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NUTRACEUTICALS FOR CARDIOVASCULAR RISK RELATED-OBESITY, THE ROLE OF MUFA AVOCADO: A SCOPING REVIEW

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ABSTRACT

Obesity and its complications are a major nutritional problem worldwide, broadly impacting various organ systems. It causes a negative effect on the risk of obesity-induced cardiovascular disease (CVD). Guidelines recommend MUFA in dietary therapy for obesity and CVD. However, little literature has focused on the potential of avocado as a nutraceutical in obesity-induced CVD, particularly related endothelial dysfunction. Therefore, a scoping review is required. The aim was to review the role of MUFA contained in the avocado diet on obesity-related CVD risk. This scoping review was performed using the 5-step Arkeys and O'Malelev framework and reported according to PRISMA ScR. Four electronic databases were searched systematically. Articles are included if eligible. The result was descriptive and narrative synthesized. A total of 513 articles were collected. Three studies of Randomized Control Trials met the inclusion criteria. Overall, nutrients contained in the avocado act as nutraceuticals. Especially monounsaturated fatty acid (MUFA) oleic can help improve endothelial dysfunction and ultimately reduce the risk of CVD. Available evidence suggests role MUFA contained avocado has the potential as a nutraceutical of dietary therapy to improve endothelial dysfunction associated with reducing obesity-induced CVD risk.

Keywords: avocado cardiovascular; endothelial dysfunction mufa; obesity

INTRODUCTION

Obesity is defined as excessive fat accumulation (Jin et al., 2023) that results from the impairment of energy balance homeostasis mechanisms by measures of body mass index (BMI) over 30 kg/m^2 (Dhurandhar, 2022). The prevalence of Obesity has grown in the last decades, approaching 20% of the global population (Carretero Gómez et al., 2021). The World Obesity Atlas 2022 predicts that 1 in 5 women and 1 in 7 men will be obese by 2030, equating to 1 billion people worldwide (Suren Garg et al., 2023). Dietary intake plays a crucial role in developing Obesity, which has negative consequences (Shatwan & Almoraie, 2022).Obesity was responsible for approximately 40% of comorbidities (Wand et al., 2023), one of which contributes to the development of CVD (Iacobellis, 2023; Sood et al., 2023). Excessive energy supply is caused by adipocyte hypertrophy and the development of visceral fat in non-adipose tissues (Jin et al., 2023). It results in organ function disorders and then promotes the comorbid (Carretero Gómez et al., 2021).

Given the increasing burden of obesity-related comorbidities, adequate therapy is required. The Obesity Medicine Association (OMA) recommends the central management of obesity through a nutritional dietary intervention approach (Fitch et al., 2023). Numerous diets have been developed to treat obesity. The principle is saturated fat-restricted intake and switch to unsaturated fat (Alexander et al., 2022). Monounsaturated fatty acid (MUFA) sources are abundant in avocados (Wang et al., 2020). Avocado contains a high level of MUFA, as much as 9,8 g/100 g of pulp (Araújo et al., 2018), making it an effective fight against obesity and comorbid (Conceição et al.,

2022). The benefits of avocado and cardiometabolic health regarding lipid profile are clear (James-Martin et al., 2022), as well as its nutraceutical potential (Tramontin et al., 2020). Nevertheless, to our knowledge, few discuss obesity-induced endothelial dysfunction and CVD risk. Traditionally addressing obesity before progressing to CVD complications could profoundly impact clinical outcomes. We were considering the nutrient content of avocado as a nutraceutical. Therefore, this scoping review aims to explore the role of MUFA contained avocado diet on obesity-related CVD risk.

METHOD

The review was carried out to summarize, map, and present the findings of research papers using descriptive approaches. Validation was performed using the 5-step Arkeys and O'Malelev framework and reported according to PRISMA ScR (priority reporting item for systematic review and a meta-analysis extension for scoping reviews) (Westphaln et al., 2021). Review in this study used a scoping review design. Article inclusion criteria were determined by publishing in English, globally, a full-text paper published after 2013, focused on nutraceuticals of avocado MUFA contain for Obesity-related CVD risk and designed by randomized controlled trial (RCT). Articles were obtained from four electronic databases, including Google, PubMed, Science Direct, and Google Scholar, to identify studies published in the last ten years between January 2013 and January 2023. Four databases were chosen because they all have a nutrition and medical sciences concentration and fit the study's objectives. The database searches' keywords were as follows: " (avocado OR unsaturated OR MUFA OR monounsaturated OR oleic) AND (obesity OR overweight OR high-fat diet) AND (cardiovascular OR CVD OR cardio-metabolic) AND (endothelial function OR endothelial dysfunction) AND (RCT OR Randomized Controlled Trial)." A total of 513 articles were collected, and full-text articles were screened for eligibility.

RESULTS AND DISCUSSION

Selection of sources of evidence

A total of 513 articles were identified from databases (Science Direct 187, Pubmed 152, Google Scholar 100, and Google 74 paper). 513 of these 63 items were eliminated during the initial assessment, and 63 articles were found to have a potential close match with the scoping review's emphasis. 12 paper is removed after duplicate, leaving 51 paper. Then, 32 papers are excluded by title, leaving 19 papers eligible—exclusion by design study, leaving 12 papers suitable for analysis. Eight of them were excluded because the outcome did not match the scoping objectives. Finally, three articles were gone for a scoping review. Figure 1 shows the PRISMA flowchart showing the search strategy used.

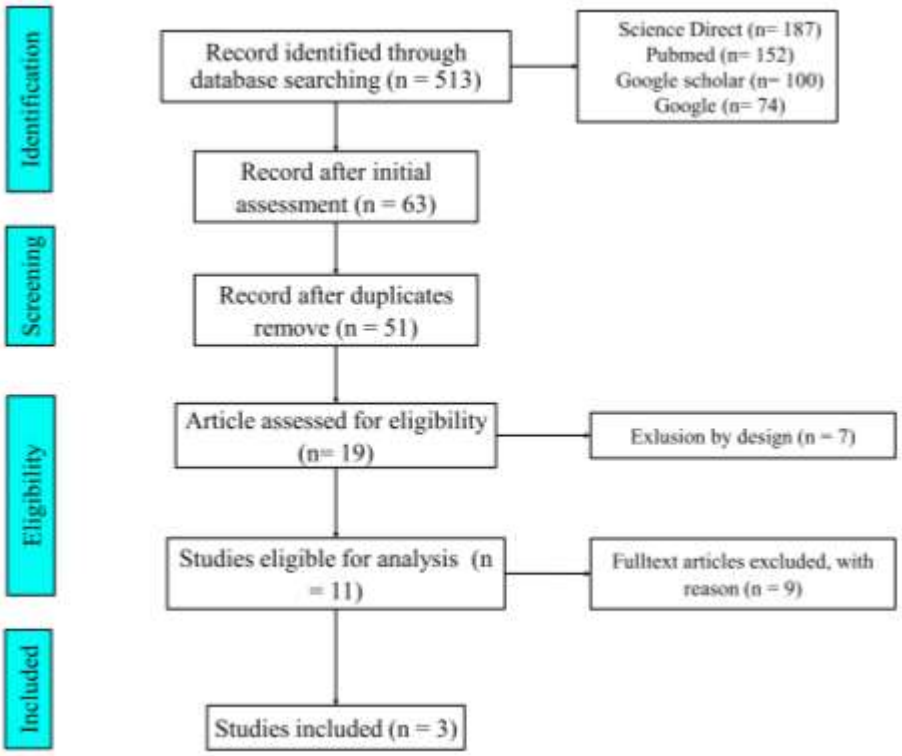

Figure 1. PRISMA flow chart

Characteristics of sources of evidence

Characteristics of the articles included in this review are: article is based on articles published in respected Scopus-indexed journals, including Q1's Food & Function and Journal of Nutrition (n = 2) and Q2's Nutrients (n = 1). All articles from the USA are included in this scoping review (n=3). All research subjects are adults (n=3), including obese/overweight individuals (n=2) and high fat/carbohydrate diets (n=1). One study examined the effects of switching from carbohydrate energy to avocado energy for 12 weeks on insulin resistance, glucose homeostasis, and cardiometabolic risk factors in self-selected free-living people (Zhang et al., 2022). One study investigated postprandial metabolic and vascular health indicators, adding MUFA and PUFA fats from avocados to a breakfast meal and replacing most carbohydrates with fat (Park et al., 2018). One study evaluated the impact of eating avocado with hamburger meat, a popular food pairing, on good postprandial vascular function and anti-inflammatory activity in healthy participants (Li et al., 2013). The duration of the intervention varied from 2 hours postprandial (11 sample size), 6 hours postprandial (39 sample size), to 12 weeks avocado intervention (124 sample size). Subjects' ages range from 25 to 65 years.

Synthesis of results

The three articles' results are evidence of avocados' effectiveness in treating obesity-related CVD risk. In other words, despite very few papers, the evidence shows the beneficial effects of the MUFA in avocados in reducing CVD risk by improving endothelial function. Mapping, analysis, and synthesis are listed in Table 1 below.

Table 1. Mapping, synthesis, and analysis.

Title	Country	Study type	Main findings	Analysis	Reference
Hass avocado modulates postprandial vascular reactivity and postprandial inflammatory responses to hamburger meals in healthy volunteers.	USA	Randomized controlled trial, crossover.	Half an avocado eaten together with a hamburger patty avoided the decline in vasodilation associated with eating hamburgers alone.	Adding avocado to a heavy-fat meal could reduce the postprandial vaso-constrictive effects of a high-fat diet, thereby having cardiovascular benefits. The MUFA oleic acid mechanism is involved in this.	(Li et al., 2013).
Avocado Fruit on Postprandial Markers of Cardio-Metabolic Risk: A Randomized Controlled Dose-Response Trial in Overweight and Obese Men and Women.	USA	Randomized controlled trial, single-center, single-blind, crossover.	Replacing high-carbohydrate and fat foods with avocados lowers cardiovascular risk.	Avocado's MUFA content enhances endothelial function by enhancing its capacity for vaso-relaxation.	(Park et al., 2018).
Avocado Consumption for 12 Weeks and Cardiometabolic Risk Factors: A Randomized Controlled Trial in Adults with Overweight or Obesity and Insulin Resistance.	USA	Single-center, randomized, 2-arm, controlled, statistician-blinded, parallel study.	After the 12-week interventions avocado, differences in the change of VCAM-1 were evident. However, the effect size estimate was small.	Increased VCAM-1 levels are higher than in normal conditions due to endothelial dysfunction, and the mechanism is not precise.	(Zhang et al., 2022).

Summary of evidence

The summary of evidence is intended to summarize results following the scoping review's primary objective. First and foremost, it should be noted that there aren't many articles on the topic of avocado as a nutraceutical and how it affects the obesity-related CVD risk associated with endothelial function. The author acknowledges that the article's initial findings may be appropriate. The exclusion procedure, however, revealed that while most studies focused RCT on Obesity, CVD, and the advantages of avocado consumption, they did not focus on outcomes related to endothelial function-related pathways. All included studies are incompletely explained. However, a red thread can be made from the study's findings. We found it on two separate occasions. Subjects ate a 250 g hamburger patty alone (approximately 436 kcal and 25 g of fat) or in combination with 68 g of avocado flesh (more than 114 kcal and 11 g of fat). The hamburger alone caused significant vasoconstriction 2 hours after consumption, but the avocado flesh alone did not (Li et al., 2013).

Avocado consumption has a complex process that modifies endothelial function to reduce the risk of cardiovascular disease brought on by obesity and high-fat diets. Adding avocado to a high-fat meal could lessen the postprandial vasoconstrictive effect of a high-fat diet. A rise in plasma concentration of the MUFA acid oleic acid may be one of the possible mechanisms underlying the

favorable impact on health (Li et al., 2013). Literature shows that dietary lipids influence vascular function. Oleic acid improves endothelial function by phosphorylating eNOS at Ser1177 and the PI3K pathway (Jackson et al., 2022).

In studies on the obesity subject, participants who ate half- and whole-avocado meals experienced considerably higher flow-mediated dilatation (FMD) than control meals. It leads to an increase in endothelial function. Even though the precise mechanisms underlying the effects of FMD reported in the current investigation cannot be explained. The MUFA content is believed to be responsible for this positive effect (Park et al., 2018). It is confirmed by the recent meta-analysis study by Fatima *et al.,* 2023. They explained that the MUFA-rich Mediterranean diet increases FMD and improves and enhances endothelial function. Biomarkers of endothelial activation and vascular cell adhesion molecule 1 (VCAM-1) are investigated. After the avocado intervention, VCAM-1 was dramatically reduced with a minor effect size. The substance of avocado MUFA plays a role in the fundamental mechanism (Zhang et al., 2022). Yet there aren't many references discussing. An old study showed that oleic acid reduced inflammatory gene mRNA levels and protective and antioxidant effects on endothelial cell activation in endothelial cells. This fatty acid protects endothelial cells from VCAM-1 caused by cytokines (Toborek et al., 2002). This study combines the results of three research studies, the action of avocados' nutritional content through different path mechanisms and targets. It provides proof that consuming avocados, which are high in MUFA, has favorable effects on the cardiovascular risk associated with Obesity as well as endothelial function.

Strengths and limitations

The first review's limitations only applied to papers written in English. Second, it was identified in only four electronic databases, and these databases were chosen due to their popularity. And third, the available sources are few and do not comprehensively discuss MUFA modifies endothelial function and lowers the risk of obesity-related CVD. Finally, the strengths of this study are the author's knowledge. It is the first review on the role of avocado in obesity-related CVD through endothelial function. Then this review collects papers with Scopus-accredited sources.

CONCLUSION

In conclusion, daily avocado consumption (high in MUFA) has the potential to be a nutraceutical diet therapy for obese individuals as well as those with high-fat and carbohydrate diets. It enhances and improves endothelial function, therefore reducing obesity-related CVD risk. It is hoped that more comprehensive research will be carried out to provide empirical evidence future.

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