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The Impact of Oatmeal on Weight Status and Changes: A Systematic Review

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ABSTRACT

Introduction: The relationship between oatmeal consumption and its effects on weight status and changes in both adults and children has garnered significant interest, particularly due to the growing concerns around obesity and the need for evidence-based dietary interventions. However, the current body of literature remains inconclusive, with a lack of a comprehensive synthesis of the evidence. This systematic review aims to examine the existing studies on this topic, revealing the scarcity of research and highlighting conflicting findings.

Methods: A thorough investigation was conducted through a comprehensive search of relevant literature in PubMed, Scopus, and Web of Science databases using 'oatmeal' OR 'oat porridge' AND 'body weight' OR 'weight' OR 'waist circumference' OR 'BMI' OR 'body mass index' OR 'body composition' as keywords until July 2023. Two independent reviewers screened the titles and abstracts, ultimately identifying five relevant articles for inclusion.

Results: The studies reviewed revealed varying outcomes regarding the impact of oatmeal consumption on weight status. Some cross-sectional studies indicated a notable association between oatmeal intake and weight, BMI, or waist circumference reduction. In contrast, randomized controlled trials did not consistently show significant changes in weight associated with oatmeal consumption.

Conclusion: Research suggested that while oatmeal may offer potential benefits for weight management, there is insufficient focused study on oatmeal specifically. Its role in weight loss appears to be modest, and it should not be regarded as a standalone solution. Therefore, oatmeal is best incorporated as part of a balanced diet and healthy lifestyle, rather than being relied upon exclusively for weight management.

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Introduction

According to the World Health Organization (WHO), it is projected that by 2030, approximately 30% of global fatalities will be attributed to lifestyle-related diseases. These diseases can be mitigated through the identification and management of associated risk factors, as well as the implementation of policies that encourage positive behavioral changes (1). Obesity is a major public health concern worldwide, as it is linked to an increased risk of several severe health conditions and substantial economic burdens (2). Overweight and obese individuals are more susceptible to a range of health problems, including cardiovascular diseases, diabetes, musculoskeletal disorders, and certain types of cancer (3). Globally, nearly 52% of adults are either overweight or obese (4). Furthermore, the prevalence of overweight and obesity among children and adolescents aged 5-19 has increased significantly, rising from 4% in 1975 to just over 18% in 2016 (3). This condition results from a persistent energy imbalance and is a complex issue influenced by a variety of factors, including genetics, hormonal levels (5), behavioral patterns, and environmental influences (6).

Extensive research over the years has demonstrated that certain food ingredients can significantly influence short-term appetite regulation. When combined with other lifestyle changes, these foods may support weight loss (7). For decades, a well-established link has existed between dietary fiber consumption and a reduced risk of obesity, while also promoting overall health (8, 9). Furthermore, the American Academy of Pediatrics recommends high-fiber diets, particularly those that include whole

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grains, to reduce the risk of cardiovascular diseases (10) and address overweight or obesity issues in children (11). The effects of various types of fiber on appetite, energy intake, and body weight have also been reviewed in the literature (12, 13). Oats, in particular, are rich in dietary fiber, including cellulose, arabinoxylans, and soluble fibers, with β-glucan standing out as a key component, making them an excellent choice compared to other cereal fibers.

Additionally, oats are characterized by significantly higher concentrations of protein and unsaturated fats (14). Viscous fibers, such as oat β-glucan, have been shown to have a more pronounced effect on reducing appetite and acute energy intake compared to less dense fibers (12). Studies investigating the relationship between fiber type, fiber intake, satiety scores, and food intake (13) have demonstrated that β-glucan, in particular, exerts an appetite-suppressing effect. Moreover, the interventions resulted in favorable changes in total body fat percentage, waist and hip measurements, and visceral fat percentage (15).

While a substantial body of research has highlighted the health benefits of oats, particularly due to their β-glucan content, emerging studies are beginning to explore other beneficial components found in oatmeal. Notably, oatmeal contains avenanthramides, which have demonstrated potential antioxidant and anti-inflammatory properties (16, 17). In addition to its well-known soluble fiber, oatmeal also contains insoluble fiber, further contributing to its broad spectrum of health-promoting effects. Therefore, oatmeal is composed of several bioactive components, each with established or emerging health benefits (17).

Despite the growing interest in the impact of oatmeal on weight status and weight changes, the existing literature remains inconclusive and lacks a comprehensive synthesis of evidence. Therefore, this systematic review aims to critically evaluate the current body of research on the effects of oatmeal consumption on weight status and weight changes in both adults and children. By compiling and analyzing the available studies, this review seeks to provide a comprehensive overview of the existing evidence. Additionally, it aims to identify gaps in knowledge, which are essential for advancing our understanding of oatmeal's effects on weight status and for identifying potential avenues for future research.

Materials and Method

Objective

This systematic review aims to assess the effects of oatmeal consumption on key weight-related outcomes, including body weight, body mass index (BMI), and waist circumference (WC).

Search Strategy

This systematic review was conducted following the guidelines outlined in the Cochrane Handbook for Systematic Reviews of Interventions. A comprehensive search of relevant literature was performed in databases such as PubMed, Scopus, and Web of Science, using various keywords including "oatmeal" OR "oat porridge" AND "body weight" OR "weight" OR "waist circumference" OR "BMI" OR "body mass index" OR "body composition," up until July 2023. To supplement the systematic search, manual searches of the reference lists of the included studies were also conducted. The search was restricted to studies involving human participants and published in English.

Study Selection

Two independent reviewers screened the titles and abstracts of the identified articles to assess their eligibility for inclusion. Full-text articles of potentially relevant studies were then retrieved and evaluated for final inclusion based on predefined criteria. Any discrepancies between the reviewers were resolved through discussion and mutual agreement. Information from the included studies was extracted using a standardized data collection form. For interventional studies, the following details were recorded: study characteristics (authors, year of publication), participant characteristics (sample size, demographics), oatmeal intervention specifics (type, dose, duration), outcome measures, and results. For cross-sectional studies, the following information was collected: study characteristics (authors, year of publication), participant characteristics (sample size, demographics), outcome measures, and results.

Finally, a narrative synthesis was performed to summarize the findings of the included studies, providing a comprehensive and insightful overview of the research in this area. To assess the risk of bias, the Cochrane guidelines for

clinical trial studies (see Table 1) and the Joanna Briggs Institute (JBI) critical appraisal checklist (see Table 2) for analytical cross-sectional studies were applied.

Table 1. Quality assessment of clinical trials (according to the Cochrane guideline)

Study	Sequence generation	Allocation concealment	Blinding of participants and personnel	Blinding of outcome assessment	Incomplete outcome data	Selective outcome reporting	Other potential threats to validity	General risk of bias
Jian Zhang et al.2012	U	H	H	L	L	L	L	Moderate
Allan Geliebter et al.2014	L	U	H	L	L	L	L	Low
Amanda Missimer et al.2017	U	H	H	L	L	L	L	Moderate

Abbreviations: L, low risk; U, unclear risk; H, high risk based on the Cochrane Collaboration's tool for assessing risk of bias qualitatively

Table 2. Quality assessment of the cross-sectionals (according to the JBI checklist)

JBI checklist	Study	
	Victor L. Fulgoni III et al.2015	Carol E. O'Neil et al.2015
1. Were the criteria for inclusion in the sample clearly defined	Yes	Yes
2. Were the study subjects and setting described in detail?	Yes	Yes
3. Was the exposure measured in a valid and reliable way?	Yes	Yes
4. Were objective, standard criteria used for measurement of the condition?	Yes	Yes
5. Were confounding factors identified?	Yes	Yes
6. Were strategies to deal with confounding factors stated?	Yes	N/A
7. Were the outcomes measured in a valid and reliable way?	Yes	Yes
8. Was appropriate statistical analysis used?	Yes	Yes
Overall appraisal	Include: Yes	Include: Yes

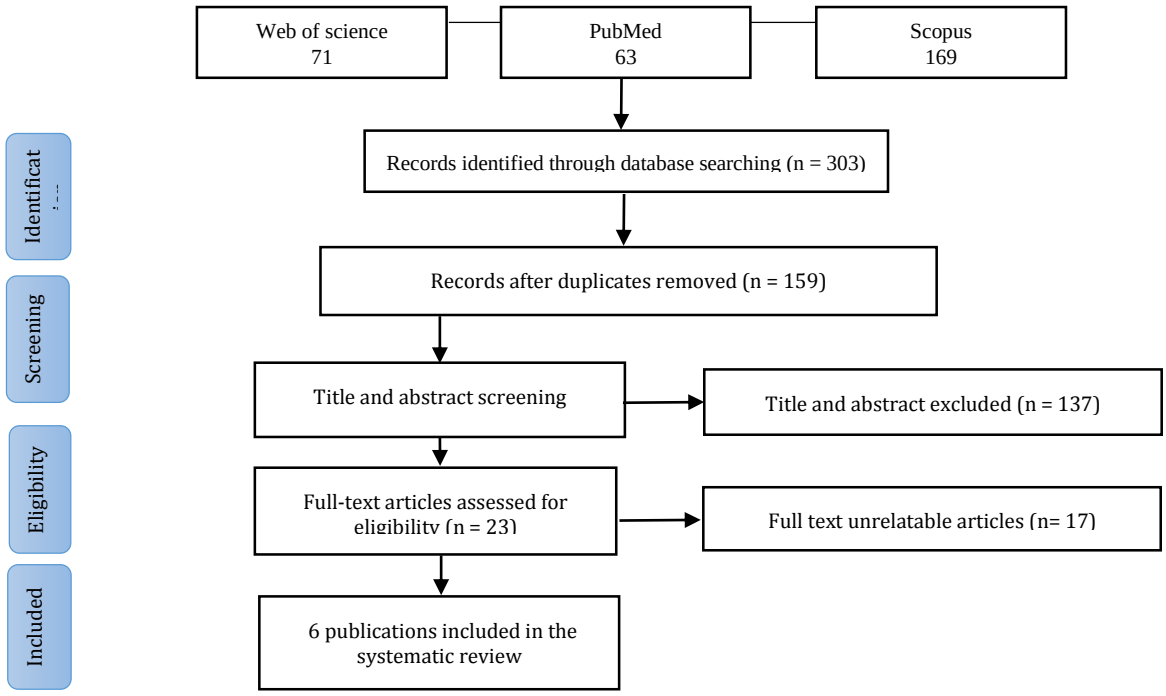

Figure 1. Summary of studies related to the effect of oatmeal on weight

Inclusion and Exclusion Criteria

The inclusion criteria were as follows: (1) access to the full text; (2) articles published in English; (3) clinical trial and cross-sectional studies.

The exclusion criteria included: (1) conference abstracts; (2) articles not focused on oatmeal; (3) articles not addressing anthropometric changes related to oatmeal consumption; (4) non-English publications; and (5) studies lacking clear information. Figure 1 presents the study selection flowchart.

A total of 303 articles were initially retrieved by searching three databases: PubMed, Scopus, and Web of Science. Of these, 159 articles were removed due to duplication, and 137 were excluded based on irrelevant titles and abstracts. After screening the remaining 23 articles, 17 were excluded because their full texts were unrelated to the research topic. Ultimately, six articles met the inclusion criteria and were included in the study.

Results

The inclusion and exclusion criteria were applied to select eligible studies (Figure 1). A total of 159 articles addressing the relationship between oatmeal consumption and weight status in adults and children were initially considered for evaluation. Of these, six studies met the inclusion criteria and were included in the final review. Among the included studies, three were cross-sectional studies, and three were randomized controlled trials (see Table 3).

Table 3. Studies published between 2012 and 2015 that investigate the associations between oatmeal consumption and its effect on weight status

Auteur's Journal & year		Design	Study population	Follow up duration	Inter vention	Results		
						Significat reduction (mean)	No changes	Significant Increase
Jian Zhang	Nutrition Journal 2012	Randomized controlled trial	Mild to moderate hyper cholesterol lemia >18 years	6 weeks	100 gram oatmeal	WC = -1.27 cm	Weight BMI	
Allan Geliebter	Journal of Nutritional Science 2014	Randomized controlled trial	N:166 Overweight 18 female 18male N:36 >18 years	4 weeks	351 Kcal oat		WC FM FFM Weight	
Amanda Missimer	Nutrients 2017	Randomized, crossover	26 female 24 male N: 50	11 weeks	100-160 Kcal oatmeal		WC BMI	

Auteur's Journal & year		Design	Study population	Variables	Consumers	Non-consumers	P value
Victor L. Fulgoni III	Elsevier Inc. 2015	Cross-sectional	11,217 female 11,606 male	Weight BMI WC	79.1 kg 27.5 97.5 cm	81.7 kg 28.5 94.9 cm	P<0.01 p<0.01 p<0.01
Carol E. O'Neil	Food & Nutrition Research 2015	Cross-sectional	Children 2_18 years N:14,690	Weight BMI WC	40.3±0.6 19.4±0.2 66.2 ± 0.6 cm	41.7±0.2 19.8±0.1 67.9 ± 0.2 cm	0.0174 0.0497 0.0032

Abbreviations: WC, waist circumference; BMI, body mass index; FM, fat mass; FFM, fat-free mass

Cross-sectional studies

The first cross-sectional study, conducted by Victor L. Fulgoni III et al. (2015), included 22,823 adults aged 19 years and older (11,217 females and 11,606 males). The study utilized data from the 2001-2010 National Health and Nutrition

Examination Survey (NHANES) (18). The results indicated a significant association between oatmeal consumption and lower weight, BMI, and waist circumference (WC). Specifically, individuals who consumed oatmeal exhibited significantly lower weight, BMI, and WC compared to those who did not consume oatmeal.

The second cross-sectional study, conducted by Carol E. O'Neil et al. (2015), included 14,690 children aged 2 to 18 years. The researchers utilized data from the National Health and Nutrition Examination Survey (NHANES) conducted between 2001 and 2010 (18). The findings revealed that children who consumed oatmeal had a significantly smaller waist circumference (WC) compared to those who did not. However, no significant differences were observed in weight or BMI when assessed using the Z-score and BMI percentile.

Randomized Clinical Trials Studies

Jian Zhang et al. (2012) conducted the first randomized controlled trial, which involved 166 adults aged 18 years and older, all of whom had mild to moderate hyperlipidemia. Participants were instructed to consume 100 grams of oatmeal daily for a duration of 6 weeks. The results of the trial demonstrated a significant reduction in waist circumference (WC) following oatmeal consumption. However, no significant changes were observed in weight or BMI (18).

Allan Geliebter et al. (2014) conducted the second randomized controlled trial, which included 36 overweight adults (18 females and 18 males). Over the course of the 4-week trial, participants were provided with 351 kcal of oatmeal daily. The results showed no significant changes in waist circumference (WC) or weight following the intervention (19).

Amanda Missimer et al. (2017) conducted the final randomized crossover study, which involved 50 healthy adults (26 females and 24 males), all aged 18 years or older. Participants consumed oatmeal for breakfast, with a daily caloric intake ranging from 100 to 160 kcal, over a period of 11 weeks. No significant changes were observed in waist circumference (WC) or BMI (20).

The final cross-sectional study by Kathy Musa-Veloso et al. (2016) utilized data from the National Health and Nutrition Examination Surveys (NHANES) conducted between 2003 and 2012, involving a total of 18,273 participants. Of these, 7,407 were aged 0-18 years, and 10,866 were over 18 years old. The study found significant associations, revealing that underweight individuals consumed 3.01 units more oatmeal than obese individuals. Similarly, normal-weight and overweight individuals consumed 0.51 and 1.30 units more oatmeal, respectively, than their obese counterparts (21). In other words, as body weight increased, oatmeal consumption tended to decrease.

In summary, the studies reviewed presented mixed results regarding the relationship between oatmeal consumption and weight status. While some cross-sectional studies found significant associations between oatmeal intake and reductions in weight, BMI, or waist circumference (WC), the randomized controlled trials did not consistently demonstrate significant changes in weight or related metrics.

Discussion

Benefits of Oatmeal Components

The impact of oatmeal on weight status and weight changes has become a subject of growing interest as individuals seek effective and sustainable strategies for weight management. This review explored the existing literature on this topic, highlighting both the need for further research and the conflicting findings in the current body of work. While numerous studies have examined the effects of oats on weight management, there remains a significant gap in research that specifically focuses on the impact of oatmeal consumption.

One key aspect that distinguishes oatmeal from other oat-based products is its presentation as a complete and convenient meal option, particularly for breakfast. Unlike plain oats, which can be incorporated into various dishes, oatmeal provides a ready-to-eat, nutrient-dense meal. In the context of today's fast-paced lifestyle, where individuals often seek time-efficient and straightforward dietary solutions, oatmeal serves as a practical and satisfying choice for those aiming to manage their weight. Its potential to promote satiety may help curb overeating and unnecessary snacking, thereby supporting weight management efforts.

With the rise of social media and modern dietary trends, oatmeal has become increasingly popular as a commonly recommended option for weight management. However, despite its widespread endorsement, there is a need for caution due to

the lack of robust scientific evidence supporting its specific effects on weight status. While dietitians and nutritionists often incorporate oatmeal into their clients' diets, assuming it is a healthier alternative to processed breakfast foods and that its high fiber content may promote satiety, the evidence supporting these claims remains limited (22). The potential mechanisms through which oatmeal may influence weight management are outlined in Table 4. This table suggests that various ingredients, such as milk, berries, and nuts, can be added to oatmeal, potentially enhancing its health benefits. For example, beta-glucan, the primary bioactive compound in oats, has been shown to inhibit the hyperplasia of liver fat cells and plays a significant role in weight management (23).

Table 4. Common ingredients of oatmeal and possible mechanism of impact on weight management

Oat
β-glucan, the most active oat component, inhibits hepatic adipocyte hyperplasia and plays a key role in weight management (25). In both liver and fat tissues, the decrease in FAS and SREBP-1, increase in PPAR, and activation of AMPK signaling were associated with these effects. Oat beta-glucan partially inhibited the synthesis of fats, while the activation of AMPK decreased the production of proteins related to lipid metabolism (38).
Milk
Various mechanisms have been suggested to explain how milk affects body weight and fat. One hypothesis is that increased calcium intake can aid in weight loss by reducing fat production and promoting fat breakdown. This may be achieved by reducing the formation of 1,25-dihydroxy vitamin D and the secretion of parathyroid or calciotropic hormones (26). Additionally, calcium can combine with fatty acids in the intestines to form insoluble soaps, limiting fat absorption. However, the long-term impact of calcium supplementation on body weight is still unclear (27). Apart from calcium, other components of dairy products, such as whey protein and conjugated linolenic acid, have also been suggested to contribute to weight and body fat loss (28, 29). Whey protein may positively preserve muscle mass and influence lipid metabolism, while conjugated linolenic acid may regulate adipogenesis, inflammation, and lipid metabolism (39).
Types of berries
Berries contain various bioactive compounds, including flavonoids such as anthocyanidins, flavonols, flavanols, flavanones, and flavones, as well as phenolic acids, hydrolyzable and condensed tannins, and stilbenes that have demonstrated the ability to reduce inflammation and reactive oxygen species (40, 41). The main mechanisms through which berries exert their anti-inflammatory effects include reducing NF-κB (nuclear factor kappa B) signaling (30), potentially due to decreased oxidative stress (42), suppressing TLR4 (toll-like receptor 4) signaling (43), and enhancing Nrf2 (nuclear factor erythroid 2-related factor 2) activity (44).
Different nuts
Nuts contain unsaturated fats that can potentially increase fat oxidation and reduce the accumulation of body fat (31). The high protein and fiber content of nuts may also increase thermogenesis and resting energy expenditure. The dietary fiber, particularly viscous fiber, present in nuts can delay gastric emptying and absorption, suppressing hunger and promoting a healthy gut microbiome, which in turn improves energy metabolism (32).

Various mechanisms have been suggested to explain how milk affects body weight and fat. A hypothesis is that increased calcium intake can help weight loss by reducing fat production and promoting fat breakdown (24). Moreover, calcium, a key component in dairy products, uniquely binds with fatty acids in the intestines, forming insoluble soaps. This process, which was established by research (25), effectively limits fat absorption as a fascinating scientific fact that sheds light on the role of calcium in weight management. Other components of dairy products, such as whey protein and conjugated linolenic acid, have also been suggested to contribute to weight and body fat loss in addition to calcium (26, 27).

Furthermore, the anti-inflammatory properties of berries are attributed to their ability to modulate NF-κB signaling pathways. This finding highlights the potential health benefits of these fruits, offering valuable insights for dietary science (28).

Nuts are a valuable source of unsaturated fats, which can help decrease body fat accumulation and promote increased fat oxidation (29). Additionally, the dietary fiber in nuts, particularly viscous fiber, plays a role in reducing hunger, improving gut health, and enhancing energy metabolism (30). Overall, oatmeal is rich in both soluble (β-glucan) and insoluble fiber, which can contribute to prolonged feelings of fullness, helping to manage appetite more effectively (45).

The viscous nature of β-glucan modulates the postprandial response to carbohydrates, promoting a gradual release of glucose. This helps prevent sharp spikes in blood sugar and insulin levels, ultimately supporting improved metabolic health (46). Additionally, the extended gastric emptying time induced by β-glucan enhances feelings of fullness (satiety) and can help reduce subsequent food intake (47, 48).

Contradictory Findings in Literature

Research on oatmeal consumption reveals distinct outcomes for adults and children, with varying potential benefits across these groups. Fulgoni et al. (2015) found that adults who consumed oatmeal experienced significant reductions in weight, BMI, and waist circumference (WC), suggesting that oatmeal may positively influence weight management in this population. In contrast, O'Neil et al. (2015) reported that while children who consumed oatmeal had smaller WC, there were no significant changes in weight or BMI Z-scores, indicating a limited impact on overall body weight in this younger cohort.

Further studies focusing on adults, such as those by Zhang (2012) and Geliebter (2014), yielded mixed results. Zhang observed significant reductions in waist circumference (WC) among individuals with mild to moderate hyperlipidemia, while both Geliebter and Missimer found no substantial changes in weight or WC. This inconsistency may reflect individual variability in how adults respond to oatmeal consumption. Additionally, Musa-Veloso et al. (2016) noted that underweight individuals tended to consume more oatmeal than their obese counterparts, emphasizing the need to consider weight status when evaluating the potential benefits of oatmeal.

In summary, the effects of oatmeal consumption differ significantly between children and adults. While oatmeal may help adults manage their weight and reduce waist circumference (WC), children primarily show benefits related to waist size, with no equivalent changes in weight or BMI. This discrepancy highlights the varying nutritional needs and metabolic responses across age groups, suggesting that dietary interventions involving oatmeal should be tailored to specific demographics for optimal outcomes. Future research could further investigate the mechanisms underlying these differences and include more diverse populations, particularly children, in randomized trials to better elucidate the potential benefits of oatmeal consumption.

Research Gaps

Amanda Missimer et al. (2017) found that consuming two eggs for breakfast, compared to oatmeal, resulted in greater satiety throughout the day (20). While some evidence supports the notion that oatmeal consumption induces greater satiety (31, 32), other studies have found no significant effect (33, 34). Furthermore, oatmeal's versatility allows it to be customized to suit a wide range of tastes and preferences. From classic combinations like fruits and nuts to savory options such as vegetables or a poached egg, the possibilities are endless. This adaptability makes oatmeal an appealing choice for individuals of all ages and dietary preferences, including picky eaters.

Despite the potential benefits of oatmeal consumption, it is important to acknowledge the limitations of the current literature. Body Mass Index (BMI) has frequently been used in epidemiological studies to identify individuals who are overweight or obese. However, its effectiveness is limited due to significant variability in body fat percentage among individuals. This variability is influenced by factors such as age, sex, and ancestry (35). Additionally, the relatively small number of studies specifically examining the impact of oatmeal on weight status or weight changes underscores the need for more comprehensive research in this area. To better understand oatmeal's effects on weight management, well-designed, randomized controlled trials are crucial. Only through such rigorous research can we determine whether oatmeal can serve as a reliable tool for weight loss or maintenance.

Potential limitations of this systematic review include variability in the types and doses of oatmeal used across the included studies, the heterogeneity in study designs, and the possibility of publication bias. Additionally, the inclusion eligibility of studies was assessed based on their titles and abstracts, which may introduce a risk of overlooking relevant studies or biases in the selection process.

In conclusion, the impact of oatmeal on weight status and weight changes remains an important and relevant area of nutritional research. While existing studies suggest potential benefits of oats in weight management, the limited number of

studies specifically focused on oatmeal and the contradictory findings warrant caution in considering it a standalone solution for weight loss. Although oatmeal offers numerous nutritional benefits and serves as a versatile meal option, its direct role in significant weight loss requires further investigation. To support evidence-based weight management strategies, more rigorous scientific studies are needed to fully understand oatmeal's potential in promoting and maintaining healthy weight. Until more conclusive evidence is available, oatmeal should be viewed as part of a balanced, varied diet that complements a healthy lifestyle. It is also crucial to emphasize the inclusion of whole-grain oats in a balanced diet as part of overall health promotion.

Conclusion

Overall, there is some evidence suggesting that oatmeal may assist with weight management, particularly in reducing waist circumference. However, more controlled studies are needed to fully understand the effects of oatmeal on weight in both adults and children. Factors such as portion sizes, frequency of consumption, and overall dietary patterns may also influence oatmeal's impact on weight. Further research is necessary to determine how oatmeal can be effectively incorporated into a comprehensive weight management strategy.

Declarations

Conflicts of Interest

The authors declare no conflicts of interests.

Authors contributions

Drafting of the manuscript and screening of the article was performed by (HM and BS). Conception and design were conducted by (TS, HM, and HA). Critical revision of the manuscript for important intellectual content and double review to minimize bias was carried out by authors (NM, AM).

Consent for publication

Not applicated.

Availability of Data and Materials

All data from this study are included in the published article and its supplementary files.

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