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Effectiveness of synbiotics in obesity management: A literature review

Efektivitas sinbiotik dalam manajemen obesitas: Tinjauan literatur

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Abstract

The increased occurrence of obesity worldwide is playing a major role in the growth of serious illnesses, such as Cardiovascular Disease and Type 2 diabetes. Modulation of gut microbiota using synbiotics is a novel alternative. This study provides evidence for the effectiveness of synbiotics in managing obesity, particularly with respect to body composition and anthropometric measurements. This review focuses on the years 2020-2025. Using the keywords “synbiotic” AND “obesity,” criteria based on inclusion and exclusion were applied to the Title, Abstract, and TEXT to screen publications. Data available in English in the specified years were used. Short-term synbiotic supplementation shows little evidence of affecting body weight or body mass index. However, waist circumference, body fat percentage, and visceral fat loss suggest that short-term to mid-term synbiotic supplementation has a more consistent effect on body composition and central obesity. The positive impact of synbiotics is more noticeable when high-fiber diets are used. In conclusion, ulterior to achieving absolute weight loss, it can be concluded that synbiotics are a safe means of managing obesity as a central means of improving body composition and central obesity.

Keywords: Anthropometry, body composition, gut microbiota, obesity, synbiotics

Abstrak

Peningkatan insiden obesitas di seluruh dunia memainkan peran utama dalam pertumbuhan penyakit serius seperti Penyakit Kardiovaskular dan Diabetes Tipe 2. Modulasi mikrobiota usus menggunakan sinbiotik merupakan alternatif yang belum banyak dieksplorasi. Artikel ini menyediakan bukti mengenai efektivitas sinbiotik dalam mengelola obesitas, khususnya terkait komposisi tubuh dan pengukuran antropometrik. Ulasan ini berfokus pada periode tahun 2020-2025. Menggunakan kata kunci “sinbiotik” DAN “obesitas”, kriteria inklusi dan eksklusi diterapkan pada Judul, Abstrak, dan Teks untuk menyaring publikasi. Data yang tersedia dalam bahasa Inggris pada tahun-tahun yang ditentukan digunakan. Suplementasi sinbiotik jangka pendek menunjukkan sedikit bukti pengaruh terhadap berat badan atau indeks massa tubuh. Namun, lingkar pinggang, persentase lemak tubuh, dan penurunan lemak visceral menunjukkan bahwa suplementasi sinbiotik jangka pendek hingga menengah memiliki efek yang lebih konsisten terhadap komposisi tubuh dan obesitas sentral. Ketika diet tinggi serat digunakan, dampak positif sinbiotik lebih terlihat. Kesimpulan, selain mencapai penurunan berat badan absolut, bahwa sinbiotik merupakan cara aman untuk mengelola obesitas sebagai cara utama untuk meningkatkan komposisi tubuh dan obesitas sentral.

Kata Kunci: Antropometri, komposisi tubuh, mikrobiota usus, obesitas, sinbiotik

Introduction

Obesity is defined as an excessive accumulation of body fat, operationally defined as a Body Mass Index (BMI) of 30 kg/m2 or more. Obesity is a rapidly growing global public health concern. The World Obesity Atlas 2025 projects that 2 billion people (an estimated 40% of all adults globally) are affected by overweight and obesity. This is an increase from the 1.6 billion people in 2010 (World Obesity Federation, 2025). Obesity has become a global health crisis. The number of obese adults worldwide has more than tripled in the past 40 years, and this figure is only expected to grow. Obesity is the cause of several chronic diseases, including type 2 diabetes, heart disease, and metabolic syndrome. The number of obese adults worldwide is expected to exceed 50% of the adult population by 2030 (World Obesity Federation, 2025). Standard methods, including dietary modification or increased exercise, have proven minimally effective in the long term. This shows that there is a need for more innovative and efficient therapeutic methods.

Obesity is defined as a disorder caused by an unbalanced intake of energy, typically associated with the accessibility of sugary foods and drinks. Given the lack of control parents typically have over their children, it is not surprising that children are an easily exploited/vulnerable demographic that is being targeted, and thus their future substance, or increasingly metabolic diseases, begin from an early age (Jannah et al., 2025; Muñoz-Cabrejas et al., 2023). According to the International Diabetes Federation (IDF), with a projected 28.6 million people suffering from diabetes by 2045, Indonesia is among the top five countries with the highest number of diabetes cases. Therefore, the prospective worsening of the metabolic health of the Indonesian population (IDF, 2025). Obesity treatment is a complex issue. Successful tapering of obesity is dependent on more than just the attainment of an energy deficit. Customarily, the metabolic response and several other biological operating factors are likely to be the reasons for the persistence of conventional treatment. This highlights the more profound and fundamental metabolic systems. This includes the gastrointestinal tract and diverse gut microbiome (Ruban et al., 2019). These realities have further reinforced the call for more comprehensive and pragmatic preventive measures, specifically the gut microbiota. The use of synbiotics is a valid solution (Kassaian et al., 2019).

The importance of gut microbiota in the development of obesity has been documented in the last few years (Hijová, 2022). Obesity is associated with dysbiosis, which is characterized by a low level of diversity within microbial communities, as well as modifications of the gut microbiota that are related to low-grade inflammation, disrupted energy metabolism, insulin resistance, and the propensity to store fat (Amabebe et al., 2020). Therefore, gut microbiota plays a key role in obesity management through its modulation. Prebiotics are non-digestible food ingredients that encourage the growth of certain bacteria, such as Bifidobacterium and Lactobacillus, which are beneficial to the host, increase the production of short-chain fatty acids (SCFAs), and improve gut barrier function (Amabebe et al., 2020; Ben Othman et al., 2023; Lauw et al., 2023). Conversely, probiotics are defined as living microorganisms that, when administered in adequate amounts, change the gut microbiota, which in turn diminishes inflammation and changes the levels of appetite-regulating hormones (Kerry et al., 2018). Numerous preclinical and clinical studies have highlighted the potential of both prebiotics and probiotics to improve weight, body mass index, and fat mass; however, there is wide variability in response based on the strain of probiotic, amount, and time of intervention (Kerry et al., 2018).

Prebiotics and probiotics are proposed to work synergistically when combined, as prebiotics support the survival and activity of probiotics in the digestive tract (George Kerry et al., 2018; Sanders et al., 2019). Several clinical trials have reported that synbiotics have a positive impact on participants' body weight and waist circumference, despite causing only minor changes. Additionally, synbiotics have positive effects on metabolism and metabolic components, such as insulin, lipids, and inflammation (Liu et al., 2018; Plaza-Diaz et al., 2019; Sarima et al., 2025). However, the reliability of these findings is inconsistent across studies, which is the main reason the authors call for specific strain effects, the ideal synbiotic dose, and the appropriate synbiotic consumption interval (Hadi et al., 2020).

Obesity results from various interacting causes, including the significant involvement of the gut microbiota in the gut-brain axis. In this context, synbiotics represent a promising, noninvasive, complementary therapy for obesity treatment (Gadde et al., 2018). The ability of synbiotics to restore gut microbiota balance, reduce inflammation, and improve metabolic health provides a strong justification for including synbiotics in obesity management plans (Gadde et al., 2018). In this regard, our study aimed to review published studies and systematically analyze the effectiveness of synbiotics in obesity management.

Methods

Data Sources and Collection

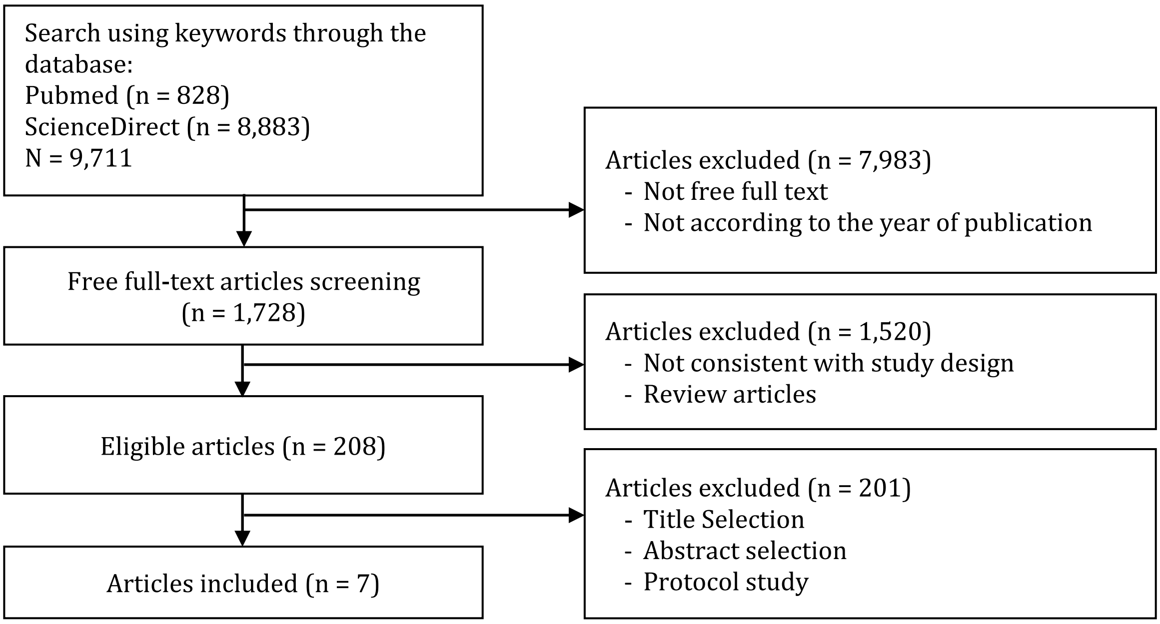
This study was conducted by reviewing previous studies in PubMed and ScienceDirect to collect relevant data. The search used keywords and keyword combinations such as: "synbiotics" AND 'obesity' and "synbiotics and obesity." To include the latest studies related to synbiotics and obesity, the search was limited to articles published in the last five years.

Only articles from the previous five years were included, and only articles published in English were considered. The initial search yielded 828 articles from PubMed and 8,883 articles from ScienceDirect.

Study Selection

In accordance with the inclusion criteria established for the selected articles, only studies focusing on the relationship between synbiotic consumption and obesity or overweight were included.

Articles were excluded based on the following criteria: articles not available as free full texts, review articles, articles related to animal studies, and articles not focusing on synbiotics and obesity. The selection process was conducted in three stages: screening titles and abstracts, and then screening full texts to determine their eligibility.



Result and Discussion

Author & Year	Study Design	Population	Intervention	Duration	Results
Laue et al. (2023)	RCT, double -blind	180 Overweight individuals With abdominal obesity	*Lactobacillus fermentum* probiotic, or synbiotic (probiotic + 10 g acacia gum)	12 weeks	Synbiotics significantly improved superficial abdominal fat (SAD) ($p = 0.002$) and hepatic steatosis ($p < 0.001$). Compared with the placebo group, the probiotic group showed a greater reduction in body fat mass (−0.61 ± 1.94 vs. +0.13 ± 1.64 kg) (Laue et al., 2023).
Anggeraini et al. (2021)	RCT, double -blind	16 obese participants	Synbiotic (probiotic + prebiotic)	8 weeks with 4-week follow-up	Although synbiotic supplementation did not significantly reduce body weight, it prevented the weight gain (+3.38 kg) observed in the control group. In addition, synbiotics

					significantly reduced fasting blood glucose (−6.125 mg/dL), and this effect lasted up to 4 weeks after the intervention, demonstrating lasting metabolic benefits (Anggeraini et al., 2021).
Atazadegan et al. (2023)	RCT, double-blind	60 overweight/obese children and adolescents	Sinbiotik (*L. coagulans SC-208* + *L. indicus HU36* + FOS)	8 weeks	Compared with placebo, the synbiotic showed a statistically significant reduction in waist-to-height ratio (WHtR) from 0.55 to 0.54 (p=0.05); however, no significant differences were observed in BMI, waist circumference, fat mass, or any other body composition metric (Atazadegan et al., 2023).
Lauw et al. (2023)	Randomized trial, open-label	55 overweight/obese adults	Synbiotic (*L. acidophilus* NCFM + *B. lactis* HN019 + polydextrose), high fruit and vegetable diet, or combination	8 weeks	Participants in the study who received the synbiotic supplement, along with the recommendation to increase their consumption of fruits and vegetables, saw a combined total reduction in body weight and body fat of 1.4 kg and 2.4 kg, respectively. In addition, their HDL-C levels increased by 0.05 mmol/L, and their triglyceride levels decreased by 0.5 mmol/L. This synbiotic supplementation also decreased the abundance of Megamonas, and the improvements observed in this study were stronger than those observed when synbiotics were supplemented alone, where participants only experienced some improvements in their metabolism and no improvements in their body measurements (Lauw et al., 2023).
Ben Othman et al. (2023)	Clinical trial	45 obese subjects	Diet vs prebiotic (30 g carob) vs probiotic (4 strains)	1 month	All groups showed weight loss, reduced BMI, and a reduced waist circumference. Prebiotics and probiotics improve fat mass and muscle strength. Compared to the group that followed the diet alone, the probiotic group showed a reduction in fasting blood glucose levels. In addition, prebiotics reduced insulin levels and HOMA-IR. (Ben Othman et al., 2023).
Fallah & Mahdavi (2023)	RCT, double-blind	46 obese women	L-carnitine + sinbiotik multistrain	8 weeks	Combination therapy resulted in greater reductions in body weight, BMI, waist and hip circumferences,

			vs L-carnitine		FBS, HOMA-IR, and QUICKI. In the combination group, weight loss ≥2.45 kg was achieved by 82.6% of participants, while in the control group only 22.7% achieved this (Fallah & Mahdavi, 2023).
Oraphruek et al. (2023)	RCT, double -blind	63 overweight /obese adults	Multispecies synbiotic (7 strain + 2 g FOS)	12 weeks	The samples demonstrated a decrease in waist circumference and total body fat percentage and an increase of 10.8 U/mL in antioxidant capacity after 12 weeks. Furthermore, there was a decrease in the MDA, Firmicutes, and Firmicutes/Bacteroidetes ratio. However, when compared to the placebo group, no body weight and BMI clinically significant differences were found, which indicates that the primary effects were on central adiposity, oxidative stress, and some gut microbiota profiles (Oraphruek et al., 2023).

Effects of Synbiotics on Anthropometric Parameters

When analyzing the effects of synbiotics on anthropometric parameters in overweight and obese individuals, the results showed a lot of variability, but a good number of studies showed the same trend when looked at in totality. Some clinical trials have shown that, in the short term, synbiotic supplementation does not cause a statistically significant change in weight and body mass index (BMI) loss, especially in children, adolescents, and adults with stable obesity. However, the weak results of total body weight loss are not a criticism of the efficacy of synbiotics, and most studies show improvements in central obesity and body composition.

Atazadegan et al. (2023) noted that while no statistically significant changes in BMI or other body composition metrics were found, waist-to-height ratios were positively impacted by synbiotic supplementation in overweight or obese children and adolescents. These data indicate that synbiotics may alter the distribution of abdominal body fat without causing weight reduction. Oraphruek et al. also noted a similar trend. After 12 weeks of multispecies synbiotic intake, no statistically significant changes in body weight or BMI were observed between the synbiotic and placebo groups; however, waist circumference and body fat percentage were positively affected by the synbiotics (Oraphruek et al., 2023; Rabiei et al., 2019). Central obesity and fat distribution measurements most strongly capture the effects of synbiotics and are, therefore, more sensitive than standard anthropometric measurements, such as BMI, which means that these measures are more affected by the use of synbiotics in a study. With these results in mind, we conducted a six-month randomized controlled trial studying overweight and obese women with polycystic ovary syndrome (PCOS). Synbiotic supplementation in conjunction with intensive lifestyle modification reduced waist circumference and waist-to-hip ratio more significantly than lifestyle intervention alone. Although both groups observed improvements in body weight and BMI, improvements in central obesity and fat distribution were more pronounced in the synbiotic group. This highlights the effect of synbiotics as an adjunct agent in lifestyle interventions (Chudzicka-Strugała et al., 2024; Zhang et al., 2025).

Using Lauw et al. (2023), synbiotic supplementation has been shown to provide a greater reduction in body weight and body composition (body fat and trunk fat) in adult populations compared to synbiotic supplementation alone or dietary interventions alone, especially when paired with a high-fiber (fruit and vegetable) diet (Lauw et al., 2023). This demonstrates that synbiotics facilitate changes in body composition when used with supportive nutritional countermeasures as a primary or secondary adjunct to stimulate change.

Ben Othman et al. considered the benefits of synbiotics and targeted elements on the microbiota in improving anthropometric records. Their study revealed that the inclusion of prebiotics or probiotics in a modified diet resulted in a significant reduction in body weight, body mass index (BMI), and waist circumference of participants, and that these changes occurred within one month, although the differences between the intervention groups were not statistically significant (Ben Othman et al., 2023). This indicates that it is possible to make changes in a short period of time, and these changes can be substantial; this is largely determined by the period during which the intervention is applied and the magnitude of dietary changes.

Additionally, Fallah and Mahdavi showed that multistrain synbiotics, together with L-carnitine, were the only treatments responsible for significant reductions in total body weight, BMI, and neck, waist, and hip circumferences compared to L-carnitine alone among the group of women studied (Fallah & Mahdavi, 2023). This suggests that other nutraceuticals may enhance the positive effects of synbiotics on body measurements owing to their potential synergistic effects on fat burning and metabolic control.

Studies have shown that synbiotics have a greater effect on measures of central obesity and fat distribution than on total body weight or BMI. Some studies show incomplete or inconsistent data, which may be due to variations in synbiotics, intervention duration, participant differences, and anthropometric measurements used in each study. When evaluating synbiotics for managing obesity, the evaluation should not stop at body weight or BMI. Waist circumference, waist-to-height ratio, and body fat percentage should be evaluated, as these are clinically and metabolically relevant.

Effects of Synbiotics on Body Composition

In comparison to the effects of synbiotics on body weight or body mass index (BMI), body composition impacts show a greater degree of consistency, especially with respect to fat mass, visceral fat, and adipose tissue distribution (Aoun et al., 2020). Clinical trials have shown that total fat mass, body fat percentage, or some measure of visceral obesity can be decreased by synbiotic supplementation, even if total body weight does not change. Laue et al. showed that probiotics and synbiotics reduced visceral fat and improved markers of hepatic steatosis, which are positive changes in body composition and lipid metabolism, despite some weight loss (Da Silva et al., 2021; Laue et al., 2023). This shows that body composition can be altered regardless of body weight changes.

The observations made by Oraphruek et al. have also been noted in other studies. In the Oraphruek study, after 12 weeks of multispecies synbiotic supplementation, there was a noted reduction in body fat percentage and waist circumference, while no changes in body weight or BMI, which were clinically insignificant, were noted between the synbiotic and placebo groups at the end of the study (Oraphruek et al., 2023). A short study duration may have caused no weight change and no clinically significant weight change. Although variability was present in human studies, animal studies had more clinically significant results. Changes in colonic microbiota and their metabolites may cause changes in the amount and distribution of adipose tissue and its quality, instead of changes in body weight. Santamarina et al. (2022) and Zhu et al. (2024) conducted preclinical studies on obese animal models and hypothesized that synbiotic formulations may improve metabolic homeostasis, reduce ectopic fat, and modulate the genes that control lipid metabolism and inflammatory response. (Santamarina et al., 2022; Zhu et al., 2024).

Among children, Atazadegan et al. found that synbiotics did not affect fat mass or fat-free mass, although the waist-to-height ratio increased (Atazadegan et al., 2023; Banach et al., 2020). This may be due to the developmental physiology of the limited duration of the intervention and the unique metabolic adaptations of children compared with adults. These results suggest that, compared with children, adults with unhealthy metabolic obesity may experience greater benefits from synbiotics.

Other studies suggest that the benefits of synbiotics on body composition are more profound with additional treatments. Lauw et al. found greater reductions in total body fat and trunk fat from the combination of synbiotics and increased fruit and vegetable consumption than from dietary intervention or synbiotic supplementation alone (Lauw et al., 2023). Additionally, according to Fallah and Mahdavi, a greater reduction in fat mass and improvement in body composition indicators compared to L-carnitine alone was observed. Fallah and Mahdavi (2023) reported that a multistrain synbiotic with L-carnitine has a synergistic effect on lipid metabolism and fatty acid oxidation. (Fallah & Mahdavi, 2023; Sepideh et al., 2016).

In addition to fat mass reduction, various studies have documented that prebiotic or probiotic supplementation can help maintain or even increase the fat-free mass. Ben Othman et al. documented that users of prebiotics or probiotics experienced fat mass reduction and increased muscle strength, although most of the differences between the groups were not statistically significant (Ben Othman et al., 2023; Hassan et al., 2024). These results are interesting because the ideal goal in obesity treatment, particularly in managing those at risk of sarcopenic obesity, is to reduce fat mass while maintaining fat-free mass.

Conclusion

Symbiotics are safe secondary supplements for managing obesity, particularly for improving central obesity and body composition rather than losing weight altogether. Short-term dietary symbiotic supplements do not significantly lower body weight and body mass index. However, consistent and positive short-term/symbiotic dietary supplements affect waist circumference, waist-to-height ratio, body fat %, and visceral fat. In the literature, these results are situational and context-dependent, with increased positive short-term/symbiotic dietary supplement waist and body composition changes in participants who made dietary modifications and lifestyle changes.

More strategically designed longitudinal studies are required to determine the right symbiotic supplements and the right objectives in the context of evidence based methodologies of dealing with obesity to understand the right objectives in incorporating symbiotics in dealing with obesity.

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