

Effect of the Mediterranean diet and the ketogenic diet on sleep quality and duration in healthy adults

Efecto de la dieta mediterránea y la dieta cetogénica en la calidad y duración del sueño en adultos sanos

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ABSTRACT

Keywords:

Mediterranean diet. Ketogenic diet.
Sleep quality. Healthy adults.

Objective: To investigate the relationship between the Mediterranean diet, ketogenic diet, and sleep quality in healthy adults. **Materials and Methods:** A literature review was conducted based on articles published within the last five years, selected from databases such as PubMed, Google Scholar and Scopus. A total of 15 studies were included, 12 of which focused on the Mediterranean diet and 3 on the ketogenic diet. **Variables** such as study design, sample size, tools used to assess sleep quality (PSQI, actigraphy), and main findings were evaluated. **Results and Discussion:** The Mediterranean diet was consistently associated with improvements in parameters such as sleep duration, latency, and efficiency. This relationship was primarily observed in healthy adults with high adherence to the dietary pattern and when validated subjective assessment tools were used. In contrast, evidence regarding the ketogenic diet was scarce and limited to specific contexts, such as studies in military populations, with no significant improvements observed. **Conclusions:** The Mediterranean diet presents stronger scientific support as a nonpharmacological dietary strategy to promote better sleep quality. The ketogenic diet, although not associated with negative.

RESUMEN

Palabras clave:

Dieta mediterránea. Dieta cetogénica. Calidad del sueño. Adultos sanos.

Objetivo: Investigar sobre la relación entre la dieta mediterránea, dieta cetogénica y la calidad del sueño en adultos saludables. **Material y métodos:** Revisión bibliográfica a partir de artículos publicados en los últimos cinco años, seleccionados en bases de datos como PubMed, Google Scholar y Scopus. Se incluyeron un total de 15 estudios, de los cuales 12 analizaron la dieta mediterránea y 3 la cetogénica. Se valoraron variables como el tipo de diseño, el tamaño muestral, las herramientas empleadas para medir la calidad del sueño (PSQI, actigrafía) y los resultados obtenidos. **Resultados y discusión:** La dieta mediterránea se asoció de forma consistente con mejoras en parámetros como la duración, latencia y eficiencia del sueño. Esta relación se observó principalmente en adultos sanos, con alta adherencia al patrón dietético, y cuando se utilizaron herramientas validadas de evaluación subjetiva del sueño. En cambio, la evidencia sobre la dieta cetogénica fue escasa y limitada a contextos específicos, como estudios en población militar, sin mejoras significativas observadas. **Conclusiones:** La dieta mediterránea presenta un mayor respaldo científico como estrategia dietética no farmacológica para favorecer la calidad del sueño. La dieta cetogénica, aunque no mostró efectos negativos, aún requiere más estudios para valorar su aplicabilidad en este ámbito.

Introduction

Sleep is an essential biological process for human well-being, as it contributes to nervous system recovery, memory consolidation, metabolic regulation and emotional stability (1). However, in recent years there has been an increase in sleep disorders, such as insomnia and sleep apnea, which, in general, do not provide an optimal quality of life and health. Among the various factors that influence the quality and duration of sleep, diet is considered a key aspect that can be modified to promote better sleep (2). Currently, two dietary patterns have been the subject of several investigations due to their possible effects on health and sleep, namely the Mediterranean diet and the ketogenic diet. The Mediterranean diet is based on a high consumption of fruits, vegetables, legumes, whole grains, olive oil and fish, and has had a great impact for its role in reducing the risk of metabolic and cardiovascular diseases (3). Studies have suggested that following this type of diet may be related to better sleep quality. On the other hand, the ketogenic diet is characterized by a very low carbohydrate intake, a moderate amount of protein and a high fat intake. In this paper we propose to investigate in depth how these two dietary patterns may influence sleep quality, a crucial aspect of health that has traditionally been little explored. The relevance of this study lies in several fundamental aspects. First, the increasing prevalence of sleep disorders in the general population represents a public health problem that requires an innovative and multidisciplinary approach. Second, the possibility of modifying sleep quality through dietary interventions offers a nonpharmacological and potentially accessible strategy for improving overall well-being. In addition, the comparison between the Mediterranean diet and the ketogenic diet will allow a more precise understanding of how different nutritional compositions may impact sleep patterns.

General Objective:

To investigate the relationship between Mediterranean diet, ketogenic diet and sleep quality in healthy adults.

Specific objectives:

- Investigate the influence of the Mediterranean and ketogenic diet on aspects of sleep, such as fatigue or rest, through studies using validated sleep quality questionnaires, such as the *Pittsburgh Sleep Quality Index*, or sleep monitoring devices.
- To evaluate the differences and similarities between the effects of the Mediterranean diet and the ketogenic diet on sleep.
- To analyze whether adherence to the Mediterranean or ketogenic diet influences sleep latency and sleep efficiency in healthy adults.
- To examine the possible long-term effects of both diets on sleep quality and the presence of sleep disorders, such as insomnia or sleep apnea.

1.2. The dream

Sleep is an essential biological function in human beings, occupying approximately one third of a person's life. It is a fundamental process for the maintenance of cognitive and physiological functions (4). During nighttime rest, the body regulates various homeostatic

processes, including thermoregulation, endocrine balance and strengthening of the immune system. It also plays a crucial role in memory consolidation and learning (5). Therefore, far from being a passive state, sleep represents an active and complex mechanism, indispensable for the correct functioning of the organism and therefore the preservation of physical and mental health, where its alteration can have significant consequences on general well-being (6).

Sleep is organized in cycles that are repeated several times during the night, each of which consists of several stages (7-10):

Non-REM (Non-rapid Eye Movement) sleep:

- Stage 1 (Transition to sleep): This is the lightest phase where it is very easy to wake up here, brain activity begins to decrease, muscles relax and breathing slows down. However, sleep is very light and the person can be easily awakened by any external stimulus. Jerky movements may also be experienced.
- Stage 2 (Light sleep): The body begins to relax, and brain activity slows down. Although it is a light sleep phase, the body is already in a more stable state of rest.
- Stage 3 (Deep Sleep): Also called "slow wave sleep" (SWS), this is the most restorative phase of the cycle. During this stage, the body performs essential functions such as cell regeneration, tissue repair and strengthening of the immune system. It is also key to memory consolidation and learning. At this point, waking the person up is more difficult, and doing so can lead to disorientation.

REM (Rapid Eye Movement) sleep: In this phase, the brain is very active, and most dreams occur. It is crucial for emotional regulation and long-term memory consolidation.

These cycles, which last approximately 90 minutes each, are repeated 4 to 6 times per night. The quality of sleep depends on the adequate proportion of these stages and on the continuity of uninterrupted sleep (11).

Sleep plays a fundamental role in our health and general well-being, being directly related to our quality of life (8,10,12). To evaluate its quality, various parameters are analyzed, such as the time it takes a person to fall asleep (latency), the total duration of rest, the frequency of nighttime awakenings and the percentage of time in bed where the human being actually sleeps. There are different methods to study sleep: the most accurate is polysomnography, a test where brain activity, breathing and movements are monitored by sensors. And also, the most widely used method because it is a more accessible option is the Pittsburgh Sleep Quality Questionnaire (PSQI), a tool that, by means of 24 questions, evaluates aspects such as latency, duration, disturbances or daytime sleepiness. Each response is scored from 0 to 3, adding up to 21 points, where a score above 5 indicates that the person has significant sleep problems. These tools allow us to identify sleep disorders that, if left untreated, can seriously affect our physical and mental health (13).

1.2.1. Impact of sleep on health

Circadian rhythm disorders significantly impact physical and mental well-being and are considered a major health issue (14). Appropriate rest is essential for several vital functions: it consolidates memory, preserves eye health, regulates body temperature, restores energy and improves brain metabolism (11,15). In Spain, the data are alarming: according to the Spanish Society of Neurology (8), between 25-35% of adults experience occasional insomnia, while 10-15% suffer from chronic insomnia. These alterations not only impair the quality of life and daily performance, but are also related to a deterioration of the general state of health.

People are vulnerable to the consequences of sleep disorders at various stages of life. At the individual level, these disorders can cause hormonal and biochemical imbalances, increase the risk of developing psychological or cognitive problems (11), and even increase mortality by increasing conditions such as hypertension, diabetes or obesity (8,18,19). On the other hand, on a social and economic scale, they decrease labor productivity and increase the probability of accidents. These effects highlight the importance of addressing sleep disorders not simply as isolated symptoms, but as critical public health risk factors. Therefore, their prevention and adequate treatment could substantially improve not only the quality of individual life, but also the efficiency of the healthcare system.

1.2.2. Sleep disturbances

Sleep disturbances are problems that compromise the ability to sleep adequately, either sufficiently or restoratively. These alterations can be transient or chronic and have a considerable effect on health and well-being. Some of the most common alterations include:

Insomnia: Insomnia is difficulty initiating or maintaining sleep, nocturnal awakenings during the night. According to Riemann et al. (10), chronic insomnia affects approximately 10-15% of the adult population and is associated with functional impairment during the day, such as fatigue, difficulty concentrating, and mood changes.

Sleep apnea: Sleep apnea is a disorder in which breathing is repeatedly interrupted during sleep. These pauses can last from a few seconds to minutes and can occur many times per hour. Khan and Aouad (8) emphasize that sleep apnea not only affects sleep quality, but can also cause daytime sleepiness and increase the risk of cardiovascular problems.

Circadian rhythm disorders: These disorders occur when the body's internal clock is not synchronized with the natural light-dark cycle. These disorders can make it difficult to fall asleep and cause daytime sleepiness.

Restless legs syndrome (RLS): RLS is characterized by a need to move the legs when falling asleep. This disorder is related to alterations in the levels of dopamine and iron in the brain.

Taken together, these alterations not only affect quality of life, but can also have long-term health consequences. For example, chronic sleep deprivation has been associated with an increased risk of metabolic problems, cognitive impairment, and mood disorders (8).

1.2.3. Factors influencing sleep quality

Sleep quality is influenced by a variety of factors, including biological, psychological, environmental and behavioral aspects. Biological factors include age, gender and

underlying medical conditions such as metabolic or endocrine disorders (2). Psychological factors such as stress, anxiety and depression are also major causes of insomnia and unrefreshing sleep. It has been shown that chronic stress can increase sleep latency and reduce sleep efficiency, leading to fragmented and non-refreshing sleep (2). In addition, lifestyle habits such as caffeine, alcohol and tobacco consumption, as well as lack of physical activity, can negatively affect sleep quality (20). The environmental setting, including exposure to artificial light at night and noise, can also interfere with circadian rhythms and the ability to fall asleep (21). Finally, diet is a modifiable factor that has recently gained attention for its potential to improve or worsen sleep quality. Several studies have shown that dietary patterns such as the Mediterranean diet and the ketogenic diet can influence sleep duration and quality through mechanisms such as neurotransmitter regulation and reduction of systemic inflammation (21,22).

1.3. Nutritional interventions

The quality of the diet depends on the variety, balance and nutritional adequacy of the foods consumed, ensuring that the body's energy and metabolic needs are met. A diversified and healthy diet not only satisfies nutritional needs, but also plays a key role in disease prevention. It has been shown that certain foods or dietary patterns may increase the risk of developing chronic noncommunicable diseases (such as diabetes, obesity, or cardiovascular disease) or, conversely, exert a protective effect (18). Given this evidence, it is crucial to assess diet quality in order to design personalized and effective nutritional intervention strategies. To measure it, internationally validated scales, called *diet quality indexes*, are used. Among the most recognized are:

Healthy Eating Index (HEI)

Dietary Quality Index (DQI)

Healthy Diet Indicator (HDI)

Mediterranean Diet Score (MDS)

These tools assign a score based on the consumption of key food groups, allowing the diet to be classified as adequate or inadequate. Its application in research and public health facilitates the identification of risky dietary patterns and the promotion of healthier habits, thus contributing to improve health outcomes at the population level (23).

1.3.1. Mediterranean Diet

The Mediterranean diet is a dietary pattern based on the traditional habits of Mediterranean countries characterized by a high intake of fruits, vegetables, whole grains, legumes, nuts and olive oil, as well as a moderate consumption of fish and dairy products, and a low consumption of red meat and ultra-processed products is recommended. This diet has been widely studied due to its multiple health benefits such as reducing the risk of cardiovascular diseases, metabolic syndrome, neurodegenerative diseases and cancer (3). Its great positive impact is attributed to antioxidants, dietary fiber, monounsaturated and polyunsaturated fatty acids, which have anti-inflammatory properties. In addition to its effects on physical health, the Mediterranean diet has also been associated with mental health benefits, such as the possibility of reduced risk of depression and anxiety (3). Since sleep quality and mental health are related, this suggests that the Mediterranean diet may also play a role in sleep regulation. (14)

1.3.2. Mediterranean Diet and Sleep

The relationship between the Mediterranean diet and sleep has been the subject of several investigations and most studies suggest that this dietary pattern may be associated with better sleep quality along with a lower frequency of disorders such as insomnia and sleeping difficulties. Mohammadi et al. (24) conducted a cross-sectional study with 535 Iranian adults to investigate the relationship between adherence to the Mediterranean diet, serum brain-derived neurotrophic factor (BDNF) levels, and sleep quality. The results showed that participants with greater adherence to this dietary pattern were less likely to have short sleep duration and poor sleep quality. These suggest that the Mediterranean diet could positively influence sleep not only through direct nutritional mechanisms, but also by modulating neurotrophic factors such as BDNF. Theorell-Haglöw et al. (21) conducted a cross-sectional study with 23,829 Swedish adults to analyze the relationship between sleep duration/quality and adherence to healthy dietary patterns. Using validated questionnaires, they evaluated two models: the modified Mediterranean diet (mMED) and the Nordic Food Index (HNFI). The results showed that participants with short sleep combined with poor quality were less likely to follow these healthy diets, while those with normal sleep and good quality maintained greater adherence. Similarly, Lopes et al. (25) conducted a cross-sectional study in Brazilian adults to evaluate the association between dietary habits and sleep quality in adults. They used food frequency questionnaires to assess dietary patterns and the Pittsburgh Sleep Quality Index to measure sleep quality. As a result, they found that greater adherence to healthy dietary patterns, characterized by high consumption of fruits, vegetables and whole grains, was associated with better sleep quality, also that higher consumption of processed foods and refined sugars was associated with sleep disturbances. Zuraikat et al. (3) analyzed the association between adherence to the Mediterranean diet and sleep quality in U.S. women with a cross-sectional study that assessed the association between adherence to the Mediterranean diet and sleep quality in U.S. women. This used the alternative Mediterranean diet index (aMED) to measure dietary adherence, which includes a high intake of fruits, vegetables, whole grains, legumes, fish and healthy fats, as well as a moderate intake of alcohol and so on, concluding that those with a higher adherence to this dietary pattern had better sleep quality, greater sleep efficiency and fewer interruptions according to the Pittsburgh Sleep Quality Index. Similarly, Godos et al. (20) conducted a cross-sectional study but in Italian adults where dietary intake was assessed using a validated food frequency questionnaire, and adherence to the Mediterranean diet was measured using a specific score reflecting the consumption of foods characteristic of this dietary pattern. And they found a lower prevalence of insomnia and nighttime awakenings since of the 1,936 participants, 67.9% reported good sleep quality and for each point increase in the Mediterranean diet adherence score individuals were 10% more likely to have adequate sleep quality, but this association was significant in normal weight or overweight individuals, and not in those participants who were obese. The study by Gupta et al. (22), carried out in Costa Rican adults, also suggested a good relationship between compliance with the Mediterranean diet, in which a food frequency questionnaire was used to evaluate dietary intake and calculate a Mediterranean diet score based on the consumption of foods typical of this dietary pattern, also obtained a result where the duration of sleep was greater, generating a hypothesis that the content of omega-3 fatty acids could improve sleep regulation. In another context, in the study by Jansen et al. (26) investigated the relationship between Mediterranean diet and sleep in 4,467 middle-aged Mexican women through a cross-

sectional study where they identified three main dietary patterns by means of principal component analysis: Fruits and vegetables: Characterized by a high consumption of fruits and vegetables. Western: Focused on the consumption of meats and processed foods. Modern Mexican: Includes high consumption of tortillas and soft drinks, with low consumption of fiber and dairy products.

As a result, they observed that those with a diet closer to the Mediterranean diet had fewer problems falling asleep and fewer nighttime awakenings suggesting a likelihood of a better quality of rest. Similarly, the results of the study by Zaidalkilani et al. (27) where they evaluated Arab women with insomnia problems and they were submitted to a questionnaire about adherence to the Mediterranean diet, and their nocturnal habits measured by the Athens Insomnia Scale questionnaire, indicate that a higher adherence to the Mediterranean diet is associated with a lower prevalence of insomnia among the Arab women studied. Specifically, participants with high adherence to this diet presented better sleep quality and a reduction in insomnia symptoms compared to those with low adherence. Hashimoto et al. (28) conducted a study to relate a diet with low energy but not in a balanced and nutritious diet in general, focusing on adequate intake of vitamins, minerals and tryptophan. This diet could be classified as a Mediterranean diet since the diet was evaluated with a questionnaire based on the amount of food ingested, which closely resembles the Mediterranean diet questionnaire. Sleep quality was measured by actygraph and their lifestyle had null changes, as a result they obtained that an adequate energy intake and a high quality diet, rich in vitamins, minerals and tryptophan, are associated with better sleep quality and suggest that maintaining a balanced and nutritious diet may contribute to prevent sleep problems in this population. Ramón-Arbués et al. (29) conducted a cross-sectional study with 868 Spanish university students to evaluate the association between eating habits and sleep quality. Using validated questionnaires, they found that a low consumption of foods characteristic of the Mediterranean diet together with a high consumption of sugary soft drinks and sweets was significantly associated with poorer sleep quality and increased risk of sleep disorders. However, it is important to mention that not all studies have found a direct relationship between the Mediterranean diet and sleep quality. For example, Oliveira and Marques-Vidal (30) analyzed data from a large middle-aged cohort where multiple dietary components were analyzed with detailed validated questionnaires and concluded that there was no association between adherence to this diet and the presence of insomnia suggesting that other factors such as genetics, lifestyle and environmental conditions however, suggest that some components such as sugary foods or red meat may be associated with poorer sleep quality. Likewise, Verkaar et al. (2) explored the relationship between different dietary patterns and sleep duration and quality in a cohort. Various dietary patterns were identified and assessed using food frequency questionnaires and objective and subjective sleep parameters were measured in the participants. Their results showed that people with a more Mediterranean diet-focused diet reported better subjective sleep quality, but no improvement in objective sleep quality scores could be observed.

1.3.3. Ketogenic Diet

The ketogenic diet is an eating pattern characterized by a very low carbohydrate intake, a moderate amount of protein and a high fat intake. Its main objective is to induce a state of ketosis, in which the body uses ketone bodies as the main source of energy instead of

glucose (21). Initially, the ketogenic diet was used as a treatment for refractory epilepsy in children, as it was observed that it could significantly reduce the frequency of epileptic seizures. In recent years, its use has expanded into other areas, including weight loss, management of type 2 diabetes, sports performance and prevention of neurodegenerative diseases.

1.3.4. Ketogenic Diet and Sleep

Some research has indicated possible benefits of the ketogenic diet in relation to sleep. Gangitano et al. (31) suggest that the ketogenic diet could affect circadian rhythms and sleep, because of its impacts on energy metabolism and neurotransmitter production. In particular, it has been proposed that ketosis could affect the regulation of adenosine, a key neuromodulator in the induction and maintenance of sleep. This diet, characterized by a very low consumption of carbohydrates and a high intake of fats, could have certain benefits on sleep quality and it has been suggested that the ketogenic diet could contribute to reduce sleep interruptions, in addition to favoring an increase in the slow-wave sleep phase, considered the deepest stage. Iacovides et al. (32) conducted a controlled study with 11 healthy young people to compare the effects of a low-carbohydrate ketogenic diet with a conventional high-carbohydrate diet. For three weeks, participants followed both diets at different periods. The results showed that the ketogenic diet did not generate significant changes in sleep quality compared to the traditional diet. Both the time taken to fall asleep and the total hours of rest remained similar in both cases. Although the ketogenic diet did induce a state of ketosis that did not negatively affect sleep, this study suggests that at least in young, healthy people, this type of diet does not impair rest when applied for short, controlled periods. In a different context, Henderson et al. (33) conducted a crossover clinical trial with 7 male military personnel with a mean age of 34 years to examine the effects of a 2-week ketogenic diet versus a high-carbohydrate diet during 36 hours of controlled sleep deprivation. The results showed that the ketogenic diet improved cognitive performance during prolonged wakefulness, with greater accuracy in tests of attention and working memory compared to the conventional diet. In addition, participants reported less subjective sleepiness and better mood under this dietary pattern. This pilot study suggests that the ketogenic diet may be a promising strategy for maintaining performance in military operations requiring prolonged periods of alertness. Similarly, Shaw et al. (16) conducted a randomized, controlled, crossover clinical trial of 36 military men with a mean age of 36 years to examine the effect of a 2-week ketogenic diet versus a conventional carbohydrate diet on cognitive performance, mood, sleep, and heart rate variability. Using standardized assessments, they found that the ketogenic diet did not produce significant changes in sleep parameters, but observed a reduction in heart rate variability, suggesting a possible increase in physiological stress during metabolic adaptation.

Method

The present work consists of a bibliographic review of scientific articles, with the aim of analyzing the existing connection between the Mediterranean diet and the ketogenic diet, as well as its influence on the quality and quantity of sleep. In order to carry out this TFG, an exhaustive search was made in different databases. The search began on February 20,

2025 and ended on April 29, 2025. The bases consulted were as follows: **PubMed, ScienceDirect, Google Scholar**

These sources provided access to both original studies and relevant scientific literature on the subject. Search strategy:

Key terms used included:

- "Mediterranean diet"
- "Ketogenic diet"
- "Sleep quality"
- "Sleep quantity"

In addition, to expand and refine the results, related terms such as:

- "Nutrition"
- "Circadian Rhythm"
- "Insomnia"
- "Apnea"

Inclusion criteria

Studies were selected that met the following characteristics:

- They address sleep quality or sleep disorders as a dependent variable.
- They explore nutrition or type of diet as an independent variable.
- Published between 2019 and 2025.
- Studies in adult humans (over 18 years of age)
- Healthy participants, without pathologies that affect sleep in a secondary way.
- Randomized clinical trial, cohort or cross-sectional study designs.

Exclusion criteria

The following types of studies were excluded:

- Studies conducted in hospitalized patients.
- Research focused on high-performance athletes, due to the specificity of their physiological requirements.

The terms that have been used in the PubMed database are:

- sleep AND ((diet*) OR (nutrition*)): 763 results were obtained, of which 17 were selected.
- (diet*) AND(circadian) OR (insomnia) OR (apnea)): 143 results were obtained, of which 3 were selected.
- circadian OR apnea OR sleep OR insomnia: 6344 results were obtained, of which 4 were selected. This search had a more general character and was mainly used to obtain definitions and a better understanding of the dream, serving as a theoretical basis to contextualize the subject

Results

The nutritional approach to the orientation towards the prevalence of problems in the conciliation or duration of sleep is presented as one of the fundamental tools for the improvement of sleep quality, without incurring in the possibility of supplements and/or nutritional complements. To begin the analysis of both diets mentioned above that may have benefits for sleep quality, the use of a Mediterranean diet should be highlighted. Twelve studies were included (2,3,20-22,24-28,30) that analyze this relationship more specifically and whose characteristics and results are detailed in Table 3.1. Most of these aforementioned studies suggest that greater adherence to this dietary pattern is associated with more favorable sleep parameters, such as longer sleep duration, shorter sleep latency and better sleep efficiency. However, for the correct interpretation of these results, it is necessary to compare the methodologies. Several studies, such as those of Zuraikat et al. (3) and Mohammadi et al. (24), have demonstrated a shorter sleep latency, longer sleep duration and greater sleep efficiency in those participants who showed greater adherence to this dietary pattern. In line with the results of these studies, Godos et al. (20) and Ramón-Arbués et al. (29) agree that those who do not adhere to this diet show an increased risk of sleep disturbances, such as frequent nighttime awakenings or perception of unrefreshing sleep.

Table 1. *Studies relating the Mediterranean diet to the quality/quantity of sleep.*

Author, year	Type of study	Population	Age range	Feature	Results	Dietary pattern
Verkaar et al. 2024 (2).	Cohort study	Dutch men and women (N= 553), excluding those who <500 or 5000kcal/day>	Media: 51 years old	To examine the cross-sectional and longitudinal associations of various types of dietary patterns with self-reported sleep quality and with actigraphy-estimated sleep parameters.	No evidence was found that dietary patterns are associated with actigraphy-estimated and self-reported sleep.	Dutch dietary guidelines Mediterranean
Godos et al. 2019 (20).	Cross-sectional study	Italian men and women (N= 2044)	Over 18 years old	To evaluate the association between sleep quality and adherence to the Mediterranean dietary pattern.	High adherence to a Mediterranean dietary pattern is associated with better sleep quality.	Mediterranean
Gupta et al. 2022 (22).	Case-control study	Costa Rican men and women (N=2169) 70% men.		The objective was to examine whether sleep inconsistencies are due to lack of adherence to the Mediterranean diet.	Sleep duration was longer, generating a hypothesis that omega-3 fatty acid content could improve sleep regulation.	Mediterranean

Jansen et al. 2020 (26).	Longitudinal study	Mexican women (N=4469)	Media: 41 years old	To assess whether dietary patterns are associated with sleep quality in middle-aged Mexican women.	A dietary pattern based on fruits and vegetables was associated with higher sleep quality, whereas an unhealthy dietary pattern was associated with poorer sleep quality.	Mediterranean
Zaidalkilani et al. 2022 (27).	Cross-sectional study	Arab women (N=917)	Media: 36 years old	To determine whether adherence to the Mediterranean diet (MD) is related to reduced insomnia in Arabic-speaking adult women in Jordan.	Participants' adherence to DM was significantly associated with improved sleep and reduced insomnia symptoms, highlighting the need for further research.	Mediterranean
Hashimoto et al. 2020 (28).	Cross-sectional study	Japanese women (N=80)	18-27 years old	To assess habitual inadequate dietary intake with dietary behavior that are associated with low objective sleep quality in adolescents and young women.	No significant associations were observed between objective sleep quality.	Mediterranean

Oliveira et al. 2023 (30).	CoLaus PsyCoLaus Study	Women and men (N=3751)	Media: 57 years old	To assess the association between sleep quality and a variety of dietary markers among middle-aged community-dwelling participants.	No consistent associations were found among a large panel of nutritional markers and quality of sleep.	Mediterranean
Zuraikat et al. 2020 (3).	Prospective cohort study	U.S. women (N=432)	20-76 years	To prospectively assess whether adherence to a modified Mediterranean diet for US populations.	increased adherence to an aMed dietary pattern and intake of its main components, as a possible lifestyle intervention to promote sleep quality in women.	Mediterranean
Mohammadi et al. 2023 (24).	Cross-sectional study	Iranian adults (N=535)	20-60 years	To investigate the relationship between serum MD and brain-derived neurotrophic factor (BDNF) levels and sleep quality and quantity in Iranian adults.	Adults with greater adherence to the Mediterranean diet had significantly lower odds of having short sleep duration and poor sleep quality.	Mediterranean

Theorell-Haglöw et al. 2020 (21)	Cross-sectional cohort study	Men and women (N= 23,829)	45-75 years	To investigate the relationships between sleep duration and adherence to healthy diets.	Short sleep duration combined with poor sleep quality is associated with poor adherence to healthy diet and meal patterns regular.	Mediterranean
Enrique Ramón-Arbués et al. 2022 (29).	Cross-sectional study	Students (N= 868)		To evaluate the association between diet and sleep quality among a group of Spanish university students.	There is a strong correlation between dietary habits and sleep quality, the low consumption of certain foods, as well as the excessive consumption of others that were associated with an increased risk of suffering from a sleep disorder of sleep.	Mediterranean

Lopes et al. 2019 (25)		Patients diagnosed with mild to severe OSA (N = 296).		To analyze the association between dietary inflammatory potential and sleep parameters in individuals with obstructive sleep apnea.	Diets with higher inflammatory potential could increase the risk of OSA symptoms, such as daytime sleepiness.	Mediterranean
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Most of the studies reviewed, whether cross-sectional, cohort or longitudinal, show an association between the Mediterranean diet and better sleep quality. This relationship has been evidenced in parameters such as longer sleep duration, shorter latency to fall asleep and greater sleep efficiency. However, a comparison of the different studies shows that the results are not entirely homogeneous. A key aspect that influences the results is the instrument used to assess sleep quality. Research such as that of Mohammadi et al. (24), Zuraikat et al. (3) and Godos et al. (20) used the Pittsburgh Sleep Quality Index (PSQI), a validated subjective questionnaire. In all these cases, significant associations were observed between greater adherence to the Mediterranean diet and better sleep quality, expressed as longer duration, shorter latency and less frequent interruptions. However, studies such as Verkaar et al. (2) and Hashimoto et al. (28) used objective measures such as actigraphy did not report significant relationships. This difference suggests that the effects of the Mediterranean diet may be more related to the subjective perception of rest than to measurable physiological parameters such as those mentioned above. However, this does not invalidate the positive effects of diet, and raises a possible difference in the type of impact where diet may improve sleep quality from the point of view of overall well-being or perception of rest, although this is not always reflected in objective data collected by devices. Another determining factor is the profile of the people included in each study. For example, Godos et al. (20) observed that the beneficial effects of the Mediterranean diet were more clearly manifested in people with normal weight, in contrast to Oliveira et al. (30), which included participants with obesity and other health conditions, the relationship between diet and sleep was less evident. In addition, when comparing studies with similar results, relevant differences can be observed in the indicators evaluated. For example, both Zuraikat et al. (3) how Jansen et al. (26) agreed that greater adherence to healthy eating patterns and especially those similar to the Mediterranean was associated with fewer nighttime awakenings and greater sleep efficiency. However, only the first of these studies also evaluated the latency to fall asleep, a variable in which a significant improvement was observed. Otherwise, studies with negative results, such as those of Verkaar et al. (2) and Hashimoto et al. (28), used different methodologies and not only that, but also in the sample size and sociocultural context. These differences can affect both the way in which information is received and the Mediterranean pattern is applied, as well as the way in which sleep is experienced and perceived. Finally, research such as that of Ramón-Arbués et al. (29) and Zaidalkilani et al. (27) agree that low adherence to the Mediterranean diet is related to poorer sleep quality, despite having been conducted in very different contexts such as Spanish university students and Arab women with insomnia.

Table 2. Studies relating the ketogenic diet to the quality/quantity of sleep.

Author , year	Type of study	Population	Age range	Feature	Results	Dietary pattern
Shaw et al. 2022 (16)	Randomized, controlled, crossover clinical trial (pilot)	36 military men	Media: 36 years old	This pilot study examined the effect of a 2-week ketogenic diet compared with a carbohydrate diet in military personnel on sleep and heart rate variability.	A 2-week induction to a ketogenic diet in male military personnel does not appear to affect sleep, but it may reduce heart rate variability, which indicating increased physiological stress.	Ketogenic
Iacovides et al. 2019 (32)	Randomized controlled clinical trial	11 participants	Media: 30 years	To determine the effects of a CD compared to a high-carbohydrate, low-fat isocaloric diet on cognitive function, sleep, and mood in healthy, normal-weight individuals.	Sleep quality and morning alertness did not differ between dietary interventions.	Ketogenic
Henderson et al. 2023 (33)	Randomized crossover trial	7 military men	Media: 34 years old	To examine the effect of a 2-week CD, compared with a CHO-based diet, on subjective sleepiness during 36 h of prolonged wakefulness in military personnel.	The 2-week CD, compared to the CHO-based diet, demonstrated beneficial effects sleepiness during 36 h of prolonged wakefulness in military personnel male.	Ketogenic

Compared to the Mediterranean diet, the ketogenic diet has received less attention for investigation regarding its relationship to sleep quality. In this review, only three studies were found that directly analyze this connection and clearly focus on the targets, and two of them were conducted in military populations (33,34), making it difficult to generalize the results to the adult population as a whole. Existing studies, such as those conducted by Shaw et al. (16), Iacovides et al. (32) and Henderson et al. (33) agree that the ketogenic diet does not appear to negatively impact sleep quality in the short term and under controlled conditions. In certain circumstances, positive effects have been observed (16,33), especially in situations of prolonged wakefulness or when alertness is required in cognitively demanding contexts, such as in military environments. In this sense, the ketogenic diet could benefit cognitive performance and attention under certain conditions. Although this does not necessarily imply an objective improvement in sleep quality. Compared with other isocaloric diets (32), mainly high in carbohydrates, no significant differences in sleep parameters such as latency, duration or efficiency have been found. This suggests that the ketogenic diet not only does not improve sleep, but also does not negatively affect it, at least in young, healthy adults. However, minor complications have also arisen. For example, the study by Shaw et al. (16) identified a decrease in heart rate variability during diet implementation which could indicate an increase in physiological stress during the ketosis adaptation phase. This aspect could influence sleep quality if it were to persist over time, although the studies reviewed have not reported significant alterations in sleep quality associated with this phenomenon. It should be emphasized that the current evidence on the ketogenic diet and its impact on sleep remains limited. Most studies have small samples, short intervention periods and have been conducted in specific contexts. With all of the above, more research needs to be conducted, especially with varied populations and in long-term application scenarios, as, two of the three studies were conducted in young, healthy men under controlled military conditions. This gives the possibility of an important bias, since it does not allow us to evaluate how this diet might behave in middle-aged adults, women, or people with already diagnosed sleep disorders. When comparing the Mediterranean diet and the ketogenic diet in relation to their impact on sleep, several significant differences can be noted in terms of the results and the quality of the available evidence. First, the Mediterranean diet is supported by a considerable number of studies that positively link it to sleep quality (3,20-22,24,26-29). The variety of methodological approaches, the diversity of the populations investigated and the consistency of the results strengthen this pattern as an effective tool to improve sleep. In contrast, the ketogenic diet has been scarcely addressed in this context. Only three studies have been identified in this review that specifically evaluate their relationship with sleep, and that meet the requirements. In addition, two of these studies were carried out in a military population (33,34), which seriously limits their applicability to other profiles. Furthermore, none of these studies used validated sleep quality scales such as the PSQI, making direct comparison with the Mediterranean diet studies difficult.

In the study by Iacovides et al. (32), conducted in healthy young adults, no significant differences were observed between the ketogenic diet and a high-carbohydrate diet in terms of sleep duration or sleep efficiency. Shaw et al. (34) also did not identify direct negative effects on sleep, although they detected a reduction in heart rate variability, possibly associated with increased physiological stress during metabolic adaptation,

and Henderson et al. (33) as a result obtained a lower subjective sleepiness during prolonged wakefulness under ketogenic diet, but without directly assessing sleep quality. These results are limited and do not allow consistent benefits to the ketogenic pattern. On the other hand, studies on the Mediterranean diet not only show subjective improvements in sleep, but are also reflected in different cultural settings and levels of health. Thus, for example, benefits have been observed in Spanish university students (29) Iranian women (24), American women (3) and Italian adults (20), this strengthens the validity, as all have consistent methods for measuring sleep quality. In addition, the feasibility and sustainability of each dietary pattern should be considered. The Mediterranean diet, being based on common, culturally accepted foods, has a high long-term adherence (3,20,22)

Discussion and conclusions

After the analysis carried out in this study, it can be concluded that the dietary patterns evaluated, in particular the Mediterranean diet, have a relevant potential as a tool to promote sleep quality in healthy adults. Regarding the Mediterranean diet, its association with improvements in parameters such as sleep latency, duration or efficiency has been supported by a consistent base of studies where these have been conducted in diverse populations and using varied methodologies, and on the contrary, the ketogenic diet, despite not having shown negative effects on rest in the studies reviewed, nor favorable effects, still does not have the necessary evidence to be recommended for this purpose. In conclusion, the Mediterranean diet stands out as a dietary pattern for the improvement of sleep quality, but it would be necessary to incorporate longitudinal studies, with representative population samples, to understand more clearly only the effects of diet on sleep.

Conflict of interest

There is no conflict of interest.

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