

The effectiveness of diet and exercise in the management of obesity

La eficacia de la dieta y el ejercicio en el manejo de la obesidad

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Abstract. Background and objectives: Obesity is a growing global health problem and is becoming a significant challenge in the clinical and public health fields. One of the main concerns is the impact on an individual's quality of life. This review aims to evaluate the effectiveness of various interventions, including physical activity and diet, in the management of obesity. Methodology: The selected studies involved a population of adults who were obese (aged 18 years and over) and had made lifestyle modifications through pattern changes, eating, physical activity, or both. A total of 324 articles were screened, of which 25 were duplicates. After a screening process for suitability, 261 articles were excluded. A further 27 articles were excluded due to inappropriate study design or incomplete data. A total of 11 full-text articles were then reviewed and included in our analysis. The results showed that participants who followed a milk-based diet recorded a significant decrease in body weight of -1.16 kg (confidence interval -1.66, -0.66 kg; $p < 0.001$) as well as a decrease in body fat mass of -1.49 kg (confidence interval -2.06, -0.92 kg; $p < 0.001$). Participants who adopted an alternate day fasting (ADF) eating pattern achieved an average weight loss of $-0.9\% \pm 0.6\%$ in the low weight loss group and $-9.9\% \pm 1.1\%$ in the low weight loss group. Meanwhile, participants who restricted calorie intake (Caloric Restriction/CR) recorded a weight loss of $-1.3\% \pm 0.7\%$ in the low weight loss group and $-9.2\% \pm 1.2\%$ in the weight loss group tall body. Combining approximately 175 minutes of intense physical activity per week with a controlled diet results in significant weight loss of up to 5%. In conclusion, this systematic review confirms that the most effective approach in the management of obesity in adults is a combination of strength and cardiovascular training of at least 175 minutes per week and a low-calorie diet tailored to the individual's metabolic needs and health condition.

Keywords: Obesity management; diet and exercise efficacy; obesity treatment; physical activity and weight loss

Resumen. Antecedentes y objetivos: La obesidad es un problema de salud mundial creciente y se está convirtiendo en un desafío importante en los campos clínico y de salud pública. Una de las principales preocupaciones es el impacto en la calidad de vida de un individuo. Esta revisión tiene como objetivo evaluar la efectividad de diversas intervenciones, incluida la actividad física y la dieta, en el tratamiento de la obesidad. Metodología: Los estudios seleccionados involucraron a una población de adultos obesos (de 18 años o más) que habían realizado modificaciones en su estilo de vida mediante cambios de patrones, alimentación, actividad física o ambas. Se examinaron un total de 324 artículos, de los cuales 25 eran duplicados. Después de un proceso de selección de idoneidad, se excluyeron 261 artículos. Se excluyeron otros 27 artículos debido a un diseño de estudio inadecuado o datos incompletos. Luego se revisó e incluyó en nuestro análisis un total de 11 artículos de texto completo. Los resultados mostraron que los participantes que siguieron una dieta a base de leche registraron una disminución significativa en el peso corporal de -1,16 kg (intervalo de confianza -1,66, -0,66 kg; $p < 0,001$), así como una disminución en la masa grasa corporal de -1,49 kg. (intervalo de confianza -2,06, -0,92 kg; $p < 0,001$). Los participantes que adoptaron un patrón de alimentación de ayuno en días alternos (ADF) lograron una pérdida de peso promedio de $-0,9\% \pm 0,6\%$ en el grupo de baja pérdida de peso y $-9,9\% \pm 1,1\%$ en el grupo de baja pérdida de peso. Mientras tanto, los participantes que restringieron la ingesta de calorías (Restricción Calórica/CR) registraron una pérdida de peso de $-1,3\% \pm 0,7\%$ en el grupo de pérdida de peso baja y $-9,2\% \pm 1,2\%$ en el grupo de pérdida de peso de cuerpo alto. Combinar aproximadamente 175 minutos de actividad física intensa a la semana con una dieta controlada da como resultado una pérdida de peso significativa de hasta un 5%. En conclusión, esta revisión sistemática confirma que el enfoque más eficaz en el tratamiento de la obesidad en adultos es una combinación de entrenamiento de fuerza y cardiovascular de al menos 175 minutos por semana y una dieta baja en calorías adaptada a las necesidades metabólicas y al estado de salud del individuo.

Palabras clave: Manejo de la obesidad; eficacia de la dieta y el ejercicio; tratamiento de la obesidad; actividad física y pérdida de peso

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Introduction

Diabetes Mellitus (DM) is a chronic disease that cannot be cured (Fang et al., 2022; Yadav et al., 2024), but can be managed effectively (Chien et al., 2024; Pettigrew et al., 2023). Globally, approximately 463 million adults have been diagnosed with DM (Danielsen et al., 2024), and it is estimated that this number will increase to 700 million by 2045 (Ayyoubi et al., 2023). The diet-exercise combination was the only intervention that significantly improved the healthy aging index score, reflecting the importance of diet and exercise in improving body function. Among the

various types of DM, type 2 Diabetes Mellitus (T2DM) is the most common, covering approximately 90-95% of total cases (Halade et al., 2024). Individuals suffering from T2DM are at increased risk of cardiovascular disease, nephropathy, retinopathy, neuropathy, and risk of amputation. To prevent these complications, good blood sugar control is very important, with measurement of glycated hemoglobin (HbA1c) being the most commonly used indicator (Galyean et al., 2024).

A healthy lifestyle has a significant impact on blood sugar control (Minasian & Nazari, 2023). There is sufficient evidence to show that HbA1c levels can be reduced through

adopting a healthy diet, maintaining an ideal body weight, and exercising regularly. Additionally, interventions that encourage these behavioral changes have been shown to be effective in managing blood sugar and reducing the risk of cardiovascular disease, especially when both aspects are emphasized and patients are motivated to follow them. The prevalence of overweight, particularly abdominal obesity, tends to increase with age. Diet and physical activity levels are major factors in determining body weight status, which is directly related to a variety of adverse health conditions, including type 2 diabetes, cardiovascular disease, musculoskeletal disorders, and some types of cancer. Apart from that, diet and physical activity also play an important role in mental health in the future (Noureddin & Abdelmalek, 2023; Ramasamy et al., 2024).

Diet and physical activity are the main factors in determining body weight status, which is then associated with a number of adverse health conditions, including type 2 diabetes, cardiovascular disease, musculoskeletal disorders, and several types of cancer. Diet and physical activity also play an important role in future mental health. However, despite the recognized importance of diet and physical activity, many older Australians do not meet the relevant guidelines (Ge et al., 2023; Syeda et al., 2023). For example, less than one in ten people consumed the recommended amount of fruit (2 servings) and vegetables (5 servings) per day, and about half did not get the minimum of 30 minutes of moderate to vigorous activity at least five days a week. Participants in the diet and diet-exercise had significantly increased the biological age of KDM at 12 months compared to participants in the exercise and control groups. The effects of diet and diet-exercise in increasing biological age were reached at the 6-month mark, at which point biological age in both groups was significantly different from the control group ($P = 0.046$ and $P = 0.006$, respectively). Both the control and exercise groups had no significant changes in biological age over the 12-month period (Lin et al., 2023). A combination of diet and exercise has been shown to increase biological age in older adults who are obese (Choy & Louie, 2023; Stevanović-Silva et al., 2022). In this study, the diet-exercise combination was the only intervention that significantly improved healthy aging index scores, reflecting the importance of diet and exercise in improving body function. The findings from this study provide a foundation for future research that will explore geroprotective therapies in older adult populations, by demonstrating that aging indices could be an indicator of the effectiveness of such interventions (Ho et al., 2022a). Biological age is an alternative method for measuring how far the aging process has progressed in a person. Although chronological age is commonly used as an indicator that can predict the risk of disease and death, there is a large degree of variation among individuals of the same chronological age (Panchal et al., 2021). Additionally, chronological age continues at a constant rate and is unaffected by any intervention, making it less useful as a dependent variable in evaluating the effectiveness of various interventions. In contrast,

biological age attempts to provide a more accurate picture of the aging process by utilizing a variety of biomarkers that represent the aging process itself, not just the associated chronic diseases (Khemka et al., 2023; Mehri et al., 2024). This study aims to evaluate the effectiveness of the combination of exercise and diet in managing obesity, to determine whether there is a difference in effectiveness between diet alone, exercise alone, or a combination of both, as well as whether there is a significant reciprocal effect between different types of exercise and diet on patients' obesity.

Materials and Methods

Search Strategy

A systematic review was registered and developed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis Protocols (PRISMA-P) guidelines. A search was conducted on PubMed and ScienceDirect using the keywords “diet”, “exercise”, “obesity”, and “lifestyle interventions”. The search time range for articles was between March 1, 2019 and May 1, 2024, to reflect recent lifestyle modifications associated with obesity. Search criteria were based on studies involving populations of obese adults (aged 18 years and over), who made lifestyle modifications such as diet, exercise, or a combination of both. There were no restrictions regarding gender, race, geographic distribution, or ethnicity. Articles that focus on different diet and exercise programs are given priority to provide more inclusive results. In addition, the reference lists of studies that met the inclusion criteria were also checked and the abstracts screened.

Eligibility criteria

Inclusion criteria for this study included studies involving adult patients with obesity and lifestyle interventions that included various diets, exercise, or both. We chose to include studies conducted within the last five years, i.e. between 2019 and 2024, to summarize the most recent research available on interventions in the management of obesity. Meanwhile, exclusion criteria include publications that are duplicates and research that does not match the focus, such as studies relating to non-obese patients, obese patients with acute conditions, pediatric obese patients, articles that are not in English, and articles published before in 2019.

Study selection

The researchers conducted an initial literature search and saved all articles to a file. Then, they independently screened all abstracts, and for research letters and books that did not have abstracts, researchers used the text content for initial screening. After initial screening, abstract was used to create a spreadsheet of the screened abstracts. The full texts of the studies that reached consensus were then carefully reviewed to assess final eligibility. This filtering process is reported using the PRISMA flow

diagram (Please see figure 1).

Data collection and quality assessment

Researchers created a specially designed spreadsheet to extract information from the final eligible studies. Information included in this spreadsheet includes study title, study location, authors, study design, study population,

publication date, duration of follow-up, interventions performed, and results obtained. Then, using a prepared spreadsheet design, data were extracted from the eligible studies. There are no disputes or conflicts at this stage. Quality assessment was carried out using the Modified Newcastle-Ottawa scale.

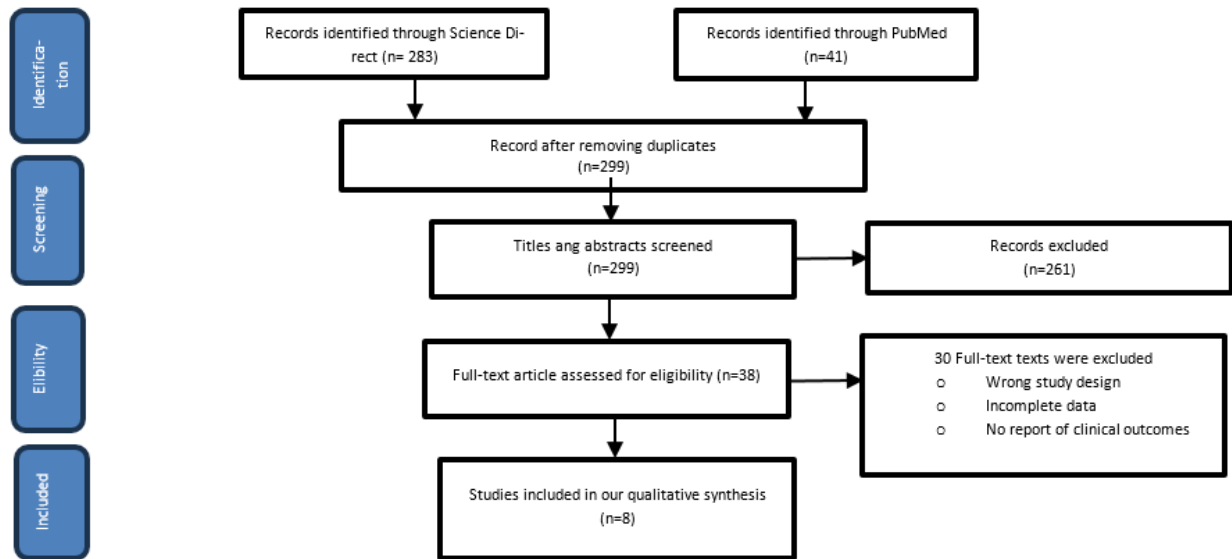


Figure 1. PRISMA flow diagram

Table 1. Overview including studies evaluating the influence of diet and exercise in the management of obesity

Authors	Study type	Study population	Study Country	Date of publication	Sample size	Intervention
(Martín-Payo et al., 2021)	pilot behavioral intervention study	>18 years old	Spanish	December 9, 2020	111 participants, with 63 belonging to the intervention group (IG) and 48 belonging to the control group (CG)	Behavior Change Wheel (BCW)
Chantal A. Pileggi (Pileggi et al., 2022a)	controlled intervention	30-60	Canada.	11 August 2022	20	a 6-week supervised, progressive, combined aerobic and resistance exercise program for women with obesity classified as diet-resistant or diet-sensitive.
E. Ho1,2, C. Qualls3, D.T. Villareal1,(Ho, Qualls, & Villareal, 2022b)	Secondary Analysis of a Randomized Controlled Trial	(age≥65 years)	United States.	April 20, 2022	107	control, diet alone, exercise alone, and diet-exercise in combination.
K.Iyer(Iyer, 2023)	A Randomized Clinical Trial	46-50	Colombia.	2023	496,622,621	Multivariate analysis
Marwa M. Elsayed(Elsayed, El Refaye, Rabiee, Abouzeid, & Elsi, 2022)	randomized controlled trial.	+_ 58	Egypt	18 March 2022	60	aerobic exercise on the treadmill (WolfGermanyPro Runner S2 Motorized Treadmill)
Vinicius Cavalheri(Cavalheri, 2023)	a randomized trial	45- 80	Australia	July 2023	415	Western Ontario and McMaster Universities Osteoarthritis Index
K.-J. HSU(Hsu et al., 2021)	A Randomized Controlled Trial	50-64	Taiwan	June 2021	69	Analysis of covariance
Nicole M. Gilbertson (Gilbertson et al., 2022)	a randomized controlled trial.	21-28	Virginia	January 2022	26	two different treatments

Results

Literature search results

We reviewed a total of 324 articles from PubMed (41) and ScienceDirect (283). Of the 324 articles, 25 of them were found to be duplicates so they were excluded. The remaining 299 articles were screened using the title and abstract. Of the 299 abstracts screened, 261 were excluded after screening for eligibility, and 27 full-text articles had incorrect study designs, incomplete data, or did not report clinical outcomes. Eleven full-text articles were reviewed and included in our study. A PRISMA flow diagram summarizing the number of studies assessed at each stage of our identification and screening process is presented in Figure 1. Our study included a total of 2,191 adults aged 18 years to 79 years. Most trials were conducted in the United States (n¼6). Others were conducted in Australia (n¼2), China (n¼1), Spain (n¼ 1) and Poland (n¼1). Study designs included meta-analyses of randomized controlled trials (n¼1), randomized controlled trials (RCTs) (n¼4), cluster randomized trials (n¼1), clinical trials (n¼3), randomized parallel group trials (n¼1), and analysis exploratory randomized clinical trials (n¼1). See Table 1.

Intervention

Diet intervention only

In the study by Stonehouse and colleagues, the treatment intervention involved dairy foods. Dairy products used in this intervention include daily consumption of milk, yogurt and cheese in amounts ranging from 20 to 84 grams per day, as well as reducing energy intake by > 2092 kJ/day (> 500 kcal/day). The study conducted by Kroeger and his team used two diet

approaches, namely alternative fasting (ADF) and calorie restriction (CR). In the ADF diet, participants consume 25% of their energy needs on fasting days and 125% of their energy needs on normal eating days, while in the CR diet, participants consume 75% of their daily energy needs for the first six months, and 50% of their energy needs in fasting days and 150% of energy requirements on normal eating days for the next six months. The study conducted by Bajerska and colleagues used two types of diet, namely the Mediterranean diet (MED) and the Central European diet (CED). The MED diet consists of 37% energy from total fat, with 20% monounsaturated fat (MUFA), 9% polyunsaturated fat (PUFA), and 8% saturated fat (SFA), as well as 18% protein and 45% carbohydrates. On the other hand, the CED diet consists of 27% energy from total fat, with 10% MUFA, 9% PUFA, and 8% SFA, as well as 18% protein and 55% carbohydrates, with high levels of dietary fiber. The study conducted by Jiang and his colleagues used two weight management approaches, namely Companion-Intensive Multi-aspect Weight Management (CIMWM) and traditional multi-aspect weight management (TMWM). The CIMWM group received two Fit Nutrition Bars/day for the first three months, along with monthly face-to-face guidance and daily online instruction. Meanwhile, the TMWM group received monthly face-to-face guidance by the same multi-faceted team as well as appropriate replacement foods, with daily self-monitoring. The meal plan in this study was planned to have an energy intake of 1200 to 1800 kcal/day, with a composition of 40-55% carbohydrates, 20-30% fat, and 15-20% protein.

Table 2.
Studies implementing dietary changes only as an intervention.

Study	Type of intervention Dietary intervention only	Groups	Outcomes
J Martin 1, JP Kirwan 2 (Martin & Kirwan, 2011)	Subjects were randomly assigned to receive a high eucaloric (n = 7) or low glycemic (n = 6) diet. Subjects participated in 60 minutes of exercise per day based on their aerobic capacity (VO2max).	overweight and obese elderly patients (5 men and 8 women; age 67 ± 1.1 years) in Metropolitan Cleveland	There were main effects of time for body weight, body mass index (BMI), FSI, insulin sensitivity factor, total cholesterol, triglycerides and LDL cholesterol
(Pérez Martínez et al., 2023)	The usual care group provides general advice with the help of nurses. Intervention consultation sessions included a dietitian who negotiated changes in specific food choices after the assessment, suggestions for increasing physical activity and reducing sedentary behavior by an exercise physiologist after the evaluation and a psychologist who developed a workbook for participants and a health coach who was trained to deliver related script calls. (15 min)	Usual care (C general advice) vs intervention (I, interdisciplinary advice) Vs intervention þ dietary supplement (IW, Iþ30 g nuts/day)	The interdisciplinary protocol produced a greater and more clinically significant effect on weight loss than usual care (1.2 kg, p ¼ 0.045 I; 1.3 kg, P ¼ 0.025) and at six months for IW (2.1 kg; p ¼ 0.010)
(Katzmarzyk et al., 2020)	Weekly sessions (16 conducted in person and six conducted by telephone): Intensive lifestyle group: increased their physical activity to 175 minutes per week, portion-controlled meals (e.g., bananas, apples, soups, and frozen meals) and prepared meals beforehand and meal replacement shakes for the first month then instructions on how to purchase, prepare, and package meals. Usual care group: regular care from their	Intensive lifestyle group vs usual care group	The intensive lifestyle group had lost significant weight of more than 5%, and 51% of patients maintained a weight loss of at least 5% at 24 months with a mean difference of 4.51% points (95% CI, 5.93 to 3, 10) between groups (P < 0.001)

	primary care team for 24 months and three newsletters per year on selected topics and a list of health promotion events offered in their community		
	All participants were prescribed a balanced and individual low-calorie diet with 25% less energy (50% and 55% carbohydrates, 30% and 35% fat). The training exercises for groups S, E, and SE were three times/week with the same training intensity and volume.		
(Benito et al., 2020)	Group S includes shoulder presses, squats, barbell rows, lateral splits, bench presses, front splits, biceps curls, and French presses for the triceps. Running, cycling, or elliptical exercise was included for group E, while group SE followed a combination of cycle ergometry, treadmill, or elliptical exercise intercalated with squats, mat machine, bench press, and front split exercises (15 lifts per set or 4500 endurance phase SE). Subject C committed to exercising for at least 200e3000 moderate intensity physical activity/week (30e60 minutes/day)	strength training group (S), vs endurance training group (E), vs strength training group þ (SE), vs 'received physical activity recommendations' group (control; C)	While following a balanced, individualized, low-calorie diet, the SE exercise protocol had a more significant effect on reducing total fat mass than any other exercise protocol. Improvements were observed in body weight and total fat mass

Diet and exercise interventions

Several other studies used combination treatment interventions. One of them is a study by Colleluori and its counterparts involved usual care, which included three additional interventions. First, the intervention involves a nutritionist negotiating changes in specific food choices after conducting an assessment. Second, suggestions were given to increase physical activity and reduce sedentary behavior by an exercise physiologist after assessment. Third, psychologists developed workbooks for participants and trained health coaches to deliver related 15-minute written calls. In addition, the intervention also includes the use of food supplements (Colleluori & Villareal, 2021).

The study by Katzmarzyk and colleagues involved two lifestyle intervention regimens, namely an intensive regimen and usual care. The intensive regimen includes increased physical activity to 175 minutes per week, portion-controlled foods (such as bananas, apples, soups, and frozen entrees), and use of packaged foods and meal replacement shakes during the first month compared with previous habits.

The usual care regimen includes routine and customary care from the primary care team for 24 months, as well as three newsletters per year covering specific health topics and a list of health promotion events available in their community (Katzmarzyk et al., 2020). The study conducted by Benito and his team used three types of training, namely strength training (S), endurance training (E), and a combination of both (SE). Group S did exercises such as shoulder press, squat, barbell row, lateral split, bench press, front split, biceps curl, and French press for triceps. Group E involved running, cycling, or elliptical training, while group SE performed a combination of cycle ergometry, treadmill, or elliptical training alternated with squats, rowing machines, bench press, and front split exercises (Benito et al., 2020).

Discussion

Our systematic review provides current evidence supporting combining exercise interventions with dietary restrictions in the management of obese individuals. It is known that any behavioral changes in severely obese and sedentary adults must result in effective means of changing both general status and body composition. All the papers we reviewed reported positive effects on health status and body composition. Therefore, it is common place to find effect sizes across publications indicating effective treatment regardless of the methodology used. However, there is likely to be a methodological and sociological bias towards such programs, which may be the reason behind the constant praise and high recommendation to obese patients. It can also encourage repeated cycles of diet and exercise programs to modify body morphology and health status. Although research conducted by Benito et al. suggests that combining exercise with diet can result in significant reductions in body fat and improvements in metabolism, few studies have involved combining these two interventions. Study conducted by Benito and his colleagues (Aguar et al., 2012) compared the effects of different types of exercise, namely strength training (S), endurance training (E), and a combination of both (SE), with all participants in each group given individual hypocaloric diets. Their findings showed that combining strength and endurance training had a more significant effect in reducing total fat mass compared with other exercise protocols. This may be due to the fact that the combination of these exercise protocols results in higher energy expenditure with less exertion.

Likewise, attempts have been made to compare the effects of different levels of calorie restriction when combined with the same aerobic exercise on overall body health. Findings from research conducted by Nicklas et al. and Villareal et al. showed that energy deficit during exercise nearly doubled peak oxygen consumption and functional ability. They also add that moderate calorie

restriction has a positive effect on exercise. Therefore, calorie restriction is highly recommended in elderly people with obesity to increase their exercise efforts. Relative to energy-restricted diets, high dairy interventions (dairy foods and dairy supplements) were associated with greater reductions in body weight and fat mass as well as reductions in lean mass. Although most studies report clinically significant weight loss and BMI reduction, changes in body composition following weight management should also be considered. For example, total body fat and visceral fat distribution are reported as risk factors for metabolic syndrome. The study by Jiang and colleagues reported a decrease in body fat percentage (BFP), body fat mass (BFM), and visceral fat area (VFA) with a slight decrease in fat-free mass (FFM) and skeletal muscle mass (SMM). They highlight the passive role of Multi-Aspect Weight Management in improving glucose metabolism and hepatic fat metabolism.

Diet and obesity

Alternative fasting (ADF) has become popular as an effective method in obesity management with significant weight loss. The study by Kroeger and his colleagues used ADF, in which participants alternated fasting and bingeing to evaluate weight loss. Study results showed that individuals who achieved significant weight loss with ADF reported better satiety, increased protein intake, and a better response to calorie restriction on fasting days. Calorie restriction has also been shown to be effective in treating obesity, reducing the risk of type 2 diabetes, and has a positive impact in reducing endogenous glucose production and hepatic insulin resistance. There is a significant effect of giving iron supplements and continuous running or jogging on increasing hemoglobin levels (Agus et al., 2021).

Visceral obesity has been linked to cardiovascular disease and diabetes. Some recommended nutritional changes include a low-fat, low-calorie diet (Welis et al., nd). However, research shows that there is no statistical difference in weight loss and visceral fat between patients on two types of energy-restricted diets, namely Mediterranean and Central European. Regardless of the type of dietary intervention performed, adherence to dietary modifications plays an important role in the overall management of obesity. In research by Gibson and his team, participants who adhered to a dietary intervention experienced greater weight loss and a reduced overall risk of cardiovascular disease compared to those who did not adhere to their diet plan. Therefore, adherence to a specific dietary plan is an important factor to achieve optimal results in the management of obesity.

Exercise and obesity

Exercise has an important role in maintaining body function and maintaining a normal body weight. Aerobic exercise has been shown to be effective in reducing the overall prevalence of metabolic syndrome among obese

middle-aged and older adults. Additionally, a combination of resistance and aerobic training also provides beneficial changes (Cavalheri, 2023; Gilbertson et al., 2022). The cause of hypertension is due to damage to blood vessels and excessive use of salt (Sari et al., 2024).

Lifestyle modifications such as exercise have been shown to reduce the incidence of type 2 diabetes by 28 to 59% (Pileggi et al., 2022b). Patients with obesity are advised to exercise for about 150 minutes each week, consisting of 75 minutes of high or moderate intensity aerobic exercise, according to their physical abilities. Additionally, it is important for patients to adhere to exercise and diet regimens; as adherence was shown to be a significant predictor of long-term weight loss among clinical trial participants (Hsu et al., 2021). Exercise can have a big impact on hemoglobin (Indika et al., 2019), aerobic exercise (low impact and mixed impact) can be used to reduce body fat percentage (Nawawi, 2014). Furthermore, overweight and obese patients should be encouraged to participate in regular exercise and avoid a sedentary lifestyle, as this may increase the risk of death and increase the risk of cardiovascular complications. By conducting further research in these areas, we can develop a more effective and holistic approach to obesity management, which will ultimately help reduce the prevalence of obesity and improve overall public health.

Learning limitations

This review recognizes that there are various types of diets not included in the analysis that may have an impact on the management of obesity. Adding information about food types from other cultures can provide additional insight into effective dietary strategies in various populations. Although limitations of this study relate primarily to English-language publications, this review notes that studies from countries with other primary languages, such as French and Arabic, can also provide valuable insight into different types of diets. Nonetheless, research from countries such as Spain, China, and Poland has provided useful information for understanding other food cultures. During the research process, discoveries regarding behavior modification and the role of support systems in the management of obesity were also recognized as important factors. Although no papers were found that synthesized or analyzed different types of exercise and their impact on obesity management during the search, this review believes that sufficient answers have been provided regarding the effectiveness of diet and exercise in obesity management. Although there is room for further research, it is hoped that this systematic review has made a valuable contribution to understanding effective obesity management strategies.

Conclusion

In conclusion, our findings suggest that the combination of exercise and diet helps manage obesity by lowering BMI and improving metabolic parameters such as lipid profile and blood sugar. A combination of a hypocaloric diet and endurance of at least 175 minutes per week plus strength training is recommended for more effective results. Therefore, patients need to work closely with their primary care provider, dietitian or nutritionist to formulate a practical, customized hypocaloric diet based on their goals, BMI and metabolic needs, as well as a sustainable exercise program to achieve and maintain weight loss. There is a need for further research comparing different diet programs and their effects on obesity and other metabolic syndrome indices.

Practical Applications

The findings from this study have several important practical applications and can be applied in a variety of contexts to assist in the management of obesity. First, health practitioners can develop weight management programs in clinics and hospitals that combine a low-calorie diet with a minimum of 175 minutes of physical activity per week. The program must be tailored to the patient's individual metabolic needs and health condition. Additionally, fitness centers and health communities can adopt this approach for group weight loss programs, ensuring participants receive guidance in structured diet and exercise. Second, nutritionists can use the results of this study to design more personalized diet plans for patients, focusing on controlled calorie reduction and balanced nutrition. Fitness trainers can also integrate strength and cardiovascular training into their clients' exercise routines, aiming for a minimum of 175 minutes per week to increase weight loss effectiveness. Third, policymakers can use this information to support public health campaigns that promote active lifestyles and balanced diets as key strategies to reduce the prevalence of obesity. Health departments could implement national programs that provide access to educational resources about healthy diets and physical exercise, as well as offering free or low-cost consultation services. By applying these research findings, healthcare professionals can more effectively help individuals achieve and maintain weight loss, which in turn can improve their overall quality of life and reduce the risk of obesity-related diseases.

Future research

Long-term research is needed to evaluate the sustainability of weight loss results achieved through diet and exercise interventions. Studies that track participants over several years will provide insight into long-term effectiveness and the likelihood of weight regain. Second, further research is needed to identify individual factors that influence response to diet and exercise interventions. Factors such as

genetics, psychology, and environment can play an important role in the effectiveness of weight loss programs, and a better understanding of these factors will allow the development of more personalized and effective programs. By conducting further research in these areas, we can develop a more effective and holistic approach to obesity management, which will ultimately help reduce the prevalence of obesity and improve overall public health.

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