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VERY LOW CALORIE DIETS AFFECT LONG TERM WEIGHT LOSS AND HEALTH OUTCOMES: A SYSTEMATIC REVIEW

Sheila Amara Putri[1], Shintia Yunita Arini[2], Dominikus Raditya Atmaka[3]*, Ardyanisa Raihan Kusuma[4], Anisah Firdaus Rahmawati[5], Mutiara Arsya Vidianinggar Wijanarko[6], Norfezah Md Nor[7], Nadiatul Syima Mohd Shahid[8]

[1]Department of Nutrition, Faculty of Public Health, Universitas Airlangga, Indonesia
[2]Department of Occupational Health and Safety, Faculty of Public Health, Universitas Airlangga, Indonesia
[3]Department of Nutrition, Faculty of Public Health, Universitas Airlangga, Indonesia
[4]Department of Nutrition, Faculty of Public Health, Universitas Airlangga, Indonesia
[5]Department of Nutrition, Faculty of Public Health, Universitas Airlangga, Indonesia
[6]Graduate School, Kagawa Nutrition University, Japan
[7]Department of Food Service Management, Universiti Teknologi Mara, Malaysia
[8]Department of Food Service Management, Universiti Teknologi Mara, Malaysia
Correspondence address: Dominikus Raditya Atmaka
Email: dominikus.raditya@fkm.unair.ac.id

ABSTRACT

Introduction: In Indonesia, obesity numbers increased from 10.5% in 2007 to 14.8% in 2013 and 21.8% in 2018. Very low calorie diets (VLCD) are currently gaining popularity to reduce weight, but can lead to inadequate nutrition and potentially negative health consequences. This systematic review aims to evaluate VLCD effect on weight loss and overall health outcomes. **Method:** Data were sourced from research journal articles in databases like Crossref, PubMed, Google Scholar, and ScienceDirect, published within the last 10 years either Indonesian or English language. Only studies involving adult subjects with minimum overweight nutrition status (BMI > 23 kg/m^2) were included. **Result:** Ten from 1063 studies qualified the selection criteria. VLCD success in weight loss depends on treatment type, duration, physical activity, and genetics. Longer and fewer-calorie VLCDs lead to more significant weight reduction, but maintaining long-term success requires a structured weight management program. VLCD benefits include improved insulin sensitivity, reduced fat, and better heart function, but it may have temporary negative effects on metabolism, aortic elasticity, constipation, sensitivity to cold, headache, and dizziness. **Conclusion:** VLCDs can be an effective approach in achieving significant weight reduction and positive health outcomes, especially if combined with long-term weight maintenance programs and appropriate follow-up treatment. However, the decision to undergo VLCD should be made with wisely considering individual health conditions and in consultation with dietitian or health professionals, as there are potential side effects and factors that may influence long-term success.

Keywords: VLCD, Weight loss, Health outcome, Fad diets, Weight management, Obesity

INTRODUCTION

In 2016, about 1.9 billion adults were in overweight condition worldwide, with more than 650 million people suffering from obesity, according to WHO data (World Health Organization, 2016). In Indonesia, the obesity figures were increasing year by year from 10.5% in 2007 to 14.8% in 2013 and 21.8% in 2018, according to Indonesian Basic Health Research results (Ministry of Health Republik Indonesia, 2018). Obesity is caused by fat accumulation due to high energy intake and low energy usage that happens for long time(Scottish Intercollegiate Guidelines Network, 2010). The World Health Organization (WHO) defines overweight and obesity in adults as a Body Mass Index of 25 or greater and 30 or greater, respectively (Nuttal, 2017).

According to Jensen et al. (2014), obesity is increasing serious health conditions risk or called as metabolic syndrome such as high blood pressure, high blood sugar, high total cholesterol, and other metabolic markers which are risk factors for degenerative disease. Respiratory problems like difficulty of breathing, asthma, or sleep apnea, as well as joint problems like osteoarthritis, osteoporosis, or musculoskeletal

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discomfort related to heavy body weight, can also arise from being overweight. Finally, obesity can also increase the risk of gallstones and gallbladder disease. Therefore, efforts are needed to optimize healthy weight in order to reduce the potential of these health conditions happening (Tchernof and Després, 2013; Albuquerque et al., 2015; Alamuddin, Bakizada and Wadden, 2016; Bray et al., 2016; Hruby et al., 2016; Upadhyay et al., 2018).

Research has made some discoveries in terms of the treatment of overweight, particularly through weight loss (Montesi et al., 2016). To achieve weight loss, an individual needs to consume fewer calories than they expend by setting a specific target that is lower than the energy needed by their body (usually between 1200-1500 kcal/day for women and 1500-1800 kcal/day for men), or by estimating personal energy requirements based on expert guidelines, which involves creating an energy decrement of either 500 kcal/day, 750 kcal/day, or a 30% from total energy requirements (Scottish Intercollegiate Guidelines Network, 2010; Jensen et al., 2014; Alamuddin, Bakizada and Wadden, 2016; Bray et al., 2016). On average, this method can create moderate weight loss of around 5-10%, which usually lasts for at least one year. Although variations in macronutrient content in food may affect total of long-term weight loss, the effect is not significant. However, the common problem is that continuous calorie restriction tends to drop within 1-4 months. Therefore, the majority of people who successfully lose weight using this method are likely to experience significant weight gain within 1 year (Rynders et al., 2019). The success of long-term maintenance of losing weight occurs when there is a deliberate weight reduction at least 10% from previous body weight and able to maintain that weight for at least 1 year (Kraschnewski et al., 2010). The success of weight loss from a diet is influenced by the selection of an appropriate diet. Therefore, it is very important to know the long-term effectiveness and side effects of diet therapy (Schwingshackl and Hoffmann, 2013).

The influence of the emergence of popular diets, especially by artists who lose weight quickly through fad diets, has led to an increased interest in these extreme weight loss methods among the general public. Fad diets are the popular diets which are often overmarketed with specific unproven claims that at many times contradict the principles of nutrition (Sulistyan, Huriyati and Hastuti, 2016; Nurjannah and Muniroh, 2019; Tahreem et al., 2022). The attempts to follow fad diets resulted in nutritional intake inadequacy among the respondents (Vidianinggar, Mahmudiono and Atmaka, 2021). These diets sometimes promote calorie intake of less than 800 kcal, which falls into the category of Very Low-Calorie Diets (VLCDs). Notably, the year 1988 witnessed a significant surge in VLCDs' popularity in the United States, largely attributed to Oprah Winfrey's endorsement of her successful 67-pound weight loss achieved through liquid food consumption. However, the enthusiasm for this approach waned in 1990, following Winfrey's admission of weight regain and her decision to avoid dieting in the future (Tsai and Wadden, 2006). Some studies suggest that VLCDs may provide protection against overweight and certain degenerative diseases, but the existing evidence is still limited, and some studies indicate that long-term reduction of consumption to such dietary patterns can have negative health consequences (Tahreem et al., 2022). Therefore, a systematic review is needed to evaluate the impact of VLCDs on weight loss and overall health outcomes.

METHODS

This research is a systematic review on observational and interventional

studies, with data collected from various literature and studies on the same topic, obtained from journal articles in databases such as Crossref, PubMed, Google Scholar, and ScienceDirect. The reviews follow the Preferred Reporting Items for Systematic Review (PRISMA) protocol. The article search strategy was based on the keywords "very low calorie diet (VLCD)" AND "long term weight loss/reduction" AND "health outcomes." The selected articles had to be published in Indonesian or English language. The data sources used included publications from full article research journals only (not including thesis, short report, news, proceeding, or only abstract paper). The process of conducting a systematic review was done by selecting the review topic, searching for relevant articles, and analyzing and synthesizing existing literature. The critical appraisal process involved four researchers to maintain the validity of the review's results following Cochrane Risk of Bias Tool procedure following the inclusion and exclusion criteria. The Cochrane Risk of Bias Tool assessed the quality of each paper included in the review based on the probability to bias due to participation recruitment, bias due to attrition, bias due to prognostic factor measurement, bias due to confounding intervening, and bias in statistical analysis and reporting. Each criterion has three scores, high, moderate, and low. Papers which had more than two high scores among six bias criteria were then excluded from the review because data quality was arguable. This review only compared study qualitatively, so that no further statistical analysis needed.

Inclusion Criteria

The inclusion criteria used included journals or articles (not including thesis, short report, news, proceeding, or only abstract paper) published within the last 10 years, in Indonesian or English language, with adult research subjects (aged 18-59 years old) with a minimum overweight nutritional status or BMI > 23 kg/m^2 based on Asia Pacific standards (WHO), research topics related to VLCD and weight loss, and international journals indexed by the databases used in this review.

Exclusion Criteria

The exclusion criteria included journals or articles with limited access or not full text, research on animal experimentation, and included subjects with degenerative diseases.

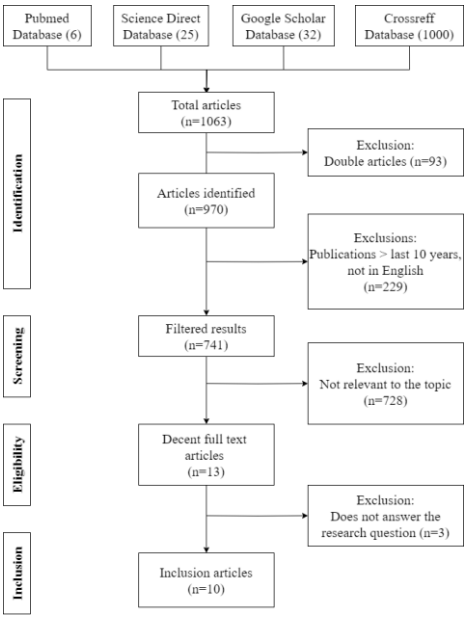

Figure 1. PRISMA Flow Diagram of Article Selection Process

RESULT

A search was conducted in the databases and a total of 1063 articles were found. After removing duplicates and manually searching the reference lists of relevant articles, 970 articles were obtained. Then, 229 articles were excluded due to unmet requirement for inclusion criteria, resulting in 741 articles. From this number, a thorough analysis and review of abstracts was conducted, where 728 articles were excluded because they were not relevant to the topic. Thirteen articles were obtained and three were excluded for not answering the research question. Finally, there were 10 studies that reported the impact of VLCDs on long-term weight reduction and health outcomes.

Table 1. Characteristics of Selected Studies

Authors & year	Study Design	Study Characteristics
(Rayner et al., 2019)	Case Control	Sample: Cases: 25 obese volunteers, Controls: 15 volunteers with normal nutritional status Inclusion: Age below18 years, BMI more than 30 kg/m2 for VLCD group and lower than 25 kg/m2 for control group. Exclusion: under insulin therapy, have previous history of CVD, on pregnancy, and have standard contraindication for MRI.
(Salem et al., 2021)	Case Control Longitudinal	Sample: Cases: 19 participants on VLCD, Controls: 16 participants on Roux-en-Y gastric bypass surgery (RYGB), Inclusion: - Exclusion: -
(Burnand et al., 2016)	Single-blinded RCT	Sample: 46 elective cholecystectomy patients at the Norfolk and Norwich University Hospital Inclusion: Adult patients, BMI higher than 30 kg/m2, and symptomatic gallstones Exclusion: Have history of liver disease, diabetes mellitus, confirmed have bile duct stones or history of abdominal surgery.
(Magkos et al., 2021)	Single-blinded RCT	Sample: 84 overweight and obese men and women aged 18-56 years (BMI = 28-40 kg/m2) Inclusion: Healthy Exclusion: Weight change ±5% in the last 3 months, vegetarian/vegan, pregnant/breastfeeding or planning for pregnancy, history of degenerative disease, or eating disorders, cancer diagnosis, using drugs that the researcher considers likely to affect the outcomes.
(Schrepf et al., 2017)	Cohort Longitudinal	Sample: 123 overweight individuals Inclusion: obese participants (BMI more than 30 kg/m2 or higher than 28 kg/m2 for Asian Americans) Exclusion: -

Authors & year	Study Design	Study Characteristics
(Lean et al., 2018)	Cluster randomized trial	Sample: Cases: 23 participants, Controls: 26 participants. Inclusion: aged 20-65 years diagnosed with type 2 diabetes within past 6 years, BMI between 27–45 kg/m22, and were not receiving insulin. Exclusion: Currently using insulin, HbA1c more than 12%, weight loss more than 5 kg in the past 6 months, estimated low glomerular filtration rate, severe heart failure, cancer, heart attack in the past 6 months, currently undergoing obesity treatment, eating disorders or vomiting behavior, pregnant or planning to become pregnant, and use of antipsychotic drugs.
(Haywood et al., 2018)	Randomized controlled trial	Sample: Ex/Healthy Advice: 36 Ex/Hypocaloric Diet: 40 Ex/VLCD: 41 participants Inclusion: Volunteers aged 65-85 years, BMI 32.3-57 Exclusion: -
(Rolland et al., 2014)	Cohort Retrospective	Sample: Participants who started the LighterLife total VLCD program between 2007-2010. Inclusion: 5,965 individuals who had tried the LighterLife Total weight management program, Caucasian women over 40 y.o., BMI more than 36.3 kg/m2. Over 3 years underwent a weight loss program for an average of 20 weeks Exclusion: have history in type 1 diabetes; porphyria; total lactose intolerance; CVD; kidney disorder or liver disease; active cancer; epilepsy, seizures, mental disorder; suffering from eating disorders; pregnant or breastfeeding; gave birth or had a miscarriage within the last 3 months.
(Steven et al., 2016)	Cohort longitudinal	Sample: 30 type 2 diabetes participants Inclusion: ages ≥25–80 years and BMI 27–45 kg/m2 Exclusion: weight loss >5 kg; thiazolidinediones, GLP-1 agonists, steroids, or atypical antipsychotics treatment; HbA1c _>9.5%; serum creatinine >150 μmol/L; or alcohol intake >3 units/day (women) or >4 units/day (men).
(Norén and Forssell, 2014)	Single-center prospective cohort	Sample: 25 obese participants Inclusion: ages 33-65 years and BMI 35.1-49 kg/m2 Exclusion: -

The studies used included case-control, longitudinal, experimental, cluster-randomized, and retrospective analyses. The study samples included individuals with obesity, type 2 diabetes, and those seeking weight management. Inclusion and exclusion criteria varied across studies, but generally included age, BMI, health conditions, and some specific medical conditions (Table 1).

The VLCD treatments used varied in type and duration, with treatments ranging from 550 kcal/day to 947 kcal/day and durations ranging from 2 to 48 weeks. Percentage of weight loss ranged from 3.7% to 25%, with the highest weight loss percentage found in the 48-week study that used a 550 kcal/day treatment. Studies reporting statistically significant results ($p<0.01$ until $p<0.001$) and one reporting non-significant results (Table 2).

Table 2. Summary of VLCD and Weight Loss

Authors & year	Location	Treatment (kcal/day)	Duration (weeks)	Weight Loss (% of baseline)	p-value
(Rayner et al., 2019)	Oxford, UK	800	8	12.0	$p < 0.001$
(Salem et al., 2021)	London, UK	800	4	7.7	$p = 0.004$
(Burnand et al., 2016)	UK	947	2	3.7	$p < 0.001$
(Magkos et al., 2021)	Europe	600	8	13.2	$P = 0.012$
(Schrepf et al., 2017)	US	800	12	16.0	$p = 0.810$
(Lean et al., 2018)	UK	825-853	20	14.6	$p < 0.001$
(Haywood et al., 2018)	Australia	2 optifast (416 kcal) + 150g lean protein	12	11.1	$p < 0.001$
(Rolland et al., 2014)	UK	550	48	25.0	$p < 0.001$
(Steven et al., 2016)	UK	624-700	32	14.5	$P < 0.001$
(Norén and Forssell, 2014)	Sweden	680	4	7.5	$p = 0.001$

In addition to significantly impacting weight loss, positive and negative effects on health by VLCDs have been reported. Nevertheless, it should be noted that the findings are not consistent across all studies conducted. Further information regarding the health outcomes and identified negative effects in each study can be found in Table 3.

Table 3. Summary of VLCD and Health Outcome

Authors & year	Health Outcome	Negative Effect
(Rayner et al., 2019)	● Rapid and significant improvement in insulin sensitivity and liver steatosis. ● Reduced liver and visceral fat from baseline and improved peripheral metabolic rate. ● Improved heart performance and decreased heart triglyceride content.	● VLCD has a significant initial negative effect on heart function, metabolism, and aortic elasticity, but it is only temporary. Improvement is observed after the full 8-week program.
(Salem et al., 2021)	● VLCD increases nerve activity in the cognitive control area of the brain in response to food signals, which is associated with increased cognitive control over	● VLCD induces changes that make sustained weight loss more difficult to maintain.

Authors & year	Health Outcome	Negative Effect
	food.	
(Burnand et al., 2016)	● Two weeks of VLCD before elective cholecystectomy in obese patients is safe and significantly reduces preoperative weight and operation time.	(not mentioned)
(Magkos et al., 2021)	● Significant weight loss can help reduce chronic pain and accompanying symptoms in people with these conditions.	(not mentioned)
(Schrepf et al., 2017)	● Remission of diabetes and improved quality of life.	● The most commonly reported side effects are constipation, increased sensitivity to cold, headache, and dizziness.
(Lean et al., 2018)	● VLCD can help reduce obesity in older adults whose obesity affects physical ability and independence. ● People who exercise and follow the VLCD program also experience increased walking speed.	● Constipation, ● Dizziness, ● Hypoglycemia.
(Haywood et al., 2018)	● VLCD can help achieve remission of type 2 diabetes mellitus and can be maintained with an appropriate weight maintenance program.	(not mentioned)
(Rolland et al., 2014)	● Significant reduction in cholesterol and triglyceride levels and systolic blood pressure.	(not mentioned)

DISCUSSION

VLCD and Weight Loss

VLCD treatments can be effective for weight loss, with the highest percentage of weight loss (25% from baseline) observed in the 48-week study that used a 550 kcal/day treatment. This diet consists of 50 g protein, 50 g carbohydrate, 17 g fats, which corresponds to 36% of the energy from protein, 36% from carbohydrates, and 28% from fat. Additionally, the food packs, including soups, shakes, and bars, provide more than 100% of the recommended daily allowances for vitamins and minerals (Saris, 2001; Tsai and Wadden, 2006; Rolland and Broom, 2011a; 2011b; Nikokavoura et al., 2015a; Muscogiuri et al., 2021).

The results of this study also showed that the type and duration of the treatment are important factors in determining the degree of weight loss achieved. The smaller the VLCD calorie consumption during treatment, the greater the likelihood of individuals losing weight within the specified time frame. In addition, the duration of VLCD treatment can also affect individual weight loss. The longer individuals undergo VLCD, the greater the possibilities of significant weight reduction (Wikstrand, Torgerson and Boström, 2010; Muscogiuri et al., 2021; Roesler et al., 2021).

VLCD Effect on Long-Term Weight Reduction

Four studies have examined how participants try to maintain their weight for the long term after undergoing a VLCD. In the Norén and Forssell (2014) study supported by earlier studies using the same population and age (Wikstrand, Torgerson and Boström, 2010), it was found that increased metabolism persisted for some time after completing the diet. These results suggest that VLCD in the eligible group resulted in significant weight loss even after one year. However, the long-term treatment involving corsets could not be evaluated due to poor compliance.

The Rolland et al. (2014) study, shows substantial initial weight loss is the most reliable indicator for long-term weight loss success. However, continuous support from healthcare professionals is essential to sustain this success in maintaining weight loss over the long term. The study participants adhered to the programs in a community-based environment, where trained facilitators in weight management and behavior change oversaw appointments and provided group support. Participants followed a VLCD along with a wellness program designed for weight reduction in obese individuals. The program, called Transactional Cognitive Behavioral Therapy, incorporates concepts from cognitive behavioral change therapy, transactional analysis, and addiction or change theory. The program is conducted in small, single-sex, weekly groups led by counselors who have specialized training in obesity weight modification (Nikokavoura et al., 2015a; 2015b).

In the Lean et al. (2018a) study, participants experienced sharp weight loss during total diet replacement intervention phase, followed by a small increase of body weight during normal food reintroduction and weight management phases. During total diet replacement intervention, participants followed a low-energy diet for approximately three months, which could be extended to five months. The diet provided about 850 kcal/day with very low fat content. During the food reintroduction phase, participants gradually reintroduced regular food over 2-8 weeks. The diet during this phase included higher content of fat. Participants were given pedometer and physical activity guidelines to help them achieve and maintain appropriate activity levels. After the initial phases, participants continued with a structured program involving monthly visits to support long-term weight reduction. Study results showed that these guidelines can help participants maintain their weight after VLCD (Lean et al., 2018).

In the Steven et al. (2016) study, participants underwent a treatment consisting of three steps: given VLCD for eight weeks, continue with gradual increment of total calorie to normal calorie intake for two weeks, and continue with weight maintenance program for six months. The results showed that the entire group experienced weight loss on average from 98.0 kg to 83.8 kg during VLCD phase. After six months, the average weight remained at 84.7 ± 2.5 kg. This indicates that structured and individual weight maintenance programs can help participants maintain their weight after experiencing weight loss during the VLCD phase. VLCD with continuous follow-up treatment appears to be a more effective approach for achieving long-term weight maintenance success (Saris, 2001).

However, the success of VLCD in weight loss also depends on other factors, such as physical activity level, eating habits, and genetic factors. Therefore, research results should be interpreted carefully and should not be considered as the sole determinant in determining the effectiveness of VLCD in weight loss.

Health Outcomes

Based on eight studies that examined the impact of VLCD on health, some results show positive effects such as

improved insulin sensitivity, reduced liver and visceral fat, and improved heart performance and reduced heart triglycerides (Rayner et al., 2019). However, this research also shows that VLCD has a significant initial negative effect on heart function, metabolism, and aortic elasticity, but it is only temporary and improvement is observed after the full 8-week program. Salem et al. (2021) found that VLCD can increase nerve activity in the cognitive control area of the brain responding to food signals, which related to the increment of cognitive control to food. Someone who undergoes VLCD can more easily control their food intake because their brain is more active in controlling their food impulses than someone who undergoes Roux-en-Y gastric bypass surgery (RYGB). However, this study also shows that RYGB produces different brain activation patterns that can help prevent a return to the original weight, while VLCD produces changes which can create a more sustain unmaintained weight reduction. Therefore, VLCD with active follow-up treatment becomes a favorable approach for achieving long-term weight maintenance success (Salem et al., 2021).

Nevertheless, VLCD can still help reduce obesity in older adults, achieve reduction to type 2 diabetes risk, and reduce chronic pain and accompanying symptoms in people with these conditions and can be maintained with an appropriate weight maintenance program (Schrepf et al., 2017; Haywood et al., 2018; Salem et al., 2021). This is supported by Lean et al.'s (2018) research that found VLCD can cause diabetes remission and improve quality of life. The subjective results of the qualitative research revealed that participants who chose to undergo VLCD observed overall increment in quality of life, including physical health, social life, and discrimination. Additionally, they also experienced positive changes in clinical indicators like the decrease of blood sugar, lower blood pressure, and lower serum cholesterol. These positive health improvements influenced the participants' motivation to continue the VLCD program (Roesler et al., 2021). People who exercise along with VLCD also experience increased walking speed (Haywood et al., 2018). Another positive effect of VLCD is the reduction of cholesterol and triglyceride levels and systolic blood pressure (Norén and Forssell, 2014).

Some studies also show that VLCD has side effects such as hypoglycemia, constipation, increased sensitivity to cold, headache, and dizziness (Haywood et al., 2018; Lean et al., 2018). This is consistent with the qualitative research where participants who chose to follow VLCD reported several minor side effects, including gastrointestinal upset, fatigue, mood changes, and hair loss. However, the participants still opted to continue the program due to positive impacts on health and weight loss and sought remedies for the symptoms or endured them despite concerns, rather than discontinuing the program (Roesler et al., 2021).

The ketogenic (keto) diet, characterized by high fat, moderate protein, and low carbohydrate intake, has gained global attention for its potential health benefits. In Malaysia and Japan, the adoption and application of the keto diet reflect distinct cultural, medical, and societal contexts. In Malaysia, the keto diet is increasingly recognized for its potential in managing non-communicable diseases such as type 2 diabetes and hypertension. Malaysian researchers have explored the keto diet's impact on neurological and nutritional disorders. A narrative review by Lim et al. discusses how the ketogenic diet can modulate the gut microbiome, offering therapeutic potential for various conditions (Lim et al., 2022).

Japan has a more established history with the ketogenic diet, particularly in clinical settings. One significant application is in the management of epilepsy(Kumada et al., 2018). A multi-institutional study evaluated the efficacy of a Japanese ketogenic milk (Meiji 817-B) in

patients with medication-resistant epilepsy. The study found that approximately 64% of patients continued the diet for six months, with notable seizure reduction in a subset of patients (Yaegashi et al., 2023). In the realm of chronic diseases, the Japan Collaborative Cohort Study (JACC) examined the association between low-carbohydrate diets and the incidence of type 2 diabetes. The study concluded that diets lower in carbohydrates and higher in fat and protein did not increase the risk of type 2 diabetes among Japanese individuals (Yaegashi et al., 2023). Additionally, the NIPPON DATA80 study, a 29-year follow-up, investigated the relationship between low-carbohydrate diets and cardiovascular mortality. The findings suggested that such diets were inversely associated with cardiovascular and total mortality in Japanese women (Nakamura et al., 2014). While both countries recognize the potential benefits of the ketogenic diet, cultural dietary habits influence its adoption. In Malaysia, traditional cuisine is rich in carbohydrates, with staples like rice and noodles, posing challenges for strict adherence to a low-carb regimen. Social dynamics, where food plays a central role in gatherings, further complicate adherence (Kumada et al., 2018; Lim et al., 2022). In contrast, Japan's traditional diet, which includes fish, vegetables, and fermented foods, may align more closely with keto principles. However, the high consumption of rice remains a significant source of carbohydrates. Japan's medical community has conducted extensive research on the ketogenic diet, particularly in clinical settings, facilitating its integration into treatment protocols .

CONCLUSIONS

In conclusion, this research suggests that VLCD treatments can be effective for weight loss. The research indicates that the higher the caloric restriction during treatment and the longer the duration of VLCD, the greater the likelihood of significant weight loss. The studies reviewed demonstrated that structured and individual weight maintenance programs can help participants maintain their weight successfully. However, it's essential to consider other factors, such as physical activity levels, eating habits, and genetic factors, as they can influence the success of VLCD in weight loss.

The impact of VLCD on health outcomes is a mix of positive and negative effects. On one hand, VLCD has been associated with improved insulin sensitivity, reduced liver and visceral fat, and improved heart performance with reduced heart triglycerides. However, there are temporary negative effects on heart function, metabolism, and aortic elasticity during the initial phase, which tend to improve after completing the full VLCD program. Additionally, VLCD affects brain activation patterns related to food control, potentially influencing long-term weight maintenance. Despite the potential side effects, participants in the studies tended to continue with VLCD due to its positive impact on health, weight reduction, and overall life quality. VLCD also shows promise in accomplishing type 2 diabetes remission, reducing chronic pain, improving various clinical indicators like blood sugar levels, blood pressure, and serum cholesterol.

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