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Circadian cycle and nutrition in the weight loss process in obese people

Circadian Cycle and Nutrition in the Weight Reduction Process in People with Obesity

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ABSTRACT

Introduction: Obesity is a chronic, multifactorial disease characterized by excessive accumulation of body fat and is associated with several comorbidities, such as type 2 diabetes mellitus and cardiovascular disease (ABESO, 2019). Estimates show that more than 2.3 billion people worldwide will be overweight by 2025, posing one of the greatest challenges for public health systems. **Objective:** The study aims to analyze the impact of the circadian rhythm on the weight loss process in obese individuals, taking into account hormonal, metabolic, and behavioral factors.

Methodology: This is a descriptive and exploratory literature review. A total of 32 articles were selected from the years 2020 to 2025. After rationing, seven articles in English and Spanish were selected for compilation. **Results:** After analyzing the studies in this review, it is concluded that the association between circadian rhythm and nutrition, through methods such as time-restricted eating, is relevant for both weight loss and obesity management.

Keywords: Circadian rhythm, Obesity, Weight reduction, Night eating, Time restriction eating, Energy intake, Hormonal regulation.

ABSTRACT

Introduction: Obesity is a multifactorial chronic disease, identified by the excessive accumulation of body fat and is related to various comorbidities, such as type 2 diabetes mellitus and cardiovascular diseases (ABESO, 2019). Estimates show that more than 2.3 billion people worldwide would be overweight by 2025, which represents one of the greatest challenges for public health systems. **Objective:** the general objective of the study is to analyze the impact of the circadian cycle on the weight reduction process in individuals with obesity, taking into account hormonal, metabolic, and behavioral aspects. **Methodology:** The study is a bibliographic review with descriptive and exploratory aspects, with a total of 32 articles selected from the years 2020 to 2025. After the screening, 7 articles in English and Spanish were selected for compilation. **Results:** After analyzing the studies in this review, it is concluded that the association between circadian rhythm and nutrition, through methods such as time-restricted eating, is relevant both for weight loss and for obesity management.

Keywords: Circadian rhythm, Obesity, Weight loss, Nighttime eating, Time-restricted feeding, Energy intake, Hormonal regulation.

1. INTRODUCTION

Obesity is a multifactorial chronic disease, identified by the excessive accumulation of body fat and is related to several comorbidities, such as type 2 diabetes mellitus, and cardiovascular diseases (ABESO, 2019). Estimates show that more than 2.3 billion people in the world would be overweight by 2025, which represents one of the biggest challenges for public health systems (ABESO, 2019). Interventions based on calorie restriction and physical activity are constantly recommended for weight loss, but their

long-term effects are usually limited, requiring more integrated approaches and individualized (GREENWAY, 2015).

In view of this, the circadian cycle has been presented as an important component physiological being important in the regulation of energy metabolism (HEMMER et al., 2021). The circadian rhythm lasts about 24 hours and participates in sleep regulation, hormonal release, regulation of body temperature and eating behavior, this cycle is influenced by light, sleep and feeding times (HEMMER et al., 2021). Evidence shows that dysregulation between circadian rhythms and daily behaviors such as irregular eating and sleep deprivation can favor the development of obesity (HEMMER et al., 2021).

Chrononutrition emerges as a promising strategy for realigning the cycle biological and eating behavior. Studies are still little explored on when This is the clinical management of obesity integrated with the circadian cycle and behavior to feed.

Thus, the study's general objective is to analyze the impact of the circadian cycle in the process of weight reduction in obese individuals, taking into account hormonal, metabolic and behavioral aspects.

2 METHODOLOGY

In this work, an integrative bibliographic review study was carried out, descriptive and exploratory characteristics. The study followed the following problem question: “What is the impact of the circadian rhythm and nutrition on the weight loss process in people? with obesity”. The research took place in the following databases: National Library of Medicine (PubMed), and CAPES journals. Using the following descriptors: circadian rhythm, chrononutrition, circadian misalignment, obesity, weight loss, chronotype, diet with time and metabolism restrictions.

The inclusion criteria were studies published in scientific journals that explored the influence of the circadian cycle on the weight loss process in people with obesity. To compile the data and prepare the table, a cutoff was considered 5-year period, between 2020 and 2025, with the aim of using more current research.

Keywords in English were used with the Boolean operator “AND”, and were only primary source articles in English and Spanish were included. excluded: monographs, reviews, editorials, opinions, duplicate studies and research that does not directly address the interaction between the circadian cycle, nutrition and obesity. The

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data collection followed the following steps: initially, the central theme of the study was defined, followed by the delimitation of inclusion and exclusion criteria. Then, the reading was carried out sequential order of titles, analysis of abstracts and, finally, full reading of the selected articles.

The search with related descriptors resulted in a total of 293,179 articles. Of these, 56,044 met the previously established inclusion criteria. After adoption of the exclusion criteria described above, 3,044 articles were kept. The then, to the sequential reading of the titles, excluding those that were not related to the the study theme, resulting in 32 articles for abstract analysis. After this analysis, 7 articles were selected for inclusion in the review. The selection process was structured in an organizational chart (Figure 1), which highlights the main steps involved.

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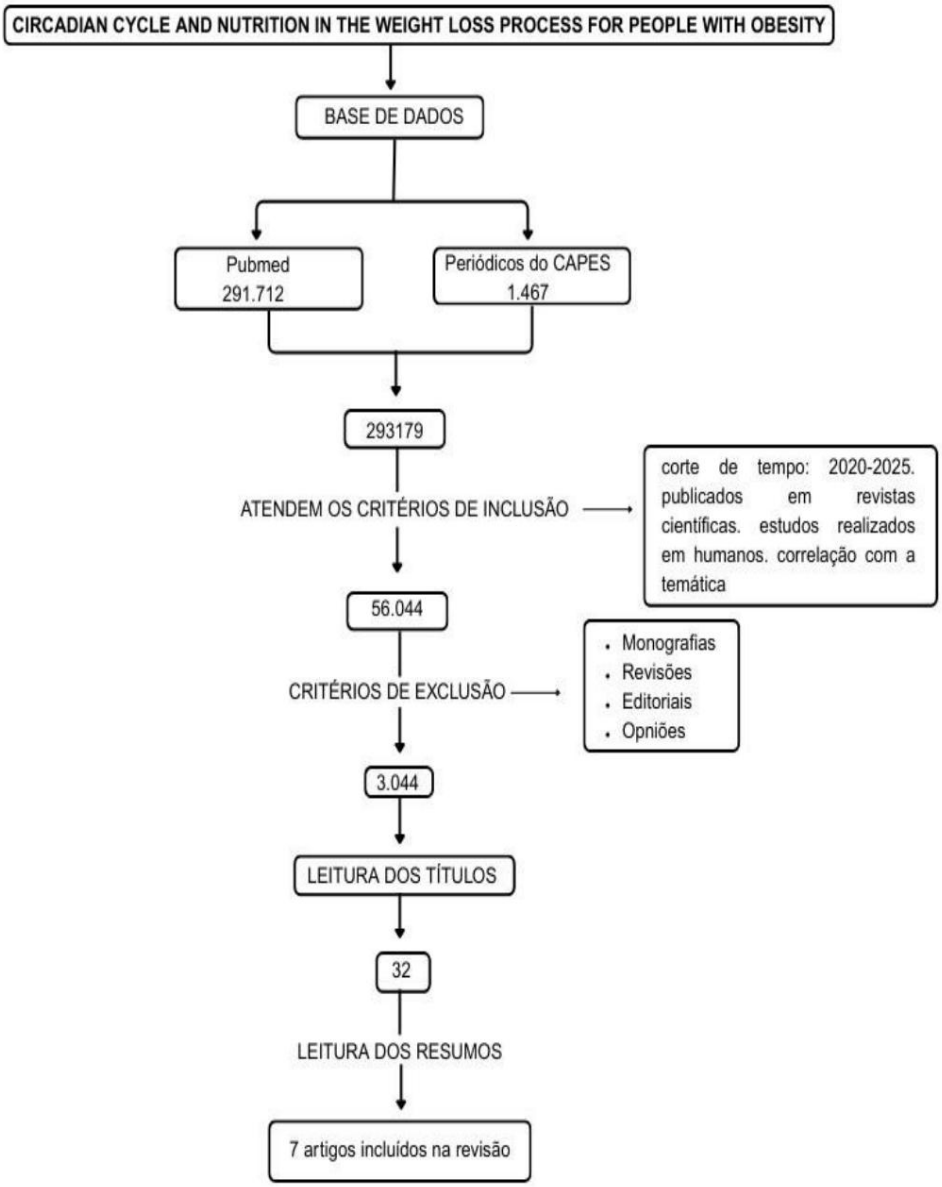
Figure 1. Descriptive organizational chart of the literature review research process.
this article.



Source: developed by the authors, 2025.

3 RESULTS AND DISCUSSION

In table 1, described below, the most significant results were compiled from each scientific article selected in the research, as well as authors, type of study, year of publication, study location, sample, objectives, methodology, and results. The seven articles are studies published in international journals, three of which were carried out in the United States, Türkiye, Japan, Spain, Argentina and Malaysia.

The predominant study was randomized, present in four articles, followed by the cross-sectional study. In addition, an observational study and a quantitative study. The participants' ages ranged from 18 to 75 years. studies were conducted with both sexes and others aimed only at females.

Table 1 – Summary of articles analyzed for review.

Article	Author, year of publication, place of study	Design, type of study and N	Study Objectives	Methodology	Main findings
1	Allison et al. (2021) USA	Randomized crossover clinical trial N=12	Analyze the impact of late daytime eating on weight and versus metabolism.	You Participants followed two dietary protocols controlled by 8 weeks: daytime feeding (8am–7pm) and insulin sensitivity, reduces body weight, improves lipid profile, reduces the trunk/leg ratio. same caloric and sleep and exercise routine.	and
2	Esther Molina-Mo ntes et al. (2022) Spain	Longitudinal observational study N = 3183	Study the connection between genetic variants of questionnaires for circadian clock (12 chronotype, sleep and SNPs in 6 genes) meal times, with chronotype, sleep pattern measurements, anthropometric, chrononutrition and genotyping of selected SNPs obesity, statistical analysis with multivariate regression and production of genetic risk scores.	Data collection,	Genetic variants are linked to lower weight gain and genetic risk score linked to evening chronotype and higher risk of overweight/ obesity.
3	Garro Busts Jessica Vanina, (2024) San Luis, Argentina	Quantitative, descriptive, longitudinal study N = 80	To evaluate the impact of the application of the circadian synchronized food cycle synchronization protocol on health with the metabolic circadian cycle, together with monitoring by a nutritionist, for 10 months.		The results were positive for most participants, 96% of them lost weight, reduced body fat, abdominal circumference, total cholesterol, LDL and triglycerides. the the A link has been identified between evening chronotype and higher BMI and body fat.

4	Yu & Ueda, (2025) Hiroshima, Japan	Randomized, controlled clinical trial N = 24	To analyze the effects of time-restricted with eating on young women, along with to training.	Three groups were divided: (8h–14h), eTRE dTRE (12h–18h) and control (8h–20h). All participants performed 3 sessions/week of push-ups with supported knees. Pre- and post-assessments included weight, triceps brachii thickness via ultrasound, and push-up performance.	The eTRE group (8am-2pm) lost more weight than the others. And shown better alignment with the circadian rhythm, improving weight loss without harming muscle mass.
5	Mazri et al. (2021) Malaysia (Klang Valley)	Cross-sectional study N = 299	To examine whether you temporal patterns of energy and macronutrient intake are associated with the metabolically healthy obesity phenotype (MHO) versus unhealthy (MUO)	Data collection was carried out through a 7-day dietary history and biochemical analysis. Food intake was divided into "early" (before the midpoint of feeding) and "late" (after) windows. Analyzed chronotype, physical activity and laboratory anthropometric data. and	Metabolically unhealthy obese person ingested less energy, carbohydrate and protein in the early window and more energy, fat and carbohydrate in the evening. It is recommended to align food intake with the circadian rhythm to help maintain a healthy metabolic profile.
6	Gu et al. (2020) Baltimore (USA)	Randomized, crossover clinical trial N = 20	To analyze the effects of a late dinner (at 10 pm) versus a usual dinner (at 6 pm) on nocturnal the metabolism, fat oxidation, blood glucose and hormones.	Two dietary protocols were applied with dinners at different times, in a controlled environment with fixed sleep. Monitoring performed put with polysomnography, actigraphy, laboratory tests and hormonal profile	Late dinner (10 p.m.) increased nocturnal postprandial glycemia and reduced fat oxidation. Increased cortisol secretion and impaired glucose tolerance were observed, especially in people with a morning chronotype. Sleep was unchanged, but metabolism became more anabolic, contributing to fat storage. If repeated chronically, this eating pattern can increase the risk of obesity and metabolic syndrome.
7	Vujoviÿ et. Al., (2002) Boston (USA)	Randomized crossover clinical trial N = 16	Analyze the effects of energy expenditure vs. late feeding.	Two early feeding protocols were applied, which reduced the highly	Eating late between meals increased hunger and cravings. It impaired tissue production.

				on hunger, with controlled energy expenditure and temperature. Hormone analysis	adipose. It modified the expression of body temperature and genes in adipose tissue, leading to greater adipogenesis and less lipolysis.

Source: Table developed by the author, 2025.

Based on what was presented, among the main findings, a study highlighted that the combination of circadian rhythm and meal times can provide benefits significant when it comes to weight loss (GARRO BUSTOS, 2024). The choices of foods and how much of them will be consumed is very important for managing obesity, because the circadian rhythm impacts energy homeostasis (AHLUWALIA, 2022).

The descriptive quantitative study demonstrated that a dietary intervention, aligning the biological rhythm to a low glycemic index diet with the inclusion of overnight fasting, resulted in weight loss in 96% of participants, with a reduction in body fat and improvement in metabolic parameters, especially among men (GARRO BUSTOS, 2024). The restriction of eating time can improve insulin sensitivity and improve synchronization of metabolism (HAWLEY et al., 2020).

A second study that also linked meal timing to metabolism, comparing feeding windows in women. The results showed that women with the same diet and physical exercise, who ate between 8am and 2pm, had a considerably greater weight loss compared to those who ate later, strengthening the idea that the timing of feeding impacts the metabolic response (YU & UEDA, 2025). To improve metabolic and hormonal regulation, it is necessary to align the feeding to a diurnal circadian cycle (FRANZAGO et al., 2023).

Two other studies consolidate the harmful effects of late food consumption. The first study found that eating dinner late hindered fat oxidation, increasing the cortisol and glucose levels, especially in individuals with a morning chronotype (GU et al., 2020). Another study showed that eating late, having the same caloric intake habitual, increased appetite, decreased energy expenditure, and altered gene expression in adipose tissue, contributing to fat accumulation (VUJOVIÿ et al., 2022). Food intake dysregulated sleep and exposure to light at night can misalign the circadian cycle and hormone production, contributing to weight gain (MELÉNDEZ-FERNÁNDEZ et al., 2023).

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Additionally, night shift work can disrupt circadian rhythms, dietary intake, inadequate diet and exposure to artificial light at night are linked to a higher risk weight gain, causes insulin resistance and metabolic disorders (HEMMER et al., 2021). When the circadian rhythm is dysregulated, it negatively impacts metabolism, contributing to the development of obesity (FERREIRA et al., 2023).

A study was also analyzed, which studied temporal patterns of eating in overweight/obese individuals. Where they concluded that individuals regardless of their chronotype that consumed more energy during the night and less during the morning people had a higher risk of having an obesity phenotype (MAZRI et al., 2021). Some genetic profiles may integrate with the timing of feeding, contributing to the development of obesity (GKOUSKOU et al., 2024). The individual with chronotype evening people have a greater chance of being overweight and obese, and a greater risk of habits irregular eating habits (VAN DER MERWE et al., 2022).

Finally, research has shown that time-restricted eating is a viable approach to resetting circadian rhythm and improving metabolism (ÿWIÿTKIEWICZ et al., 2021). individualized interventions on food intake, aligned with behavior are effective in managing obesity (AHLUWALIA, 2022). Combining the methods based on the circadian rhythm to a routine of physical activity helps to enhance the results, serving as a complement to body weight reduction (HAWLEY et al., 2020).

FINAL CONSIDERATIONS

From the results found in this research, it is concluded that the alignment between the circadian rhythm and meal times contribute significantly to the process weight loss. The studies analyzed indicate that approaches such as time restriction food and energy consumption during the day are associated with metabolic effects positive, reduction of body fat and, consequently, weight loss.

On the other hand, it was observed that the dysregulation of the circadian rhythm, aligned with patterns irregular or nocturnal eating habits have a negative impact on metabolism, increasing the risk of fat accumulation. Studies show that circadian rhythm dysregulation alters hormone production, causing greater release of the hunger hormone, increasing appetite and decreasing satiety.

Furthermore, it increases insulin resistance, reduces energy expenditure and makes it difficult to reduce weight. In this way, align energy intake with regular times that are compatible with the cycle biological represents an effective method in the treatment of obesity.

It is therefore concluded that the association between circadian rhythm and nutrition, through methods such as time-restricted eating are relevant for weight loss. This is a auspicious approach that can be used in clinical practice for obesity management. However, further studies are still needed to support the conduct described above.

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