Research Article Volume 01, Issue No. 01. 2024



The Medical Journal of Obstetric and Gynaecology

Effects of Dairy Intake on Weight Variability and Obesity Risk During Menopause: A Systematic Review

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Article History :
Received date : 2024/07/14
Revised date : 2024/08/17
Accepted date : 2024/09/22
Published date : 2024/10/07

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ABSTRACT

Background: The transition into menopause involves significant physiological changes and an increased susceptibility to obesity, as evidenced by studies showing weight gain and metabolic disturbances during this period. **Methods:** The study adhered to the guidelines set forth by the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 to ensure methodological rigor and currency. **Result:** The review process involved an extensive search and assessment of the literature, initially identifying 20 relevant articles. After screening titles and abstracts, 10 studies were selected based on our inclusion criteria, excluding reviews and case reports. A final in-depth analysis included five studies featuring analytical cohort, randomized, crossover, and prospective designs. **Conclusion:** The review suggests yogurt may help perimenopausal women manage weight gain and reduce obesity risk, but further research is needed to understand its mechanisms. Short-term 2% milk consumption has limited impact on cardiometabolic risk factors in postmenopausal women with abdominal obesity. Longitudinal cohort studies don't support dairy's benefits on bone health.

Keyword: dairy consumption, menopause, obesity, perimenopausal woman

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INTRODUCTION

The perimenopausal phase, which marked the transition to menopause, is a critical period in a woman's life characterised by intense hormonal swings and notable physiological changes. Within this timeframe, the decrease in estrogen levels has been strongly associated with changes in the distribution of body fat, which in turn contributes to a higher susceptibility to obesity among women.[1] The Centers for Disease Control and Prevention (CDC) statistics indicates that 43.3% of women aged 40–59 in the United States are categorised as obese. Studies like the Healthy Women Study and the Study of Women's Health Across the Nation have reported that weight gain and increased fat mass are common following menopause. Furthermore, these modifications increase the susceptibility to the development of diseases such as diabetes, cardiovascular disease (CVD), and metabolic syndrome (MetS).[2]

The 2020–2025 Dietary Guidelines for Americans advise that dairy products should be included in three daily servings, as they are a key component of many dietary patterns. Although worries exist over the saturated fat content of dairy, its contribution to weight management continues to be a subject of contention.[3] Several studies have indicated that some constituents of dairy fat, including short-chain fatty acids, may reduce the likelihood of obesity. Moreover, dairy products are rich in nutrients, including substantial quantities of proteins, minerals, and vitamin D, all of which are thought to assist in the regulation of body weight. Nevertheless, the existing research on the correlation between dairy intake and weight results lacks consistency and does not provide conclusive findings.[4]

The research regarding the relationship between dairy consumption and weight change is inconsistent. Although certain study suggests that including 2-3 servings of dairy into a diet that restricts calories will improve weight and fat mass loss, other studies have not observed any notable impact on weight change. Likewise, extensive observational research have yielded inconclusive findings, but an increased consumption of dairy has been associated with decreased prospects of

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abdominal obesity and overweight status.[5,6] The divergent results can be ascribed to variations in the varieties of dairy products ingested. Undoubtedly, fermented dairy products such as yogurt and cheese have attracted considerable interest due to their possible positive effects on health. Yoghurt, the abundant source of probiotics, has been linked to advantageous changes in gut flora, providing defense against obesity. In contrast to milk or cheese, research has indicated that increased intake of yogurt is associated with reduced weight gain.[7]

Based on the inconclusive findings of other studies, it is imperative to conduct more study on the correlation between dairy intake and weight control after menopause. The transition to menopause is a crucial phase that presents heightened susceptibility to obesity and associated metabolic health problems. Hence, it is essential to comprehend the intricacies of how various dairy products influence weight change and the incidence of obesity in order to establish dietary recommendations that are supported by empirical research. Particularly, the function of yogurt and other fermented dairy products in regulating weight growth at this period requires further careful examination.

This comprehensive analysis seeks to elucidate the complex correlation between dairy consumption, fluctuations in weight, and the susceptibility to obesity after menopause. This review aims to consolidate current studies in order to offer more lucid understanding of the impact of dairy intake on weight control and guide dietary guidelines that support optimal health during this critical period of life. The results of this study will provide valuable guidance for therapies and dietary approaches aimed at addressing the unique health requirements of women during the adjustment to menopause.

METHODS

Protocol

The investigation adhered closely to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines, ensuring meticulous compliance with recognized methodological standards. By rigorously applying these criteria, the study aimed to enhance the clarity, replicability, and

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systematic rigor of the review process. A comprehensive approach was employed for literature searching, data extraction, and synthesis of findings, meticulously designed to minimize biases and bolster the validity and reliability of the research conclusions. This careful adherence to PRISMA guidelines underscores the commitment to producing robust and trustworthy evidence.

Criteria for Eligibility

This study provides a thorough review of research conducted over the past decade to elucidate the intricate relationship between dairy consumption, weight changes, and obesity risk during menopause. By systematically analyzing and integrating data from various studies, the research aims to identify patterns and offer insights that can refine patient care strategies for managing menopausal health.

The primary objective of this investigation is to distill and highlight key findings from a broad spectrum of scholarly sources, enhancing our understanding of menopause and its associated complexities. To ensure the accuracy and depth of the review, stringent inclusion criteria were applied: only peer-reviewed articles published in English between 2014 and 2024 with valid DOIs were considered, affirming their credibility. Non-research materials, such as reviews, editorials, and duplicate publications, were excluded to maintain the focus and integrity of the analysis.

The systematic and rigorous methodology employed in this study ensures that the data included is both relevant and reliable. This approach provides a robust foundation for deriving meaningful insights and advancing clinical practices aimed at leveraging dairy consumption to address menopausal challenges effectively.

Search Strategy

We used "dairy intake OR weight variability OR menopause” as keywords. The search for studies to be included in the systematic review was carried out using the PubMed, SagePub, and Sciencedirect databases.

Data retrieval

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The authors commenced the review by meticulously examining each article's abstract and title to determine its relevance to the research objectives. Only those studies that met the predefined inclusion criteria were selected for in-depth analysis, ensuring the identification of meaningful patterns and trends in the literature.

To ensure consistency, the review was restricted to full-text articles published in English. A stringent screening process was employed to filter out articles that did not align with the study's focus or inclusion criteria. This rigorous approach allowed for the inclusion of only the most relevant and applicable studies.

The evaluation process involved a thorough assessment of various factors, including study design, titles, authors, publication dates, research locations, and methodologies. This detailed approach ensured that the analyzed content was of high quality and relevance, thereby reinforcing the credibility and validity of the study's findings.

Quality Assessment and Data Synthesis

The authors began by meticulously reviewing the abstract and title of each article to determine its relevance for further analysis. Following this preliminary screening, the selected articles were subjected to a rigorous and thorough evaluation. This detailed approach ensured that only the most pertinent studies were included in the subsequent in-depth analysis. By refining the selection process in this way, the authors were able to perform a more comprehensive and nuanced assessment of the research, thereby enhancing the clarity and depth of the review.

Table 1. Search Strategy

Database	**Search Strategy**	***Hits***
Pubmed	*("dairy intake" OR "weight variability" AND "menopause")*	6
Science Direct	*("dairy intake" OR "weight variability" AND "menopause")*	27
Sagepub	*("dairy intake" OR "weight variability" AND "menopause")*	140

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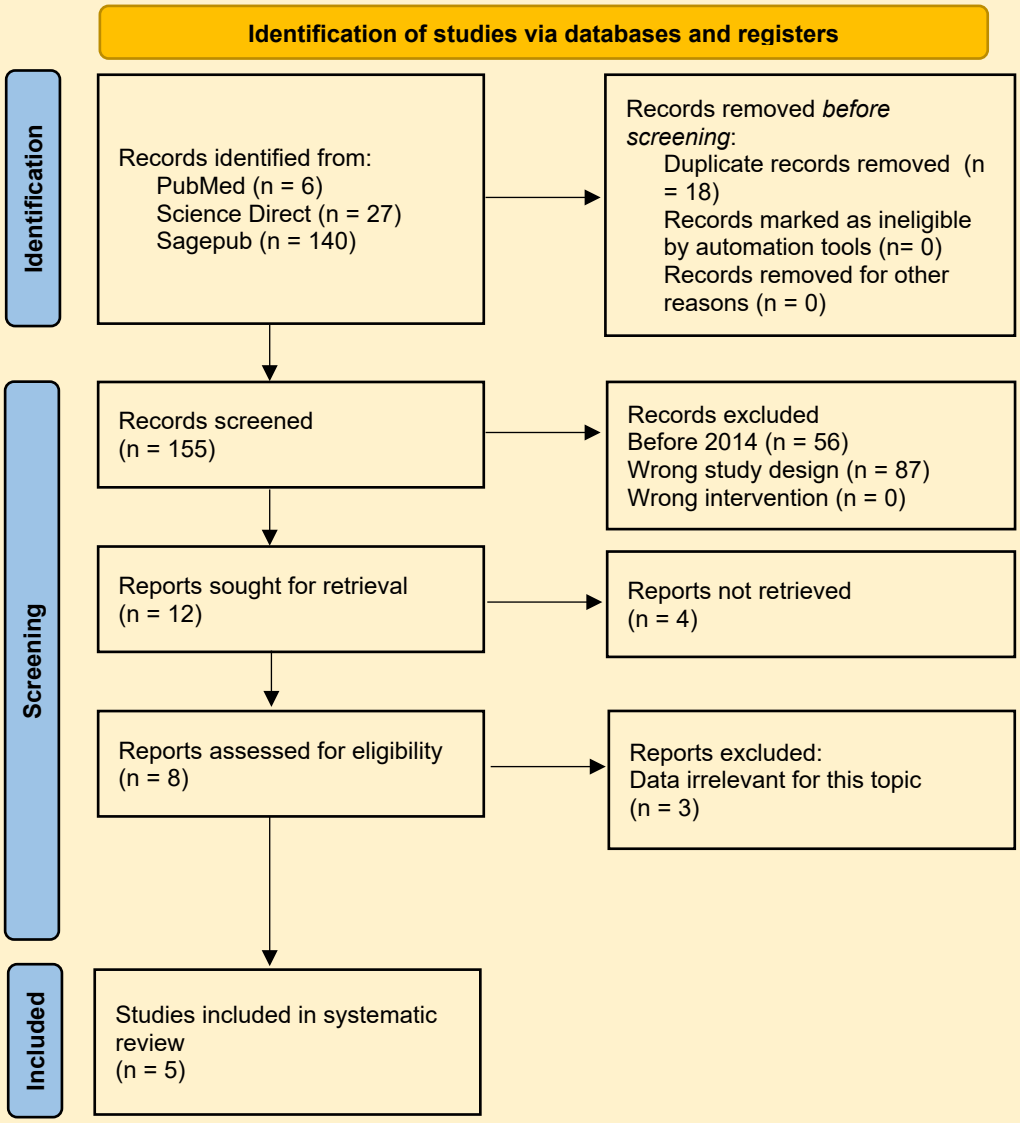


Figure 1. Article search flow chart

Table 2. Critical appraisal of Study

Parameters	(Drouin-Chartier et al., 2015)	(Rautiainen et al., 2016)	(Purdue-Smithe et al., 2019)	(Wallace et al., 2020)	(Yuan et al., 2023)
1. Bias related to temporal precedence Is it clear in the study what is the "cause" and what is the "effect" (ie, there is no confusion about which variable comes first)?	Yes	Yes	Yes	Yes	Yes
2. Bias related to selection and allocation Was there a control group?	Yes	No	No	No	No

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3. Bias related to confounding factors					
Were participants included in any comparisons similar?	No	No	No	No	No
4. Bias related to administration of intervention/exposure					
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Yes.	No.	No.	No.	No.
5. Bias related to assessment, detection, and measurement of the outcome					
Were there multiple measurements of the outcome, both pre and post the intervention/exposure?	Yes	No	No	No	No
Were the outcomes of participants included in any comparisons measured in the same way?	Yes	No	No	No	No
Were outcomes measured in a reliable way?	Yes	Yes	Yes	Yes	Yes
6. Bias related to participant retention					
Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	Yes	Yes	Yes	Yes	Yes
7. Statistical conclusion validity					
Was appropriate statistical analysis used?	Yes	Yes	Yes	Yes	Yes

RESULT

Our study began with an extensive search for research articles across established databases, including Science Direct, PubMed, and SagePub. Through a meticulous multi-step screening process, we identified five key studies that were particularly relevant to our systematic review. Each selected paper underwent a thorough analysis, with specific aspects highlighted for in-depth examination. To present a concise summary of our findings, we have compiled the key information in Table 3.

Table 3. The literature included in this study

Author	Origin	Method	Sample	Result

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Drouin-Chartier et al.,[8] (2015)	Canada	RCT	27 participants	No significant effects were observed on LDL-C, triglycerides, LDL size, CRP, cell adhesion molecule levels, or insulin sensitivity by the MILK diet. Nevertheless, it decreased measures of HDL-C, adiponectin, endothelin, fasting glucose levels, blood pressure, VLDL apolipoprotein B fractional catabolic rate, and plasma sterol concentrations. These results were similar to those observed with the NCEP milk-free diet.
Rautiainen et al.,[9] (2016)	USA	Prospective study	18,438 participants	An investigation included 8238 women revealed that increased consumption of high-fat dairy products was linked to reduced weight gain, but lacking this association with low-fat dairy products. An association was found between the highest quintile of high-fat dairy product consumption and a reduced risk of developing overweight or obesity. No significant correlation was found between dietary or supplemented calcium or vitamin D intake and the likelihood of developing overweight or obesity. This study indicates that maintaining a well-balanced diet can effectively mitigate weight gain and enhance general health.
Purdue-Smithe et al.,[10] (2019)	USA	Prospective study	116,429 participants	An analysis utilizing food frequency questionnaires revealed that consuming 4 servings or more of dairy per day or more at the beginning of the trial was

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				linked to a 23% reduced likelihood of experiencing early menopause. The association was restricted to low-fat dairy products, where consuming 2 servings or more per day or more was observed to be associated with early menopause. However, there was no link between high-fat dairy consumption and early menopause.
Wallace et al.,[11] (2020)	USA	Cohort	3,302 participants	Ingesting FDP was linked to reduced abdomen adipose tissue and increased bone size in the radius and tibia. An negative correlation was observed between the consumption of FDP and the levels of parathyroid hormone and β-carboxyterminal cross-linked telopeptide of type I collagen. Investigation of longitudinal data revealed that the consumption of FDP reduced the decrease in radius total vBMD and Ct vBMD, as well as in area and thickness, regardless of total calorie, calcium, or protein intakes. Consuming milk was linked to a comparatively smaller reduction in aBMD and failure load at the radius.
Yuan et al.,[12] (2023)	USA	Cohort	116,429 participants	The study revealed that persons who consumed larger quantities of yogurt had the least amount of weight gain at each examination, even if they

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				did not report higher overall dairy consumption. A weekly consumption of 2.0 servings of yogurt was associated with a 31% decrease in the risk of obesity, although the highest overall dairy consumption only resulted in a 12% decrease. Greater levels of physical activity and scores on the alternative healthy eating index were similarly linked to substantial decreases in the risk of obesity. However, the association was further reinforced by increased consumption of yogurt.

DISCUSSION

In a study of perimenopausal women by Yuan et al., higher total dairy intake was found to be associated with a reduced risk of obesity, with yogurt showing a particularly strong correlation with decreased weight gain over the 12-year period surrounding menopause. Interestingly, the study revealed a U-shaped relationship between milk and cheese intake and obesity risk. Additionally, physical activity and a healthy diet were independently linked to lower obesity risk, but the findings indicated that higher yogurt consumption further amplified this reduction in risk, beyond the influence of lifestyle factors.[12,13]

Short-term interventions targeting total dairy intake and weight change generally indicate an inverse relationship, especially under calorie-restricted conditions.[13] However, longitudinal studies on habitual dairy intake and long-term weight change remain scarce. Our analysis found no consistent link between total dairy consumption and reduced annual weight gain, though it did show an association with a lower overall risk of obesity. This contrasts with findings from

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the Women's Health Study, which reported a significant inverse association between total dairy consumption and weight change, suggesting that the relationship between dairy intake and weight management may vary across different study populations.[12,14]

Yogurt consumption, in particular, has been consistently associated with lower adiposity in cohort studies, highlighting its potential benefits for weight management. These effects may be due to yogurt's high calcium content, acidity, probiotic profile, and satiating properties. Notably, even after accounting for lifestyle factors such as diet and physical activity, yogurt maintained an independent association with obesity prevention.[15-17] In contrast, milk consumption showed no clear relationship with weight gain or obesity risk in our analysis. When adjusted for baseline BMI, the associations between milk intake and weight change were further diminished, indicating that individual baseline characteristics may play a significant role in moderating the effects of milk on obesity risk. Further studies are needed to explore the influence of different types of milk on weight and obesity in perimenopausal women.[17,18]

With regard to cheese intake, large-scale longitudinal studies in the U.S. have generally found no significant association between cheese consumption and weight change or obesity. However, a Swedish study reported a lower risk of weight gain with regular cheese consumption. In our analysis, cheese intake did not consistently correlate with weight gain, but moderate cheese consumption was linked to a reduced risk of obesity in non-obese perimenopausal women. The variations in findings across studies may be due to differences in consumption patterns, as well as the types and amounts of cheese consumed in different populations.[19-21]

A 2011 systematic review suggested that dairy intake could potentially reduce the risk of metabolic syndrome (MetS), but it emphasized the need for more high-quality randomized clinical trials to confirm these potential benefits.[9] More recent meta-analyses of randomized controlled trials have shown no significant effects of high-fat or low-fat dairy on LDL-C, HDL-C, CRP, or blood pressure, a finding that contrasts with epidemiological studies linking milk consumption to

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improved lipid profiles. Additionally, high-fat dairy intake has been associated with elevated plasma glucose levels, which runs counter to evidence suggesting that total dairy and cheese consumption may lower the risk of type 2 diabetes. These conflicting results underscore the need for further investigation. Although both milk consumption and adherence to an NCEP diet reduced plasma glucose levels in postmenopausal women, the mechanisms driving these effects remain unclear.[9,13]

CONCLUSION

A study found that a higher intake of total dairy was linked to a reduced risk of obesity in perimenopausal women. Yogurt consumption was found to be even stronger in reducing weight gain over 12 years. However, the relationship between total dairy intake and weight change remains limited. Longitudinal studies examining habitual dairy intake and weight change remain limited, and further research is needed to understand the impact of various milk types on obesity risk.

DISCLOSURE STATEMENT

Disclosure Statement: The authors have no conflicts of Interest to declare.

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