MLS – HEALTH & NUTRITION RESEARCH (MLSHNR)
http://mlsjournals.com/Health&nutritionrsearch-Journal
ISSN: 2603-5820
(2025) MLS-Health & Nutrition Research, 4(2), 133-155. doi.org/10.60134/mlshn.v4n2.4245

Obesity and overweight: Ketogenic Diet, Mediterranean Diet or Mindful Eating?

Sobrepeso y obesidad: ¿Dieta congénica, dieta Mediterránea o mindful eating?

Ariadna Mamais Mazzuco
Universidad Europea del Atlántico, Spain (arimamais@gmal.com) (https://orcid.org/0009-0002-0388-3964)

Manuscript information:

Recibido/Received:13/06/25
Revisado/Reviewed: 08/07/25
Aceptado/Accepted: 10/10/25

Keywords:
Obesity, overweight, Mindful Eating, Ketogenic Diet, Mediterranean Diet.

ABSTRACT

Obesity continues to rise and, despite advances in medicine, there is no universally valid nutritional approach for all individuals. The objectives of this study are to compare the effects of the Mediterranean Diet, the Ketogenic Diet, and Mindful Eating in the treatment of overweight and obesity in adults.
Method: A literature review was conducted using scientific evidence generated over the past five years. 23 clinical trial articles published in PubMed (Medline) were selected, analysed, and compared.
Results and Discussion: The studies demonstrate benefits regarding weight, cardiovascular risk, and type 2 diabetes in favor of hypocaloric diets, whether Mediterranean or ketogenic. The benefits of Mindful Eating are related to improvements in eating behavior, without effects on the parameters evaluated in this study. It is concluded that both the hypocaloric Mediterranean Diet and low- and very-low-energy ketogenic diets are useful strategies for treating overweight and obesity in adults. Both dietary patterns lead to weight loss through fat mass reduction and decreased waist circumference, with these changes occurring more rapidly with ketogenic diets. Furthermore, when there is a weight loss of at least 5%, both diets lead to improvements in lipid and glycaemic profiles. Studies show that hypocaloric ketogenic diets do not increase cardiovascular risk; however, very low-calorie ketogenic diets should not be followed for more than two months and should always be supervised by a medical professional..

Palabras clave:
Obesidad, sobrepeso, Mindful Eating, Dieta Cetogénica, Dieta Mediterránea.

RESUMEN

La obesidad continúa en aumento y a pesar de los avances en la medicina, no hay un abordaje nutricional válido para todas las personas. Los objetivos de este trabajo son comparar los efectos de la Dieta Mediterránea, la Dieta Cetogénica y el Mindful Eating en el tratamiento del sobrepeso y la obesidad en adultos. Método: Se realizó una revisión bibliográfica de la evidencia científica generada en los últimos cinco años.

	Se seleccionaron, analizaron y compararon 23 artículos de ensayos clínicos publicados en Pubmed (Medline). Resultados y discusión: Los estudios demuestran beneficios en cuanto al, peso, riesgo cardiovascular y de diabetes tipo 2, a favor de las dietas hipocalóricas ya sea mediterráneas o cetogénicas. Los beneficios del Mindful Eating se relacionan exclusivamente con mejoras en el comportamiento alimentario, sin efectos en los parámetros evaluados. Se concluye que tanto la Dieta Mediterránea hipocalórica como las dietas cetogénicas bajas y muy bajas en energía son estrategias útiles para el tratamiento del sobrepeso y la obesidad en adultos. Ambos patrones alimentarios producen descenso de peso a partir de la masa grasa y disminución de la circunferencia de cintura, siendo estos cambios más veloces con las dietas cetogénicas. Además, cuando se produce un descenso de al menos el 5% del peso, ambas dietas generan mejoras en el perfil lipídico y glucémico. Los estudios demuestran que las dietas cetogénicas hipocalóricas no aumentan el riesgo cardiovascular, sin embargo las que son muy bajas en calorías no deberían realizarse por más de dos meses y sin supervisión médica.

Introduction

Obesity is currently a major health problem throughout the world. According to WHO (1) in 2022, one in eight people were obese, and since 1990, obesity has doubled among adults and quadrupled among adolescents. Children are also a high-risk group for obesity, with increasing prevalence.

Every year, 42 million deaths are caused by non-communicable diseases (NCDs). Two-thirds of these deaths are caused by just four conditions: cancers, coronary heart disease, stroke and diabetes. All of these conditions are closely associated with excess weight (2,3).

Obesity is a chronic, multifactorial disease that originates throughout life due to two mutually reinforcing processes. On the one hand, early effects that occur even before birth, due to parental obesity or during pregnancy; and on the other hand, unhealthy habits such as poor diet and lack of physical activity, influenced by environments that favor the development of obesity. These processes lead to an imbalance between the energy metabolized and the energy used by the body, which favors an accumulation of fat in the body, with consequences for health. This imbalance is caused by multiple factors, such as lack of physical or economic access to fresh food, obesogenic environments, lack of time for cooking, and psychosocial factors (1,3,4). This is why both environmental and behavioral aspects must be addressed when dealing with such a complex chronic pathology (5).

Several therapeutic strategies have been investigated in recent years. Among them are pharmacological ones, such as GLP-1 analogues, and nutritional ones, such as the low glycemic index diet, the ketogenic diet or the Mediterranean diet. However, there is currently no validated and definitive treatment that is effective for all patients and obesity must be approached on an individual and multidisciplinary basis (5).

In this paper, the available scientific evidence will be analyzed to establish a comparison between the effects of the Ketogenic Diet (KD), Mindful Eating (ME) and the Mediterranean Diet (MD) in the treatment of obesity and overweight in adults. On the one hand, changes in weight and waist circumference will be evaluated, and, on the other hand, the reduction in the risk of cardiovascular disease and diabetes will be analyzed by means of plasma lipoprotein and glycemia values. Finally, the possibility and potential benefits of the long-term incorporation of each of the tools will be assessed, with the objective of maintaining or achieving a good nutritional and health status.

Method

This Final Degree Project consists of a bibliographic review of the updated scientific evidence. For its elaboration, articles corresponding to clinical studies have been examined in order to compare the effects of Mindful Eating, the Ketogenic Diet and the Mediterranean Diet in the treatment of obesity and overweight. Only articles with results related to changes in body weight, waist circumference, lipid profile and/or glycemic profile of the participants were included.

For this literature review, a systematic search was carried out in Pubmed (MEDLINE) to compile the relevant studies. In addition, Google Scholar was used to search for information related to each topic, such as clinical practice guidelines, publications of important health organizations and articles more than five years old that were relevant to

the theoretical framework. The search began on February 10, 2025 and ended on April 29, 2025.

The inclusion criteria for the scientific articles were: that they were published between 2019 and 2025, that they were experimental clinical trials, and that they included the results of interest already mentioned. In addition, the study population was observed to be between 18 and 70 years of age, with a BMI between 25 and 45 kg/m2 and without prevalent pathologies (fatty liver or diabetes, for example). The exclusion criteria were: that less than 20 subjects participated, that the subjects had been diagnosed with pathologies and that the studies had a duration of less than 6 weeks. In addition, articles not indexed, not found on the web and those published in journals corresponding to quartiles 3 or 4 of the Scimago Journal and Country Rank were discarded. On the other hand, articles that were not comparable were excluded because they did not present the main characteristics of the intervention in question.

The searches performed in Pubmed, applying the filters of last 5 years and clinical trials, were:

- "Mindful Eating and obesity": 18 articles were obtained from this search, of which 7 were used, as they met the inclusion criteria and did not have the characteristics to be excluded.
- "Mindful Eating and overweight": this search yielded 15 articles of which none were used. The vast majority were included in the previous search.
- "Mediterranean diet and obesity": 179 articles were obtained from this search, of which 7 were used because they met the inclusion criteria and were exempt from the exclusion criteria.
- "Mediterranean diet and overweight": 132 results were obtained, of which 1 study was used. Most of them also corresponded to the previous search.
- "Ketogenic Diet and obesity": this search yielded 48 articles of which 8 were used in this work.
- "Ketogenic diet and overweight": 40 results were obtained and none of the articles were used. Most of them were included in the previous search.
- Google Scholar: This search engine was used to access the full text of some of the selected articles, as well as to search for official web pages, guides and relevant articles used for the theoretical framework and not included in the discussion.

Finally, a total of 23 articles were obtained for the completion of this final degree project.

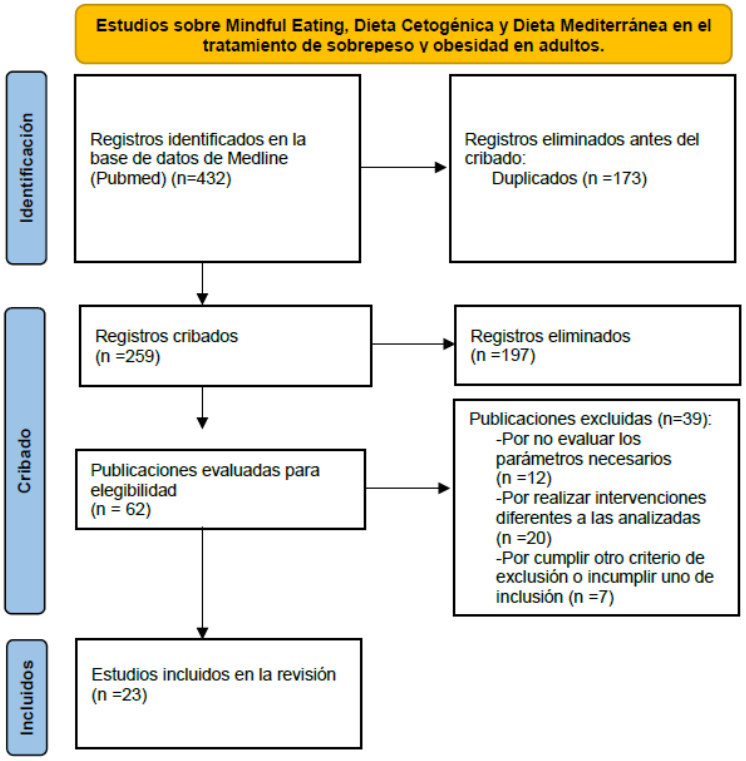

Figure 1. Item selection flowchart.

Discussion and conclusions

The studies on Mindful Eating in the treatment of overweight and obesity are summarized in Table 1.

The vast majority of the articles (6–10) do not show positive results for the parameters studied in this literature review, i.e., EM did not produce changes at the physical or biochemical level in the participants. It should be noted that the Mindful Eating or MB-EAT tool produced improvements in different psychological and eating behavioral aspects. In the study by Salvo et al. (8) the EM intervention achieved a slight decrease in weight (not significant) but with an increase in fat mass and a decrease in lean mass. This effect may be explained by an observed reduction in physical activity levels for the group that received the EM intervention. However, 60% of the program participants reported not performing the mindful eating practices for 7 days or more, which may have affected the results of the study. The study by Moreira et al. (7) also had multiple limitations, caused by the COVID-19 pandemic. This caused many volunteers to drop out of the study and only 45 subjects completed the study. In addition, anthropometric measurements were performed by each individual and EM practices were conducted virtually, which may produce biases. On the other hand, in the trial by Morillo-Sartó et al. (6) the number of participants was low and the subjects knew whether they had been assigned to the experimental or control group, which could affect their expectations and create a bias.

However, Zergani et al. (11) Zergani and Henninger et al. (12) found, in women, improvements in favor of Mindful Eating for body weight. The first showed significant

differences in the two interventions that included ME, compared to the control group, in relation to weight loss (BMI), level of physical activity and self-efficacy. However, the number of subjects who completed the study was small and may not be generalizable to the general population. The limitations reported in the article are very brief, which may indicate a lack of analysis. In addition, changes in weight were greater in the group whose intervention consisted of ME along with implementation intention therapy. In the second study, conducted by Henninger et al. (12)in 8 weeks, the practice of ME generated improvements in fat percentage, waist circumference and weight. They also observed improvements in eating behavior and quality of life. However, the changes were not significant and were only found after complete analysis of the cases, so they should be interpreted carefully as an estimate of efficacy when adherence to treatment is high. On the other hand, the small number of subjects who completed the study and the high dropout rate, unevenly distributed among the groups, are limitations that may have caused a bias and detract from the validity of the result. In addition, adherence to EM treatment was low, indicating that women's acceptance of the intervention was limited. This low adherence may also have minimized the effects of the intervention. Further studies are needed to confirm the effects of EM on weight in the female population.

In summary, the evidence indicates that ME interventions applied in overweight or obese adults do not result in significant benefits in weight and central adiposity. Nor do they appear to generate improvements in health as reflected in the blood lipoprotein profile or glycemic profile. It appears that the points in favor of EM are related solely to eating behavior in both female and male populations. However, the quality of the studies is generally low and the results should be interpreted carefully.

Table 1 Studies on Mindful Eating in the treatment of overweight and obesity.

REFERENCE	TYPE OF STUDY	SUBJECTS	DURATION OF OPERATION	OBJECTIVES	RESULTS
Moreira et al. 2024 (7)	Randomized clinical trial.	45 overweight and obese subjects over 18 years of age.	4 months	To evaluate the effect of EM compared to conventional nutritional treatment on eating behavior, physical activity and weight.	Restrictive eating behavior decreased significantly in the ME group and increased in treatment as usual. Weight decreased only in the usual treatment group.
Morillo Sartó et al. 2023 (6)	Randomized clinical trial with control group.	76 overweight or obese subjects, aged 45 to 75 years.	7 weeks	To evaluate the effect of the ME + conventional treatment program on eating behavior, weight, waist circumference and biochemical parameters, compared to conventional treatment without ME.	A significant reduction in short- and long-term "emotional eating" was seen in the ME group. There was no decrease in weight or waist circumference in any of the groups in the short term, but there were significant differences between the groups in the long term.
Pepe et al. 2023 (9)	Randomized clinical trial.	70 women with obesity. From 18 to 50 years old.	6 months	To compare the effects of ME+hypocaloric diet with those of ME and diet individually, on weight and eating behavior.	There were no differences in the decrease in weight and waist circumference between the groups. The ME group was favored in terms of improvements in eating behavior (uncontrolled eating and emotional eating). The groups that included ME decreased in anxiety and depression.
Salvo et al. 2022 (8)	Randomized clinical trial.	133 low-income, overweight or obese women. From 18 to 60 years old.	10 weeks	To compare the effects of ME + conventional treatment, Mindfulness + conventional treatment and the control group (conventional treatment) on eating behavior, biochemical, anthropometric parameters and body composition.	The ME group had greater improvements in eating behavior (binge eating) followed by the Mindfulness group. Weight decreased in all three groups, favoring the ME group, but not significantly. However, in the ME group, fat mass increased and fat-free mass decreased. There were no significant changes in biochemical parameters.

Zergani et al. 2024 (11)	Randomized, controlled clinical trial.	56 women over 20 years of age, overweight or obese.	3 months	To compare the effects of ME, ME + implementation intention therapy and control group on weight, self-efficacy and physical activity level.	Both experimental groups had significant improvements in physical activity level, weight and self-efficacy. Weight and physical discomfort decreased to a greater extent in the ME + implementation intention group than in the ME group.
Radin et al. 2023 (10)	Randomized, controlled clinical trial.	144 overweight or obese subjects over 18 years of age.	8 weeks	To compare the effects of 4 interventions: Mindfulness meditations, ME+healthy eating, meditations+ME+healthy eating and control group (no intervention), on stress, cravings, and adiposity.	Perceived stress decreased in the ME+meditation group and not in the ME group. No treatment had any effect on weight or BMI.
Henninger et al. 2023 (12)	Randomized, controlled clinical trial.	39 overweight and obese women, aged 18 to 65 years.	8 weeks	To compare the effects of ME and one type of Yoga *("YogaDance"),* jointly and individually, on body fat, weight, waist circumference, quality of life and eating behavior.	In the ME and ME+*"YogaDance"* groups, fat percentage and waist circumference decreased, while quality of life and eating behavior improved, compared to the control group. However, the differences were not significant.

ME: Mindful Eating.

Regarding the use of the Mediterranean Diet (MD) to treat obesity and overweight, Table 2 summarizes the studies analyzed in this work.

Regarding DM without caloric restriction, Meslier et al. (13) and Uffelman et al. (14) observed a significant decrease in total and HDL cholesterol, as a function of adherence to the diet, without changes in glycemia. In Meslier's study, LDL cholesterol was also reduced. HDL lowering is not desirable at the cardiovascular level, but both interventions lasted only 8 weeks, possibly insufficient for profound changes.

Jospe et al. (15)with isocaloric DM, found reductions in weight, body fat and waist circumference at 6 and 12 months, associated with high adherence (2.2% and 3% decrease in body weight, respectively). Of note was the significant decrease in HbA1c, linked to a higher fiber intake, although there were no changes in plasma lipids. This could be explained by the lack of exhaustive control over intake, the higher consumption of processed meats and the absence of randomization, which introduces biases but also provides realism. The high completion rate (171 people) reinforces the validity of the findings.

Picklo et al. (16)evaluated an isocaloric DM with and without eggs. The diet without eggs improved total cholesterol, LDL and triglycerides; the one that included eggs showed no benefit. This crossover study (4 weeks per phase) showed great individual variability with respect to dietary cholesterol, a relevant aspect when evaluating results. However, the small sample size limits the validity of the study.

Barnard et al. (17)compared, in a crossover clinical trial, normocaloric DM with a low-fat vegan diet, with no findings in favor of DM. However, the records showed an unplanned caloric deficit of 500 kcal during the vegan diet, probably because of its greater restrictiveness. This could have generated a compensatory increase in intake during the DM period, diminishing its effect. In addition, the weight gain observed during the washout period suggests subsequent offsets. It is possible that biases have been introduced, intentional or not, favoring the vegan diet.

Regarding DM with caloric restriction, Rosi et al. (18) found that both the diet with high pasta intake (AP) and the diet excluding pasta (BP) reduced blood glucose, insulin and HOMA index in 6 months. The AP diet reduced total cholesterol and increased HDL, while the BP reduced triglycerides. Although there were statistical differences, both improved the lipid profile in a similar way. Weight loss was significant in both groups (7% BP and 10% AP), coming from body fat without muscle loss. Allocation by preference, and not randomization, could generate biases but also greater adherence, suggesting that including preferred foods in hypocaloric diets could improve outcomes.

Dellis et al. (19)compared two hypocaloric DM, one excluding carbohydrates at breakfast. Both reduced weight, body fat and waist circumference, with better results in the carbohydrate-free diet in the morning (9% vs. 6% in 2 months), possibly due to greater satiety of protein and fatty foods. The loss was greater in men. Glycemia, insulin and HOMA index decreased in both, as did triglycerides and HDL. LDL only decreased in the diet that included carbohydrates in the morning, perhaps due to the higher consumption of saturated fats in the other group.

The study by Luo et al. (20)the study, with a large number of participants, showed that DM significantly improved glycemic control, total cholesterol and LDL, with weight decreases of 6.5% at 3 months and 7.2% at 6 months. As with many diets, the initial decline was greater and then plateaued, suggesting possible sustained loss and long-term benefits.

In summary, DM without caloric restriction can generate a slight weight loss in overweight adults, although this effect could be more related to participation in the study

than to the diet itself. Improvements in glycemic control and lipid profile are inconclusive, and the loss of at least 5% of body weight appears to be a key factor in optimizing these parameters.

In contrast, the evidence indicates that energy-restricted DM achieves sustained reductions in weight and body fat, even after one year, with significant improvements in blood glucose, total cholesterol, LDL and triglycerides. These effects appear to be linked to high fiber intake, low caloric density foods and lower consumption of red or processed meats. It would be useful to investigate why HDL cholesterol decreases in various studies. Finally, for overweight people, DM could be established as a habitual eating pattern and not only as a diet for specific purposes.

Table 2 Studies on the Mediterranean Diet in the treatment of overweight and obesity.

REFERENCE	TYPE OF STUDY	SUBJECTS	DURATION OF OPERATION	OBJECTIVES	RESULTS
Jospe et al. 2020 (15)	Non-randomized clinical trial.	171 Subjects overweight grade 2 or obese. Over 18 years old.	12 months.	To compare the effects of the Paleo diet, DM and intermittent fasting, with or without HIIT (high-intensity intermittent exercise) on adherence, intake, and anthropometric and cardiometabolic parameters.	DM produced more significant improvements in glycemic control. All groups lost weight at 6 months, but at 12 months only with intermittent fasting and DM. Those who adhered more to DM showed a greater decrease in weight. Fat mass and waist circumference decreased similarly in all 3 diets.
Meslier et al. 2020 (13)	Randomized controlled clinical trial.	82 overweight or obese subjects	8 weeks	To compare the effects of a Mediterranean Diet (normocaloric) with a control group (usual Western diet) on cardiometabolic health, markers of inflammation and microbiota.	DM produced a significant decrease in LDL cholesterol compared to the control group, which was directly proportional to dietary adherence.
Picklo et al. 2022 (16)	Randomized crossover clinical trial.	33 overweight or obese subjects aged 20 to 75 years.	4 weeks per procedure, with a 4-week washout period between each procedure.	To compare the effect of a DM without whole egg, a DM with 1 egg/1000 kcal/day and an average American diet on lipid profile. All three diets were isocaloric.	Total and LDL cholesterol were significantly reduced in the egg-free DM and in the American diet. Triglycerides also decreased with DM. Consumption of 1 egg per 1000 kcal. It did not increase cardiovascular risk.

Uffelman et al. 2024 (14)	Randomized clinical trial.	60 subjects aged 30 to 69 years with overweight or obesity.	2 months	To compare the effects of DM with DM with high mushroom intake on cardiometabolic health. The diets were normocaloric.	The implementation of both Mediterranean diets produced a non-significant decrease in total and HDL cholesterol. DM with mushrooms slightly decreased blood glucose levels.
Rosi et al. 2020 (18)	Non-randomized clinical trial.	49 subjects with obesity, 18 years of age and older	6 months	To compare the effects of two hypocaloric DM, one high in pasta (minimum 5 servings per week) and the other low in pasta (up to 3 servings per week), on weight, anthropometric parameters, body composition, quality of life and intake of the subjects. As well as in the lipid and glycemic profile.	Both diets significantly decreased body weight, waist circumference and body fat. They also improved insulin sensitivity and lipid profile.
Dellis et al. 2019 (19)	Randomized clinical trial.	70 obese or overweight subjects aged 18 to 65 years.	2 months	To compare the effect of a hypocaloric DM with a hypocaloric DM deprived of carbohydrates during the morning on weight, waist circumference, body fat, insulin sensitivity and lipid profile.	Only in the unrestricted group was LDL cholesterol reduced. In both groups, HDL cholesterol, triglycerides, waist circumference and insulin sensitivity decreased and there was a decrease in weight greater than or equal to 5%. In the group that avoided carbohydrates in the morning, weight loss was faster.
Luo et al. 2022 (20)	Randomized clinical trial.	202 overweight and obese subjects in Asia (BMI greater	6 months	To compare the effects of three hypocaloric diets: a DM, a typical traditional Chinese plant-based diet, and a diet high	In all three groups, weight decreased by 7% of body weight at 6 months and the lipid profile improved significantly The DM

		than or equal to 24)		in animal products, on weight and insulin sensitivity.	group had the best glycemic control.

DM: Mediterranean Diet

Regarding the effects of ketogenic diets (KD) for treating obesity and overweight, Table 3 describes the included studies.

Trials of very low calorie ketogenic diets (VLCKD) have shown a rapid decrease in weight and waist circumference (21–25) show a rapid decrease in weight and waist circumference. Di Rosa et al. (21)with 268 participants, found that the VLCKD achieved a 5% reduction in body weight in one month, compared to the three months required with the Mediterranean Diet (MD). Although the increase in fat-free mass was lower, no fat loss was observed, despite the rapid weight reduction. The use of supplements (vitamins, minerals, bicarbonate and omega 3) could have favored the results.

Sanchez et al. (25) also compared VLCKD and DM, observing a significant decrease in weight and body fat at 6 months, without affecting muscle mass. Although only 20 subjects completed the study, adherence was high. In the studies of Cunha et al. (22) and Caprio et al. (23)in addition, the VLCKD achieved greater reductions in weight (9.8% and 8.9%, respectively) and waist circumference than a conventional hypocaloric diet, in addition to reducing fasting blood glucose. However, both trials included few participants, which limits the validity of the results, although adherence was high.

In the trial by Basciani et al. (24)in addition, the VLCKD with vegetable or whey proteins produced a greater loss of weight and abdominal fat than that based on animal proteins. Although the differences were small, all three interventions significantly reduced waist circumference. As for glycemia, only the diet with animal and whey protein achieved a significant decrease. However, the HOMA index and insulin improved in all three groups, as did plasma lipids (total cholesterol, LDL and triglycerides). Adverse effects were mild and there were no dropouts, although the intervention lasted only 45 days and the number of participants who finished was 48.

Regarding low-calorie ketogenic diets (LCKD), Michalczyk et al. (26) observed a 15% reduction in body weight in 3 months with a 20% caloric deficit. Waist, blood glucose, triglycerides and HDL also improved. The diet included 70% fat, so the effect on LDL cholesterol was not evaluated. The study focused on women, which is relevant given the paucity of evidence in this group. Adherence was good, possibly due to less restriction compared to VLCKDs, and participants received calcium, vitamin D and multivitamin supplementation.

Lim et al. (27)in a 6-month study, they found weight reductions of 6.9% at 3 months, lower than in the previous study, despite a similar caloric deficit. This could be explained by a lower adherence to macronutrient distribution. Over time, weight loss slowed and some recovery was observed at one year. HbA1c and triglycerides decreased significantly, while total cholesterol decreased slightly. Supplementation was also used, although its impact is unknown. Notably, the CD group had a dropout rate twice as high as the control group, with no clear explanation in the study.

Wu et al. (28) evaluated a hypocaloric DC in phases, designed according to the Chinese food culture. This produced improvements in weight, fat mass, visceral fat and waist circumference, with an 8% weight loss in 3 months, slightly higher than that achieved with a drug (GLP-1 agonist). HbA1c, HOMA and triglycerides were also reduced, and HDL increased without raising LDL. Adverse effects were minor and adherence was high. No randomization was performed, since the participants chose their intervention, which may have generated bias, although it provides a perspective closer to real life.

In summary, VLCKD allows a rapid weight loss (more than 6% in two months) and a decrease in waist circumference, due to its low energy intake (600-800 kcal/day). They also generate early improvements in glycemic metabolism and could benefit the lipid

profile, although the evidence is still limited. The loss of fat mass without affecting muscle mass reinforces its usefulness in people with severe obesity who require rapid reductions. However, most studies have a maximum duration of 2 months, so prolonged application is not recommended. Supplementation and medical supervision are essential due to the low caloric intake.

LCKDs also promote relevant weight reductions (more than 5% in 3 months), improving waist circumference, glycemia, triglycerides and HDL. They do not increase total or LDL cholesterol if unsaturated fats are prioritized. As with VLCKDs, their effectiveness is greatest in the first 3 months, and it is not recommended to extend them beyond 6 months due to the paucity of long-term evidence. The reported good adherence could be related to the anorexigenic effect of ketone bodies. Although it is not known whether these diets cause a rebound effect, the observed preservation of muscle mass could contribute to avoid it.

Table 3 Studies on the ketogenic diet in the treatment of overweight and obesity.

REFERENCE	TYPE OF STUDY	SUBJECTS	DURATION OF OPERATION	OBJECTIVES	RESULTS
Cunha et al. 2020 (22)	Randomized clinical trial.	39 subjects with obesity, over 18 years of age.	2 months	To compare the effects of a VLCKD with a standard hypocaloric diet on visceral fat and liver fat.	In the VLCKD group, compared to the hypocaloric diet, a significant decrease in weight, waist circumference, visceral fat and liver fat was observed.
Di Rosa et al. 2022 (21)	Randomized clinical trial.	268 subjects aged 18 to 70 years, overweight or obese.	3 months	To compare the time it takes for VLCKD and hypocaloric DM to generate a 5% decrease in body weight and changes in body composition.	To decrease 5% of body weight, it took 1 month with VLCKD and 3 months with DM. However, in the DM group there was a greater decrease in fat mass and waist circumference and a greater increase in fat-free mass.
Lim et al. 2024 (27)	Randomized controlled clinical trial.	59 subjects aged 21 to 65 years, with obesity (BMI greater than 27.5 kg/m2 in Asia).	6 months	To compare the effects of a healthy hypocaloric CD with those of a usual hypocaloric diet on weight loss at 3, 6 and 12 months, together with changes in metabolic parameters.	A significant difference was seen in favor of DC in weight loss at 3 and 6 months. For HbA1 and triglycerides the difference was also significant at 12 months. Total and LDL cholesterol showed significant differences at 12 months only.
Michalczyk et al.2020 (26)	Randomized controlled clinical trial.	91 overweight or obese women aged 30 to 60 years.	3 months.	To compare the effects of a LCKD on blood glucose, insulin, HbA1c, waist circumference and lipid profile, compared to a control group (no intervention)	Significant improvements were seen in blood glucose, insulin, HbA1c, HDL cholesterol and triglyceride values compared to the control group. In addition, there was a significant difference in the decrease in weight and waist circumference.

Caprio et al. 2023 (23)	Randomized clinical trial.	39 overweight or obese subjects, aged 18 to 65 years, who suffered from frequent migraines.	2 months	To compare VLCKD with a balanced hypocaloric diet, in parameters respective to migraine, anthropometric parameters, plasma lymphocytes, inflammation, changes in aldosterone and renin.	A significantly greater decrease in weight, waist circumference and visceral fat was seen in the VLCKD group. four months later, they had not regained weight. Glycemia decreased significantly in this group.
Wu et al. 2022 (28)	Non-randomized clinical trial.	90 subjects with obesity (BMI higher than 28 kg/m2 in Asia)	12 weeks	To compare the effects of a CD intervention (in phases), with one of lifestyle changes + hypocaloric diet, with a pharmacological one (GLP-1 agonist) on anthropometric and metabolic parameters.	The effect of CD on weight loss was significant and somewhat superior to pharmacological treatment. CD significantly decreased fat mass, visceral fat, waist circumference, insulin sensitivity and blood pressure. It did not increase triglycerides or LDL cholesterol.
Basciani et al. 2020 (24)	Randomized clinical trial.	48 subjects with obesity, aged 50 to 70 years old.	45 days	To compare the effects of three types of VLCKD: with animal, vegetable or whey protein, on microbiota, body composition, lipid profile, insulin sensitivity.	Blood pressure, waist circumference, HOMA index, insulin, total and LDL cholesterol and triglycerides decreased significantly in all three groups. Weight and abdominal fat decreased significantly in the whey and vegetable protein group.
Sanchez et al. 2021 (25)	Randomized clinical trial.	20 obese or overweight subjects, aged 18 to 65 years.	6 months	To compare the effects of a VLCKD compared to a hypocaloric DM, on weight and fat mass reduction, endothelial function and vasa vasorum density.	VLCKD produced a reduction in markers of endothelial dysfunction and atheromatous disease. Results associated with a significant decrease in body weight and total body fat, compared to DM.

DC: Ketogenic Diet; VLCKD: Very low calorie ketogenic diet; LCKD: Low-calorie ketogenic diet; DM: Mediterranean Diet.

It is concluded that Mindful Eating does not produce changes in body weight or waist circumference, nor in plasma lipoprotein values or glycemic profile. Therefore, it also does not reduce the risk of cardiovascular disease or type 2 diabetes. On the other hand, the hypocaloric Mediterranean Diet produces weight loss and a decrease in waist circumference, as well as improvements in the lipid and glycemic profile. This could be realized in the long term by promoting cardiovascular health and reducing the risk of type 2 diabetes. On the other hand, low and very low calorie ketogenic diets produce a very significant weight loss in a short period of time (more than 5% in two months), as well as a reduction in waist circumference and plasma triglycerides. They also improve glycemic control and increase HDL cholesterol. These diets do not raise LDL cholesterol and do not produce a loss of lean mass. However, they should be performed in the short term, especially VLCKD (maximum 2 months for very low calorie and 6 months for low calorie) as there is no evidence of their application for longer periods.

Thus, both DC and energy-restricted DM are effective in preventing cardiovascular disease and type 2 diabetes in people who are obese or overweight. With both diets, a loss of at least 5% of body weight is required to observe improvements in plasma lipoprotein and glycemia values.

The limitations of this work are diverse. On the one hand, there are those related to the low quality of the available evidence on EM in the treatment of this disease; also the short duration of the studies of the three interventions and the lack of follow-up of the patients after the end of the interventions. In addition, most of the studies were concluded for very few subjects, limiting the possibility of extrapolating the results to the population. Nor was it possible to evaluate the different effects according to sex and degree of overweight/obesity, since these divisions are not made in the analyses of the studies. On the other hand, comparing a behavioral strategy with a dietary strategy can be complex and even unnecessary, since they are not mutually exclusive.

It would be interesting to conduct long-term studies (1 year or more) that analyze the effects of Mindful Eating in the treatment of obesity and overweight, carrying out periodic face-to-face interventions with a large number of participants. As well as performing long-term (years) follow-up of subjects participating in studies on ME, CD and DM in obesity and overweight, after the interventions have ended. It would also be useful to analyze, in cohort studies, the long-term impact of ketogenic diets on cardiovascular risk and type 2 diabetes, differentiating the effects in men and women. Finally, it would be important to analyze the effects of ketogenic and Mediterranean low-calorie diets on visceral fat (by bioimpedance) and markers of inflammation.

¶ (12 points)

References (14 points)

¶ (12 points)

1. Obesidad y sobrepeso [Internet]. [cited November 30, 2024]. Available at: https://www.who.int/es/news-room/fact-sheets/detail/obesity-and-overweight

2. World Obesity Federation Global Obesity Observatory [Internet]. [citado 25 de febrero de 2025]. World Obesity Day Atlases | Obesity Atlas 2024. Available at: https://data.worldobesity.org/publications/?cat=22

3. Europe WHORO for. WHO European Regional Obesity Report 2022 [Internet]. World Health Organization. Regional Office for Europe; 2022 [citado 10 de abril de 2025]. Available at: https://iris.who.int/handle/10665/353747

4. Sobrepeso y obesidad - Causas y factores de riesgo | NHLBI, NIH [Internet]. 2022 [cited February 8, 2025]. Available at: https://www.nhlbi.nih.gov/es/salud/sobrepeso-y-obesidad/causas

5. SEEDO [Internet]. 2024 [cited March 2, 2025]. Guía Española Giro. Available at: https://www.seedo.es/index.php/guia-giro

6. Morillo-Sarto H, López-del-Hoyo Y, Pérez-Aranda A, Modrego-Alarcón M, Barceló-Soler A, Borao L, et al. 'Mindful eating' for reducing emotional eating in patients with overweight or obesity in primary care settings: A randomized controlled trial. Eur Eat Disord Rev [Internet]. marzo de 2023 [cited February 7, 2025];31(2):303-19. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10100015/

7. Moreira MFS, de Azevedo BEF, Beretta MV, Busnello FM. Nutritional Counseling Based on Mindful Eating for the Eating Behavior of People Living with Overweight and Obesity: A Randomized Clinical Trial. Nutrients [Internet]. 20 de diciembre de 2024 [cited February 7, 2025];16(24):4388. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11676100/

8. Salvo V, Curado DF, Sanudo A, Kristeller J, Schveitzer MC, Favarato ML, et al. Comparative effectiveness of mindfulness and mindful eating programmes among low-income overweight women in primary health care: A randomised controlled pragmatic study with psychological, biochemical, and anthropometric outcomes. Appetite [Internet]. October 1, 2022 [cited February 7, 2025];177:106131. Available at: https://www.sciencedirect.com/science/article/pii/S0195666322002227

9. Pepe RB, Coelho GS de MA, Miguel F da S, Gualassi AC, Sarvas MM, Cercato C, et al. Mindful eating for weight loss in women with obesity: a randomised controlled trial. Br J Nutr [Internet]. septiembre de 2023 [cited February 7, 2025];130(5):911-20. Available at: https://www.cambridge.org/core/journals/british-journal-of-nutrition/article/mindful-eating-for-weight-loss-in-women-with-obesity-a-randomised-controlled-trial/FEBA9D60A940E6FC5C1FAD6D5C0B2E2F

10. Radin RM, Epel ES, Mason AE, Vaccaro J, Fromer E, Guan J, et al. Impact of digital meditation on work stress and health outcomes among adults with overweight: A randomized controlled trial. PloS One. 2023;18(3):e0280808.

11. Zergani MJ, Taghdisi MH, Seirafi M, Malihialzackerin S, Kojidi HT. Mindfulness-based eating awareness training versus itself plus implementation intention model: a randomized clinical trial. Eat Weight Disord [Internet]. 2024 [cited February 7, 2025];29(1):53. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11329387/

12. Henninger SH, Fibieger AY, Magkos F, Ritz C. Effects of Mindful Eating and YogaDance among Overweight and Obese Women: An Exploratory Randomized Controlled Trial. Nutrients. March 28, 2023;15(7):1646.

13. Meslier V, Laiola M, Roager HM, De Filippis F, Roume H, Quinquis B, et al. Mediterranean diet intervention in overweight and obese subjects lowers plasma cholesterol and causes changes in the gut microbiome and metabolome independently of energy intake. Gut. julio de 2020;69(7):1258-68.

14. Uffelman CN, Schmok JN, Campbell RE, Hartman AS, Olson MR, Anderson NL, et al. Consuming Mushrooms When Adopting a Healthy Mediterranean-Style Dietary Pattern Does Not Influence Short-Term Changes of Most Cardiometabolic Disease Risk Factors in Healthy Middle-Aged and Older Adults. J Nutr [Internet]. February 2024 [February 20,

2025];154(2):574-82. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10997904/

15. Jospe MR, Roy M, Brown RC, Haszard JJ, Meredith-Jones K, Fangupo LJ, et al. Intermittent fasting, Paleolithic, or Mediterranean diets in the real world: exploratory secondary analyses of a weight-loss trial that included choice of diet and exercise. Am J Clin Nutr [Internet]. March 1, 2020 [cited February 21, 2025];111(3):503-14. Available at: https://www.sciencedirect.com/science/article/pii/S0002916522010322

16. Picklo M, Rust BM, Yeater K, Raatz S. Identification of different lipoprotein response types in people following a Mediterranean diet pattern with and without whole eggs. Nutr Res N Y N. septiembre de 2022;105:82-96.

17. Barnard ND, Alwarith J, Rembert E, Brandon L, Nguyen M, Goergen A, et al. A Mediterranean Diet and Low-Fat Vegan Diet to Improve Body Weight and Cardiometabolic Risk Factors: A Randomized, Cross-over Trial. J Am Nutr Assoc [Internet]. February 17, 2022 [cited February 28, 2025];41(2):127-39. Available at: https://doi.org/10.1080/07315724.2020.1869625

18. Rosi A, Tesan M, Cremonini A, Biasini B, Bicchieri L, Cossu M, et al. Body weight of individuals with obesity decreases after a 6-month high pasta or low pasta Mediterranean diet weight-loss intervention. Nutr Metab Cardiovasc Dis [Internet]. June 2020 [cited February 21, 2025];30(6):984-95. Available at: https://linkinghub.elsevier.com/retrieve/pii/S0939475320300612

19. Dellis D, Tsilingiris D, Eleftheriadou I, Tentolouris A, Sfikakis PP, Dellis G, et al. Carbohydrate restriction in the morning increases weight loss effect of a hypocaloric Mediterranean type diet: a randomized, parallel group dietary intervention in overweight and obese subjects. Nutrition [Internet]. March 1, 2020 [cited February 20, 2025];71:110578. Available at: https://www.sciencedirect.com/science/article/pii/S0899900719301388

20. Luo Y, Wang J, Sun L, Gu W, Zong G, Song B, et al. Isocaloric-restricted Mediterranean Diet and Chinese Diets High or Low in Plants in Adults With Prediabetes. J Clin Endocrinol Metab [Internet]. May 17, 2022 [cited February 28, 2025];107(8):2216-27. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9282247/

21. Di Rosa C, Lattanzi G, Spiezia C, Imperia E, Piccirilli S, Beato I, et al. Mediterranean Diet versus Very Low-Calorie Ketogenic Diet: Effects of Reaching 5% Body Weight Loss on Body Composition in Subjects with Overweight and with Obesity—A Cohort Study. Int J Environ Res Public Health [Internet]. October 11, 2022 [cited February 13, 2025];19(20):13040. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9603454/

22. Cunha GM, Guzman G, Correa De Mello LL, Trein B, Spina L, Bussade I, et al. Efficacy of a 2-Month Very Low-Calorie Ketogenic Diet (VLCKD) Compared to a Standard Low-Calorie Diet in Reducing Visceral and Liver Fat Accumulation in Patients With Obesity. Front Endocrinol [Internet]. September 14, 2020 [cited February 13, 2025];11:607. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7521128/

23. Caprio M, Moriconi E, Camajani E, Feraco A, Marzolla V, Vitiello L, et al. Very-low-calorie ketogenic diet vs hypocaloric balanced diet in the prevention of high-frequency episodic migraine: the EMIKETO randomized, controlled trial. J Transl Med [Internet]. October 4, 2023 [cited February 23, 2025];21:692. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10548576/

24. Basciani S, Camajani E, Contini S, Persichetti A, Risi R, Bertoldi L, et al. Very-Low-Calorie Ketogenic Diets With Whey, Vegetable, or Animal Protein in Patients With Obesity: A Randomized Pilot Study. J Clin Endocrinol Metab. 1 de septiembre de 2020;105(9):dgaa336.

25. Sánchez E, Santos MD, Nuñez-Garcia M, Bueno M, Sajoux I, Yeramian A, et al. Randomized Clinical Trial to Evaluate the Morphological Changes in the Adventitial Vasa Vasorum Density and Biological Markers of Endothelial Dysfunction in Subjects with Moderate Obesity Undergoing a Very Low-Calorie Ketogenic Diet. Nutrients [Internet]. December 23, 2021 [cited February 21, 2025];14(1):33. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8746664/

26. Michalczyk MM, Klonek G, Maszczyk A, Zajac A. The Effects of a Low Calorie Ketogenic Diet on Glycaemic Control Variables in Hyperinsulinemic Overweight/Obese Females. Nutrients [Internet]. June 22, 2020 [cited February 13, 2025];12(6):1854. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7353458/

27. Lim SL, Tay M, Ang SM, Wai SN, Ong KW, Neo WJ, et al. Development and Pragmatic Randomized Controlled Trial of Healthy Ketogenic Diet Versus Energy-Restricted Diet on Weight Loss in Adults with Obesity. Nutrients [Internet]. December 19, 2024 [cited February 13, 2025];16(24):4380. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC11677078/

28. Wu W, Zhou Q, Yuan P, Qiao D, Deng S, Cheng H, et al. A Novel Multiphase Modified Ketogenic Diet: An Effective and Safe Tool for Weight Loss in Chinese Obese Patients. Diabetes Metab Syndr Obes Targets Ther [Internet]. 1August 7, 2022 [cited February 23, 2025];15:2521-34. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9393022/