

## The Impact of Physical Exercise on Gestational Diabetes and Maternal Weight Management: A Meta-Analysis

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**Abstract :** Physiological changes during pregnancy, such as alterations in the circulatory, respiratory, and musculoskeletal systems, can negatively impact daily physical activity. This reduced activity is often associated with an increased risk of adverse maternal health outcomes, particularly gestational diabetes mellitus (GDM) and excessive weight gain. This meta-analysis aims to evaluate the effectiveness of structured physical exercise interventions during pregnancy in reducing the risk of GDM and managing maternal weight gain. A comprehensive search was conducted across six major databases: PubMed, Cochrane Library, EMBASE, Web of Science, ScienceDirect, and ClinicalTrials.gov, covering the period from database inception until 2023. Randomized controlled trials (RCTs) that explored the effects of physical exercise programs on pregnant women with low physical activity levels were included. The search was performed using EndNote and results were managed using RevMan (Review Manager) for meta-analysis. RCTs involving healthy pregnant women with low levels of physical activity or sedentary lifestyles were selected. These RCTs must have incorporated structured exercise programs during pregnancy and reported on outcomes related to GDM and maternal weight gain. From an initial pool of 5,112 articles, 65 RCTs (involving 11,400 pregnant women) met the inclusion criteria. Data extraction was performed, followed by a quality assessment of the selected studies using the Cochrane Risk of Bias tool. The meta-analysis was conducted using RevMan software, where pooled relative risks (RR) and weighted mean differences (WMD) were calculated using a random-effects model to address heterogeneity across studies. Sensitivity analyses, subgroup analyses (based on factors such as exercise intensity, duration, and pregnancy stage), and publication bias assessments were also conducted. Structured physical exercise during pregnancy led to a significant reduction in the risk of developing GDM (RR = 0.68; P < 0.001), particularly when the exercise program was performed throughout the pregnancy (RR = 0.62; P = 0.035). In addition, maternal weight gain was significantly reduced (WMD = -1.18 kg; 95% CI -1.54 to -0.85; P < 0.001). There were no significant adverse effects reported for either the mother or the neonate, confirming that exercise interventions are safe for both. This meta-analysis highlights the positive impact of regular moderate physical activity during pregnancy in reducing the risk of GDM and managing maternal weight gain. These findings suggest that physical exercise should be encouraged as a routine part of prenatal care. However, more research is required to refine exercise recommendations and determine the most effective interventions based on individual risk factors and pregnancy stages.

**Keywords :** gestational diabetes, maternal weight management, meta-analysis, randomized controlled trials

**Conference Title :** ICDM 2025 : International Conference on Diabetes and Metabolism

**Conference Location :** San Diego, United States

**Conference Dates :** January 16-17, 2025