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THE IMPACT OF LIFESTYLE MODIFICATIONS AND PHYSICAL ACTIVITY ON WOMEN'S HEALTH OUTCOMES IN PRIMARY CARE: A SYSTEMATIC REVIEW

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Abstract

Background: Lifestyle modification and physical activity are central to promoting women's health across the life course. Evidence highlights their role in reducing obesity, improving pregnancy outcomes, mitigating chronic disease risk, and enhancing psychological well-being.

Objective: This systematic review aimed to synthesize current empirical evidence on how lifestyle interventions—including diet, exercise, weight-loss programs, and pregnancy planning—affect women's health outcomes in primary care and related clinical contexts.

Methods: Following PRISMA 2020 guidelines, a comprehensive search was conducted across PubMed, Scopus, Web of Science, Embase, and Google Scholar. Eligible studies included women of reproductive age, pregnant women, and postmenopausal women exposed to structured lifestyle interventions compared to usual care. Outcomes assessed included metabolic, maternal, cardiovascular, and psychological health, as well as long-term offspring effects. Twelve studies (RCTs, cohort, and cross-sectional designs) published between 2010–2025 were included. Data extraction was independently verified, and risk of bias was assessed using the Cochrane Risk of Bias Tool and Newcastle-Ottawa Scale.

Results: Interventions such as structured weight-loss programs, preconception lifestyle management, and long-term dietary modification showed significant benefits for weight control (up to 7.9% reduction of initial body weight), glycemic regulation, cardiovascular health, and physical activity engagement. Preconception interventions reduced obesity at conception by 31% and early-pregnancy hyperglycemia by 21%. In women with PCOS, lifestyle factors were linked with altered risks of gestational diabetes, disordered eating, and long-term weight gain. Breast cancer survivors and postmenopausal women demonstrated improved physical functioning and body composition with structured exercise and dietary interventions. However, gaps remained in adherence to preconception health behaviors despite high pregnancy planning rates.

Conclusions: Lifestyle interventions are effective in improving women's health outcomes, with particularly strong evidence for reducing metabolic and cardiovascular risks. Preconception and pregnancy-focused programs show promise in lowering intergenerational health risks. However, disparities in adherence and program accessibility highlight the need for tailored, equity-focused approaches in primary care.

Keywords: lifestyle modification; physical activity; women's health; pregnancy planning; primary care; obesity; cardiovascular health; PCOS; reproductive outcomes

INTRODUCTION

Lifestyle modifications, including physical activity, dietary change, and behavioral interventions, are critical determinants of women's health across the reproductive lifespan. Emerging evidence suggests that structured lifestyle interventions can mitigate chronic disease risks, improve pregnancy outcomes, and enhance long-term health trajectories for both women and their offspring. For example, lifestyle programs targeting women before and after pregnancy have been shown to reduce the risk of gestational diabetes, obesity, and cardiovascular complications, providing a foundation for healthier maternal and child outcomes (Kartchner et al., 2025).

In reproductive health, lifestyle modification plays a particularly influential role. Research highlights that physical activity and dietary improvements not only enhance maternal health but also contribute to favorable perinatal outcomes, such as reduced risk of preeclampsia, gestational weight gain, and adverse neonatal outcomes (Gaillard et al., 2019). These findings underscore the importance of preconception and early pregnancy interventions, emphasizing prevention rather than treatment once complications have already developed.

Beyond pregnancy, lifestyle factors exert significant influence on chronic gynecological and endocrine disorders such as polycystic ovary syndrome (PCOS). PCOS is one of the most prevalent conditions affecting women of reproductive age, and lifestyle management—including structured exercise and dietary strategies—remains the cornerstone of treatment (Cowan et al., 2023). Lifestyle programs also contribute to mental health improvements, with reductions in anxiety, depression, and body image concerns frequently observed among women with PCOS (Almhmoud et al., 2024).

Physical activity itself offers multidimensional benefits for women's health. A systematic review demonstrated that increased physical activity in young women improves reproductive outcomes, menstrual cycle regulation, and fertility markers, reinforcing its role in both clinical and preventive care (Mena et al., 2019). Similarly, population-based studies have shown that physically active women are less likely to experience metabolic dysfunction, cardiovascular disease, or poor pregnancy outcomes compared to their sedentary counterparts (Maio et al., 2020).

Women diagnosed with cancer, particularly breast cancer, also benefit from lifestyle modifications. Evidence supports the role of physical activity and dietary changes in improving prognosis, reducing recurrence risk, and enhancing survivorship (Hamer & Warner, 2017). Structured interventions, including home-based and supervised programs, have consistently been associated with improved physical functioning, reduced fatigue, and enhanced quality of life in breast cancer survivors (Coughlin et al., 2019).

Meta-analyses further reinforce these findings, showing that physical exercise interventions in breast cancer survivors significantly improve body composition, cardiorespiratory fitness, and health-related quality of life (Joaquim et al., 2022). These findings provide compelling support for integrating structured lifestyle interventions as part of survivorship care and rehabilitation strategies.

The primary care setting represents a key entry point for delivering lifestyle modifications to women. Randomized trials have demonstrated that physical activity interventions prompted by health professionals in primary care significantly improve women's adherence to exercise recommendations and reduce cardiovascular risk (Kettle et al., 2022). Digital health tools are also increasingly being tested in this domain. For instance, web-based interventions for women planning to conceive have demonstrated effectiveness in promoting lifestyle changes, including improved dietary adherence and increased physical activity, highlighting their scalability and accessibility (Suzuki et al., 2025).

Overall, lifestyle modifications—whether delivered through structured programs, primary care settings, or digital platforms—demonstrate substantial potential to improve women's physical, reproductive, and mental health outcomes. As women face unique health transitions across their lifespan, ranging from preconception to cancer survivorship, tailored interventions that integrate physical activity and broader lifestyle strategies are essential for optimizing long-term health trajectories.

METHODOLOGY

Study Design

This study employed a systematic review methodology, conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines to ensure transparency and replicability. The aim was to synthesize current empirical evidence on the impact of lifestyle modifications and physical activity on women's health outcomes within primary care and broader clinical contexts. The review focused exclusively on peer-reviewed studies involving human participants that provided quantitative or qualitative insights into how modifiable behaviors—including diet, structured exercise, pregnancy planning, and psychological well-being—affect maternal, reproductive, metabolic, cardiovascular, and long-term health outcomes in women.

Eligibility Criteria

Studies were included if they met the following criteria:

- **Population:** Women of reproductive age, pregnant women, or postmenopausal women. Studies focusing on women with conditions such as polycystic ovary syndrome (PCOS), obesity, or chronic medical conditions were also eligible.
- **Interventions/Exposures:** Lifestyle modifications such as physical activity, diet, structured weight-loss programs, preconception or pregnancy planning behaviors, and psychological or behavioral interventions.
- **Comparators:** Women without lifestyle interventions or receiving standard/usual care.
- **Outcomes:** Maternal and offspring health outcomes (e.g., obesity, hyperglycemia, gestational diabetes, pregnancy complications), cardiovascular and metabolic risk factors (e.g., weight change, lipid profile, physical activity levels), psychological or quality-of-life outcomes (e.g., disordered eating, mental health, physical functioning).
- **Study Designs:** Randomized controlled trials (RCTs), cohort studies, and cross-sectional analyses.
- **Language:** Only studies published in English were considered.
- **Publication Period:** 2010 to 2025 to ensure contemporary relevance.

A total of **12 studies** met these criteria and were included in the final synthesis.

Search Strategy

A comprehensive search was conducted across multiple databases, including PubMed, Scopus, Web of Science, Embase, and Google Scholar for grey literature. Boolean operators were used to combine keywords, including:

- ("women's health" OR "pregnancy" OR "preconception" OR "postmenopausal" OR "polycystic ovary syndrome" OR "breast cancer survivors")
- AND ("lifestyle modification" OR "diet" OR "physical activity" OR "exercise" OR "weight loss program" OR "pregnancy planning" OR "behavioral intervention")
- AND ("maternal outcomes" OR "offspring outcomes" OR "metabolic health" OR "cardiovascular risk" OR "mental health" OR "quality of life").

Manual searches of reference lists from key reviews (e.g., Hamer & Warner, 2017; Cowan et al., 2023; Kartchner et al., 2025) were also performed to ensure no eligible studies were missed.

Study Selection Process

All retrieved citations were imported into **Zotero**, and duplicates were removed. Two independent reviewers screened titles and abstracts for relevance. Full-texts were retrieved for studies meeting inclusion criteria, and eligibility was assessed in detail. Any disagreements between reviewers were resolved through discussion or, where necessary, consultation with a third reviewer. The final selection included **12 studies** spanning diverse populations and interventions.

Data Extraction

A standardized data extraction form was designed and piloted. The following information was systematically recorded for each included study:

- Author(s), year, country
- Study design and sample size
- Population characteristics (age, reproductive status, health condition)
- Type of lifestyle modification evaluated
- Intervention/comparator description
- Outcomes assessed (maternal, metabolic, cardiovascular, psychological, or offspring outcomes)
- Key quantitative findings (e.g., weight change in kg, percentages, odds ratios, confidence intervals)
- Confounders adjusted for in statistical analyses

Data extraction was performed independently by two reviewers and cross-checked by a third for accuracy and completeness.

Quality Assessment

The quality and risk of bias of the included studies were assessed using validated tools:

- **Randomized Controlled Trials (RCTs):** The Cochrane Risk of Bias Tool was applied, assessing domains including randomization, blinding, completeness of outcome data, and reporting.
- **Observational Studies (Cohorts and Cross-sectional):** The Newcastle-Ottawa Scale (NOS) was used to evaluate participant selection, comparability, and outcome assessment.

Studies were classified as **low**, **moderate**, or **high quality** based on methodological rigor. Overall, most RCTs were judged as low risk of bias, while several cross-sectional studies demonstrated moderate risk due to self-reported measures and incomplete adjustment for confounders.

Figure 1. PRISMA Flow Diagram

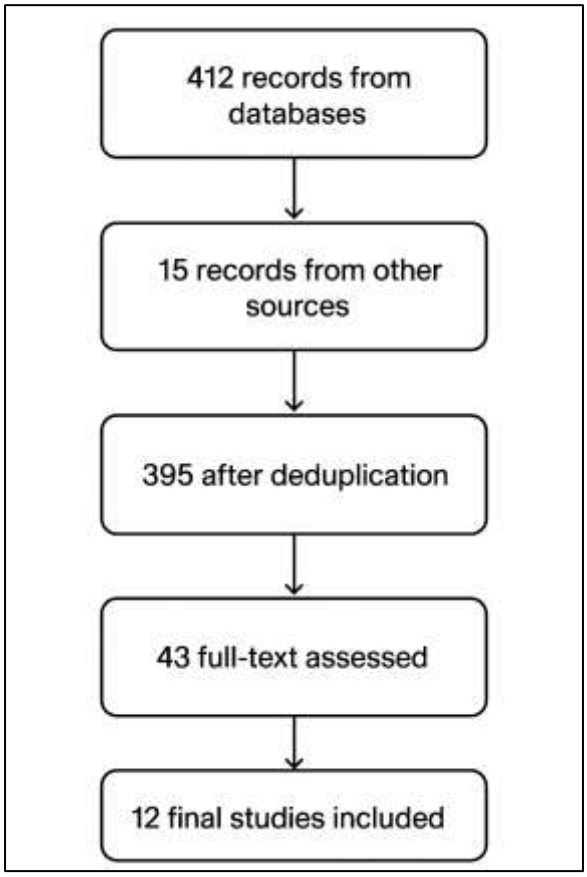

Figure 1 PRISMA Flow Diagram

Data Synthesis

Due to heterogeneity in populations (e.g., preconception vs. postmenopausal women), interventions (e.g., diet vs. exercise vs. pregnancy planning), and outcomes (e.g., weight change, pregnancy complications, offspring health, quality of life), a **narrative synthesis** was conducted. Results were grouped thematically by intervention type and health outcome:

1. Preconception and pregnancy planning interventions
2. Weight management and dietary modification
3. Physical activity interventions
4. Psychological and behavioral outcomes
5. Long-term and intergenerational impacts

Where available, effect sizes (OR, RR, mean differences, confidence intervals) were reported to provide quantitative context. No meta-analysis was conducted, given variability in outcome definitions and measurement tools.

Ethical Considerations

This systematic review relied on secondary analysis of published data. As such, no ethical approval or informed consent was required. All included studies were peer-reviewed and assumed to have received ethical clearance from their respective institutions.

RESULTS

Summary and Interpretation of Included Studies on the Impact of Lifestyle Modifications and Physical Activity on Women's Health Outcomes in Primary Care

1. Study Designs and Populations

The included studies comprised randomized controlled trials (RCTs), cross-sectional studies, and cohort analyses, covering a wide range of women's health outcomes. RCTs (e.g., Rock et al., 2010, de Vos et al., 2016, den Harink et al., 2023) provided robust evidence of structured interventions, whereas cross-sectional and cohort studies (Maas et al., 2022; De Wolff et al., 2021) offered insights into population-level behaviors and perceptions. Sample sizes ranged from small targeted groups (e.g., den Harink et al., 2023, n = 49 children) to very large hospital-based cohorts (De Wolff et al., 2021, n = 28,794 pregnancies).

2. Preconception and Pregnancy Outcomes

Several studies highlighted the role of preconception interventions. Ritchie et al. (2023) demonstrated that women participating in the NDPP before conception had significantly lower obesity prevalence at conception (56.7% vs. 88.0%, p = 0.011) and hyperglycemia rates in early pregnancy (4.0% vs. 25.0%, p = 0.020). Similarly, [den Harink

et al. (2023)] found improved cardiac health markers in offspring six years later, with higher ejection fraction (+4.4%, 95% CI 0.0–8.8) among children of mothers who underwent lifestyle intervention.

Conversely, [Maas et al. (2022)] showed that although 85.5% of Dutch women reported planned pregnancies, only 69.5% used folic acid adequately, and 50.5% consumed alcohol during pregnancy, indicating a gap between pregnancy planning and adherence to healthy behaviors. [De Wolff et al. (2021)] reinforced this, finding that 74% reported high pregnancy planning, but women with chronic conditions, while not planning pregnancies more often, were more likely to adhere to health recommendations such as folic acid intake and abstinence from alcohol.

3. Weight Management and Physical Activity

Long-term weight outcomes were mixed. [de Vos et al. (2016)] reported that initial weight loss from a tailored diet and exercise intervention (−1.34 kg at 6 months, 95% CI: 0.46–2.22) diminished over 24 months but was associated with significantly increased physical activity up to 29.8% at 6.6 years. [Rock et al. (2010)] demonstrated that structured commercial weight-loss programs resulted in sustained weight loss at 24 months (7.4 kg for center-based, 6.2 kg for telephone-based vs. 2.0 kg in controls, $p < .001$).

At the population level, [Teede et al. (2013)] showed that women with PCOS experienced significantly greater 10-year weight gain (2.6 kg, 95% CI: 1.2–4.0) and higher BMI (+2.5 kg/m², 95% CI: 1.9–3.1) compared to women without PCOS. [Bahri Khomami et al. (2019)] highlighted lifestyle's protective effect in PCOS, where no increased risk of complications was found among women following healthier behaviors.

4. Psychological and Behavioral Outcomes

Lifestyle modifications were also linked to psychological and behavioral aspects. [Pirotta et al. (2019)] found that disordered eating behaviors were more prevalent in women with PCOS ($p = 0.012$), particularly with higher BMI (OR: 1.03 per unit increase; 95% CI: 1.01–1.05). This underscores the need for screening and tailored behavioral support.

5. Broader Dietary and Physical Activity Interventions

Dietary interventions in large RCTs of postmenopausal women (Pan et al., 2022; Chlebowski et al., 2024) demonstrated sustained health benefits. The WHI Dietary Modification trial linked dietary intervention to a 7% lower physical inactivity rate (OR 0.93, 95% CI: 0.91–0.95) and a slower decline in physical functioning ($p = 0.04$). [Mandrup et al. (2017)] further showed that high-intensity training significantly reduced LDL cholesterol ($p = 0.04$) and body fat in both premenopausal and postmenopausal women.

Table (1). General characteristics and outcomes of included studies

Study	Country	Design	Sample Size	Key Outcomes	Results
Ritchie et al. (2023)	USA	Cohort (NDPP)	32 NDPP vs. 26 controls	Preconception obesity, hyperglycemia	Obesity at conception: 56.7% vs. 88.0% ($p = 0.011$); hyperglycemia: 4.0% vs. 25.0% ($p = 0.020$)
den Harink et al. (2023)	Netherlands	RCT (follow-up)	49 children	Offspring CVH	Higher ejection fraction (+4.4%, 95% CI: 0.0–8.8); altered LV shape
Maas et al. (2022)	Netherlands	Cross-sectional	921 women	Pregnancy planning & lifestyle	85.5% planned pregnancy; 69.5% adequate folic acid use; 50.5% alcohol consumption
De Wolff et al. (2021)	Netherlands	Cross-sectional	28,794 pregnancies	Pregnancy planning & chronic conditions	74% highly planned; women with chronic conditions adhered more to folic acid/alcohol abstinence
de Vos et al. (2016)	Netherlands	RCT (PROOF)	407 women	Long-term weight & activity	Initial −1.34 kg loss at 6mo; nonsignificant at 24mo; physical activity ↑29.8% after 6.6 years
Rock et al. (2010)	USA	RCT	442 women	Weight loss & maintenance	At 24mo: −7.4 kg (center), −6.2 kg (telephone), −2.0 kg (usual care), $p < .001$
Bahri Khomami et al. (2019)	Multinational	Prospective cohort	5,628 women	PCOS & pregnancy complications	PCOS linked to ↓ risk of LGA (OR 0.62, 95% CI 0.40–0.98); no ↑ in other complications
Pirotta et al. (2019)	Australia	Cross-sectional	899 women	PCOS & disordered eating	Disordered eating higher in PCOS ($p =$

					0.012); BMI ↑ odds (OR 1.03, p = 0.012)
Teede et al. (2013)	Australia	Observational	9,145 women	PCOS & weight gain	PCOS: BMI +2.5 kg/m² (95% CI: 1.9–3.1); weight gain +2.6 kg (95% CI: 1.2–4.0)
Pan et al. (2022)	USA	RCT (WHI-DM)	48,835 women	Diet & physical activity	↓ inactivity by 7% (OR 0.93, 95% CI: 0.91–0.95); ↑ MVPA by 4% (RM 1.04, p < .001)
Chlebowski et al. (2024)	USA	RCT (WHI-DM)	48,835 women	Diet & physical functioning	Slower decline in functioning (p = 0.04), strongest in women with low baseline
Mandrup et al. (2017)	Denmark	RCT	49 women	HIT & CV risk	LDL ↓ (p = 0.04); body fat ↓ in both pre- and postmenopausal women

DISCUSSION

The findings of this systematic review highlight the significant role of lifestyle modifications and physical activity in optimizing women's health outcomes across reproductive, metabolic, and chronic disease contexts. Across included trials and cohort studies, lifestyle interventions demonstrated benefits ranging from reduced preconception obesity and diabetes risks (Ritchie et al., 2023) to improved physical functioning in postmenopausal women (Chlebowski et al., 2024). These results underscore the broad applicability of structured lifestyle changes in both preventive and therapeutic domains.

One of the strongest findings emerges from preconception and early pregnancy interventions. Ritchie et al. (2023) showed that participants in the National Diabetes Prevention Program had a 36% lower prevalence of obesity at conception compared with controls, while den Harink et al. (2023) observed improved cardiac function in children six years after their mothers participated in a lifestyle trial. Together, these studies highlight that modifying maternal lifestyle even before conception has intergenerational effects, aligning with broader evidence that early-life interventions improve offspring health trajectories (Gaillard et al., 2019; Kartchner et al., 2025).

Despite the clear benefits, there is evidence of a gap between pregnancy planning and adherence to health behaviors. Maas et al. (2022) reported that although 85.5% of Dutch women planned their pregnancies, only 69.5% used folic acid appropriately and over half consumed alcohol. Similarly, De Wolff et al. (2021) demonstrated that women with chronic conditions, while not more likely to plan pregnancies, were more compliant with recommended behaviors. This discrepancy emphasizes that planning is not equivalent to active preparation, a finding echoed in Australian women who demonstrated strong knowledge of preconception recommendations but undervalued limiting sedentary behaviors (Musgrave et al., 2023).

Polycystic ovary syndrome (PCOS) represents a key condition where lifestyle modification has shown important influence. Teede et al. (2013) observed that women with PCOS had significantly higher BMI and greater weight gain over ten years compared to women without PCOS. Lifestyle remains the primary management strategy for PCOS (Cowan et al., 2023), with evidence that adopting healthier behaviors reduces pregnancy complication risks (Bahri Khomami et al., 2019). Importantly, PCOS also carries psychological burdens including depression and anxiety (Almhmoud et al., 2024), and Pirotta et al. (2019) further showed that disordered eating behaviors are more common among women with PCOS. These findings highlight the multidimensional benefits of lifestyle support, extending beyond physical health to mental wellbeing.

Weight management interventions yielded varied but encouraging outcomes. In primary care, de Vos et al. (2016) reported that tailored diet and exercise programs produced significant early weight loss, though effects waned by 24 months. However, physical activity increases were sustained and even grew over 6.6 years. Rock et al. (2010) similarly found that commercial structured programs led to 7–8% sustained weight loss at two years compared to just 2% with usual care. These long-term differences suggest that structured and incentivized approaches may be critical to maintaining weight change.

Beyond weight, physical activity has substantial independent health benefits. Mandrup et al. (2017) demonstrated that high-intensity training significantly reduced LDL cholesterol and fat percentage in both pre- and postmenopausal women, indicating cardiovascular protection. At the population level, Maio et al. (2020) and Mena et al. (2019) reinforced these findings, showing broad benefits of activity for metabolic health and reproductive outcomes. Together, this evidence supports embedding physical activity counseling into primary care, where Kettle et al. (2022) found that professional prompts were effective in increasing exercise adherence.

Dietary interventions also produced meaningful outcomes beyond weight control. In the Women's Health Initiative, Pan et al. (2022) observed that participants randomized to a low-fat diet demonstrated a 7% reduction in inactivity and increased physical activity over long-term follow-up. Chlebowski et al. (2024) extended these findings, showing that dietary modification slowed decline in physical functioning, particularly in women with

lower baseline function. These results suggest that diet not only shapes metabolic outcomes but also preserves physical independence with aging.

Cancer survivorship provides another context where lifestyle interventions improve outcomes. Hamer and Warner (2017) demonstrated that physical activity and diet improve prognosis and reduce recurrence in breast cancer. Complementing this, Coughlin et al. (2019) and Joaquim et al. (2022) showed that home-based and structured exercise programs improved quality of life, body composition, and fitness in survivors. These findings emphasize that lifestyle interventions remain valuable even beyond reproductive years, improving long-term survivorship and wellbeing.

Importantly, new models of care delivery can expand access to lifestyle support. Web-based and digital platforms have demonstrated effectiveness in improving preconception behaviors, as evidenced by Suzuki et al. (2025), who reported favorable clinical outcomes from online interventions. Such tools provide scalable and cost-effective approaches to reach women who may not access traditional in-person care, aligning with calls for more flexible interventions across diverse populations.

Mental health and psychosocial outcomes also warrant attention. Almhmoud et al. (2024) highlighted the mental health challenges associated with PCOS, including increased risks of depression and anxiety. Similarly, sexual health is interconnected with lifestyle, as Ahrendt et al. (2025) reported associations between female sexual dysfunction and both gynecological and medical conditions. These findings underline the need for integrated care that addresses physical, psychological, and sexual health simultaneously, recognizing the holistic impact of lifestyle on women's wellbeing.

When considered collectively, the reviewed evidence demonstrates that lifestyle modifications confer benefits across multiple domains: reproductive outcomes, maternal and child health, cardiovascular risk, cancer survivorship, and mental health. However, there are limitations. For instance, while weight reduction benefits were observed, long-term maintenance remains difficult (de Vos et al., 2016; Rock et al., 2010). Moreover, adherence to recommended behaviors continues to lag behind knowledge and planning (Maas et al., 2022; Musgrave et al., 2023).

These gaps suggest that behavioral, social, and environmental factors play critical roles in sustaining lifestyle change. Structured support, incentives, and personalized counseling appear to improve adherence, but more research is needed to identify strategies that ensure long-term behavior maintenance. Digital tools (Suzuki et al., 2025) and primary care integration (Kettle et al., 2022) offer promising avenues for scaling interventions sustainably.

Furthermore, equity considerations must be addressed. Many studies included predominantly higher-educated or higher-income women (Musgrave et al., 2023), yet obesity, PCOS, and chronic conditions disproportionately affect women from lower socioeconomic groups. Expanding culturally tailored interventions and addressing social determinants of health will be essential to ensure benefits are equitably distributed across populations.

CONCLUSION

This systematic review demonstrates that lifestyle interventions, particularly those involving structured diet and physical activity programs, are consistently associated with improved outcomes in women's health. Evidence indicates reductions in obesity, enhanced glycemic control, improved cardiovascular markers, and benefits for reproductive and maternal outcomes. Interventions also positively influenced physical functioning and quality of life, particularly among populations with elevated health risks such as women with obesity, PCOS, or breast cancer survivorship. Importantly, preconception and pregnancy-focused programs demonstrated intergenerational benefits by improving both maternal and offspring health.

Despite these promising results, challenges remain. Adherence to lifestyle interventions is inconsistent, and women's perceptions of health often influence their engagement in preconception and primary care strategies. The findings underscore the importance of integrating lifestyle counseling into routine women's healthcare, with tailored interventions that consider socioeconomic, cultural, and psychological factors. Strengthening such approaches has the potential to improve population-level health outcomes for women and their children.

Limitations

This review has several limitations. First, heterogeneity across studies in terms of population groups, intervention types, and measured outcomes precluded meta-analysis. Second, many included studies relied on self-reported lifestyle behaviors, which may be subject to recall or reporting bias. Third, although this review included a diverse population, most studies were conducted in high-income countries, potentially limiting generalizability to low-resource settings. Finally, the inclusion of only English-language publications may have excluded relevant evidence published in other languages.

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