caparello, G., Barrea, L., Scerbo, F., Esposito, E., & De Lorenzo, A. (2020). Eating habits and lifestyle changes during COVID-19 lockdown: An Italian survey. Journal of Translational Medicine, 18(1). https://doi.org/10.1186/s12967-020-02399-5

12. Escalante, J. (2021). Calidad de sueño y su relación con el nivel de actividad física, en estudiantes de terapia física durante la pandemia covid-19 de la universidad Norbert Wiener, Lima, Agosto-Noviembte 2020. 6.

13. García, B. O., Martínez, M. R., Cuadros, R. E., Poma, J. G., & Velásquez, C. H. (2022). Cambios de Hábitos Alimentarios debido al confinamiento de Covid-19 en Comunidad Campesina de Sapallanga 2021. Visionarios En Ciencia y Tecnología, 6(2), 102–110. https://doi.org/10.47186/visct.v6i2.96

14. Gonzales, A., & Enero, C. (2020). Hábitos alimentarios y actividad física en estudiantes de nutrición y dietética de la universidad Maria Auxiliadora que llevan clases virtuales por la covid-19.

15. Gualano, M. R., Lo Moro, G., Voglino, G., Bert, F., & Siliquini, R. (2020). Efeitos do bloqueio covid-19 na saúde mental e distúrbios do sono na Itália. International Journal of Environmental Research and Public Health, 17(13), 1–13.

16. Huamán, L., Gómez, E., & Ochoa, E. (2021). Nivel de actividad física y calidad de sueño en docentes de la escuela de tecnología médica de la universidad peruana cayetano Heredia durante el estado de emergencia sanitaria noviembre del 2020. 3(2), 6.

17. Huarcaya, W. V., Miranda Monzón, J. A., Napanga Saldaña, E. O., & Driver, C. R. (2022). Impact of COVID-19 on mortality in Peru using triangulation of multiple data sources. Revista Panamericana de Salud Publica/Pan American Journal of Public Health, 46, 1-6. https://doi.org/10.26633/RPSP.2022.53

18. Jiménez-Pavón, D., Carbonell-Baeza, A., & Lavie, C. J. (2020). Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people. In Progress in Cardiovascular Diseases (Vol. 63, Issue 3). https://doi.org/10.1016/j.pcad.2020.03.009

19. Lázaro, M., & César, D. (2019). Guías Alimentarias para la Población Peruana.

20. Lujan, R. J. M. (2020). Autopercepción del estrés en aislamiento social en tiempos de covid-19. Revista ConCiencia EPG, 5(1), 85-99.

21. Mantilla, S. C., & Gómez-Conesa, A. (2007). El Cuestionario Internacional de Actividad Física. Un instrumento adecuado en el seguimiento de la actividad física poblacional. Revista Iberoamericana de Fisioterapia y Kinesiologia, 10(1), 48–52. https://doi.org/10.1016/S1138-6045(07)73665-1

22. Mundial, A. M. (2013). Declaración de Helsinki de la AMM – principios éticos para las investigaciones médicas en seres humanos.

23. Muñoz, L., Briones, M., & Pérez, Y. (2022). Changes in the eating behavior of highly educated adults during the different stages of home confinement by COVID-19 in Iberoamerica. Nutricion Hospitalaria, 39(5), 1068–1075. https://doi.org/10.20960/nh.04018

24. Nieman, D. C., & Wentz, L. M. (2019). The compelling link between physical activity and the body's defense system. In Journal of Sport and Health Science (Vol. 8, Issue 3). https://doi.org/10.1016/j.jshs.2018.09.009

25. Pilotto, A., Custodero, C., Maggi, S., Polidori, M. C., Veronese, N., & Ferrucci, L. (2020). A multidimensional approach to frailty in older people. In Ageing Research Reviews (Vol. 60). https://doi.org/10.1016/j.arr.2020.101047

26. Poza, J. J., Pujol, M., Ortega-Albás, J. J., & Romero, O. (2022). Melatonin in sleep disorders. Neurologia, 37(7), 575–585. https://doi.org/10.1016/j.nrl.2018.08.002

27. Ramos-Padilla, P., Villavicencio-Barriga, V. D., Cárdenas-Quintana, H., Abril-Merizalde, L., Solís-Manzano, A., & Carpio-Arias, T. V. (2021). Hábitos alimentarios y calidad del sueño durante la pandemia de covid-19 en población adulta del Ecuador. International Journal of Environmental Research and Public Health, 18(7).

28. Rico-Gallegos, Carina, G., Vargas, G., Poblete-Valderrama, F. A., Carrillo-Sanchez, J., Rico-Gallegod, J., Mena-Quintana, B., Chaparro-Baeza, D. K., & Resendiz-Hernandez, J. M. (2020). Hábitos de actividad física y estado de salud durante la pandemia por COVID-19. Revista Espacios, 41(42), 1–10. https://doi.org/10.48082/espacios-a20v41n42p01

29. Romero, R. (2021). Calidad de sueño y transtornos temporomandibulares.

30. Silva, A. F., Dalri, R. de C. de M. B., Eckeli, A. L., Uva, A. N. P. de S., Mendes, A. M. de O. C., & Robazzi, M. L. do C. C. (2022). Calidad de sueño, variables personales, laborales y estilo de vida de enfermeros de hospital. Revista Latino-Americana de Enfermagem, 30. https://doi.org/10.1590/1518-8345.5756.3576

31. Simpson, R. J., Kunz, H., Agha, N., & Graff, R. (2015). Exercise and the Regulation of Immune Functions. Progress in Molecular Biology and Translational Science, 135. https://doi.org/10.1016/bs.pmbts.2015.08.001

32. Skotnicka, M., Karwowska, K., Kłobukowski, F., Wasilewska, E., & Małgorzewicz, S. (2021). Dietary habits before and during the covid-19 epidemic in selected european countries. Nutrients, 13(1690), 1–18.

33. Taboada, X. (2022). Asociación entre la actividad física, calidad de sueño y comportamiento alimentario de estudiantes universitarios que reciben educación a distancia, semestre 2020-2. Repositorio Institucional – UCS, 1–35.

34. Ticse, L. (2023). Hábitos alimentarios durante la pandemia de covid 19, en las familias de escolares en un centro educativo del distrito de Carabayllo, Lima 2020.

35. Ulfe, S. (2021). Calidad de sueño durante la pandemia en egresados de Tecnología Médica. Lima-2020. Repositorio Institucional Cybertesis UNMSM, 83.

36. Valiensi, S. M., Folgueira, A. L., Enriz, N. M., Garay, A. D. C., & Giardino, D. L. (2022). Análisis de la calidad del sueño, alteraciones del humor y modificaciones de algunos hábitos y conductas durante dos diferentes períodos de la pandemia por covid-19 en Argentina. Vertex Revista Argentina de Psiquiatría, 33(157), 23–33. https://doi.org/10.53680/vertex.v33i157.270

37. Vilchez-Cornejo, J., Quiñones-Laveriano, D., Failoc-Rojas, V., Acevedo-Villar, T., Larico-Calla, G., Mucching-Toscano, S., Smith, J., Torres-Román, Aquino-Núñez, P. T., Cruz, J. C.-D. la, Rosario, A. H., Espinoza-Amaya, J. J., Palacios-Vargas, L. A., & Díaz-Vélez, C. (2016). Salud metal y calidad del sueño en estudiantes de 8 facultades de medicina humana de Perú. Revista Chilena de Neuro Psiquiatría, 54(4), 272–281.

38. Villareal, C. (2022). Hábitos alimentarios , actividad física en relación con el estrés en universitarios durante la cuarentena por la pandemia COVID-19 , Lima. 51.

39. Voitsidis, P., Gliatas, I., Bairachtari, V., Papadopoulou, K., Papageorgiou, G., Parlapani, E., Syngelakis, M., Holeva, V., & Diakogiannis, I. (2020). Insomnia during the COVID-19 pandemic in a Greek population. In Psychiatry Research (Vol. 289). https://doi.org/10.1016/j.psychres.2020.113076

40. Yancan, E. A., Rojas, C. P., & Dias, J. A. (2020). Hábitos alimentarios Y actividad física del personal de salud del dentro de aislamiento temporal villa panamericana durante la pandemia del covid 19, 2020.

FINANCING

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

AUTHORSHIP CONTRIBUTION

Data curation: Ruth M. Ticona-Chino, Eric Torres-Cruzate, Liset Z. Sairitupa-Sanchez, Mardel Morales-García, Alcides Flores-Paredes, Wilter C. Morales García.
Methodology: Ruth M. Ticona-Chino, Eric Torres-Cruzate, Liset Z. Sairitupa-Sanchez, Mardel Morales-García, Alcides Flores-Paredes, Wilter C. Morales García.
Software: Ruth M. Ticona-Chino, Eric Torres-Cruzate, Liset Z. Sairitupa-Sanchez, Mardel Morales-García, Alcides Flores-Paredes, Wilter C. Morales García.
Drafting - original draft: Ruth M. Ticona-Chino, Eric Torres-Cruzate, Liset Z. Sairitupa-Sanchez, Mardel Morales-García, Alcides Flores-Paredes, Wilter C. Morales García.
Writing - proofreading and editing: Ruth M. Ticona-Chino, Eric Torres-Cruzate, Liset Z. Sairitupa-Sanchez, Mardel Morales-García, Alcides Flores-Paredes, Wilter C. Morales García.