The Effect of Intervention on Pregnancy with Diabetes Mellitus on Health-Related Quality of Life (HRQoL)

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ABSTRACT

Gestational diabetes mellitus (GDM) is a form of hyperglycemia that develops during pregnancy and is associated with maternal and neonatal complications. Women with GDM face increased risks of cesarean delivery, preeclampsia, and mental health issues, while their infants are more prone to macrosomia, neonatal jaundice, and long-term metabolic disorders. This systematic review evaluates the impact of interventions on the health-related quality of life (HRQoL) of pregnant women with diabetes mellitus. A systematic search in Scopus, SAGE, ScienceDirect, and ProQuest was conducted for studies published between 2021 and 2025, following PRISMA 2023 guidelines. From 611,094 initial records, 36 studies met the inclusion criteria, with five selected for in-depth analysis. The JBI critical appraisal tool was used to assess the validity and reliability of findings. Results indicate that digital health interventions, such as mobile fitness applications, improve adherence to pelvic floor exercises, enhancing physical health. Psychological interventions, including self-transcendence nursing models and cognitive-behavioral therapy, effectively reduce stress and enhance emotional well-being. Cardiovascular monitoring is essential, as GDM increases the risk of cardiac complications. Counseling, both face-to-face and app-based, supports self-care and lowers fasting blood glucose levels. In conclusion, a multidisciplinary approach integrating digital technology, psychosocial support, and cardiovascular monitoring is crucial for optimizing maternal and fetal health. Comprehensive care strategies, supported by policy frameworks, can enhance intervention effectiveness and improve the overall quality of life for women with GDM.

Keywords : Diabetes Mellitus, GDM, Hrqol, Intervention, Quality Of Life

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disease characterized by high blood glucose levels due to impaired insulin secretion, insulin action, or both. In pregnant women, diabetes mellitus is known as gestational diabetes if it occurs during pregnancy or as pre-existing type 1 or type 2 diabetes (IDF, 2021, 2025). Diabetes mellitus can attack pregnant women or what is called gestational diabetes mellitus (GDM) is a form of hyperglycemia or high blood glucose levels that develop during pregnancy and usually disappear after delivery (Aspilayuli et al., 2023; Yunus et al., 2021).

Women diagnosed with gestational diabetes face a higher likelihood of undergoing cesarean delivery or giving birth prematurely. Infants born to mothers with GDM are at increased risk of developing macrosomia, respiratory issues, neonatal jaundice, requiring neonatal intensive care, and are more susceptible to type 2 diabetes later in life (Eades et al., 2024; Ye et al., 2022). Beyond the immediate complications during pregnancy and childbirth, women with GDM are approximately eight times more likely to develop type 2 diabetes compared to those without the condition (Dennison et al., 2021). Around 70% of women with a history of GDM will eventually develop type 2 diabetes, with the greatest risk occurring within the first five years postpartum and reaching its peak about a decade after pregnancy (Mora-Ortiz & Rivas-García, 2024). Additionally, mothers with GDM have a heightened risk of complications such as preeclampsia, polyhydramnios, high blood pressure, premature rupture of membranes, psychological issues including depression, and a higher likelihood of cesarean delivery (Choudhury & Rajeswari, 2021; Yang & Wu, 2022).

Women diagnosed with gestational diabetes not only face challenges to their physical health but also endure considerable emotional and psychological strain, which collectively diminishes their overall quality of life (QoL) (Güldner et al., 2024). The quality of life in individuals with gestational diabetes mellitus is shaped by a combination of medical, social, and psychological elements. In this context, quality of life refers to overall well-being, encompassing physical and mental health, social engagement, and the ability to effectively manage the condition (Ansarzadeh et al., 2020). Those affected by GDM often encounter numerous demands, including adhering to a strict dietary regimen, frequently monitoring blood glucose levels, attending regular medical appointments, and in some cases, requiring insulin treatment (Dennison et al., 2019). These obligations can heighten stress, anxiety, and frustration, particularly when they interfere with daily routines or limit participation in previously enjoyed activities (Nazarpour et al., 2024). Moreover, the emotional toll of coping with pregnancy-related complications may evoke feelings of guilt, fears about adverse outcomes, and anxiety regarding the baby's future health (Antunes et al., 2022).

This study aims to explore the effects of interventions applied to pregnant women with diabetes mellitus on their HRQoL. The expected results of this systematic review can provide deeper insight into the importance of a holistic approach in managing gestational diabetes and improving the well-being of pregnant women.

METHODS

The findings of the review are reported in accordance with the recommendations of the Preferred Reporting Items for Systematic Reviews (PRISMA) 2023 to be used (JBI, 2023). We conducted an article search using 4 databases, namely Scopus, SAGE, ScienceDirect, and ProQuest since early February 2025 for studies that reported and discussed the provision of interventions to pregnant women with diabetes. The search used in compiling/determining inclusion and exclusion criteria or study characteristics according to PICOS (Population, Intervention, Comparison, Outcomes, and Study). The combination of keywords and MeSH terminology that was developed was then applied to the search for articles in the database. The keywords and topic titles used to search for articles were "diabetes mellitus", "DM",

"pregnancy" "gestational", "GDM", "quality of life", "HRQOL", "Life Quality", and "Health-Related Quality Of Life" with Boolean (AND/OR) published in the last 5 years (2021-2025) with full-text articles in English.

**Table 1. Inclusion criteria based on PICOS in article selection**

PICOT/PICOS Framework	Inclusion Criteria	Exclusion Criteria
Population	Pregnancy with diabetes mellitus patients	Patients with diseases other than Diabetes Mellitus and not pregnant
Intervention	All interventions	Without any intervention
Compartors	-	-
Outcomes	It has an influence and benefits for patients, and is effective to implement in improving quality of life.	The research results are still pseudo and have no effectiveness.
Study Design	Randomized control trial, Quasy-Experimental, Qualitative Study, A Pilot Study dan Cross-sectional	Review, Conference Paper, Short Survey, Book Chapter, dll
Time	2021 - 2025	Before 2021
Laguage	English	Indonesia, Germany, China, Portugal, etc.

Following the PRISMA 2023 guidelines, the first stage is to search for potential articles based on article titles and abstracts in reputable databases. The full text of each article that meets the selection criteria will be reviewed in depth alternately by each author and reviewed again together to determine the quality of the article based on the assessment of JBI's critical appraisal tools in overcoming the risk of bias. Then the articles are extracted using a pre-pilot data extraction format created in a Microsoft Excel spreadsheet, so that if there are differences of opinion, they will be resolved through discussion and agreement.

RESULTS

Study Selection

A total of 611,094 articles were identified, then duplicates were removed and 145 articles were left for further review. Then 58 articles were excluded based on the last 5 years of publication, type of intervention, and English language, resulting in 87 articles. From the feasibility test and in-depth full-text review, 36 articles remained and 5 research articles were taken for review in accordance with the qualification provisions of this systematic review.
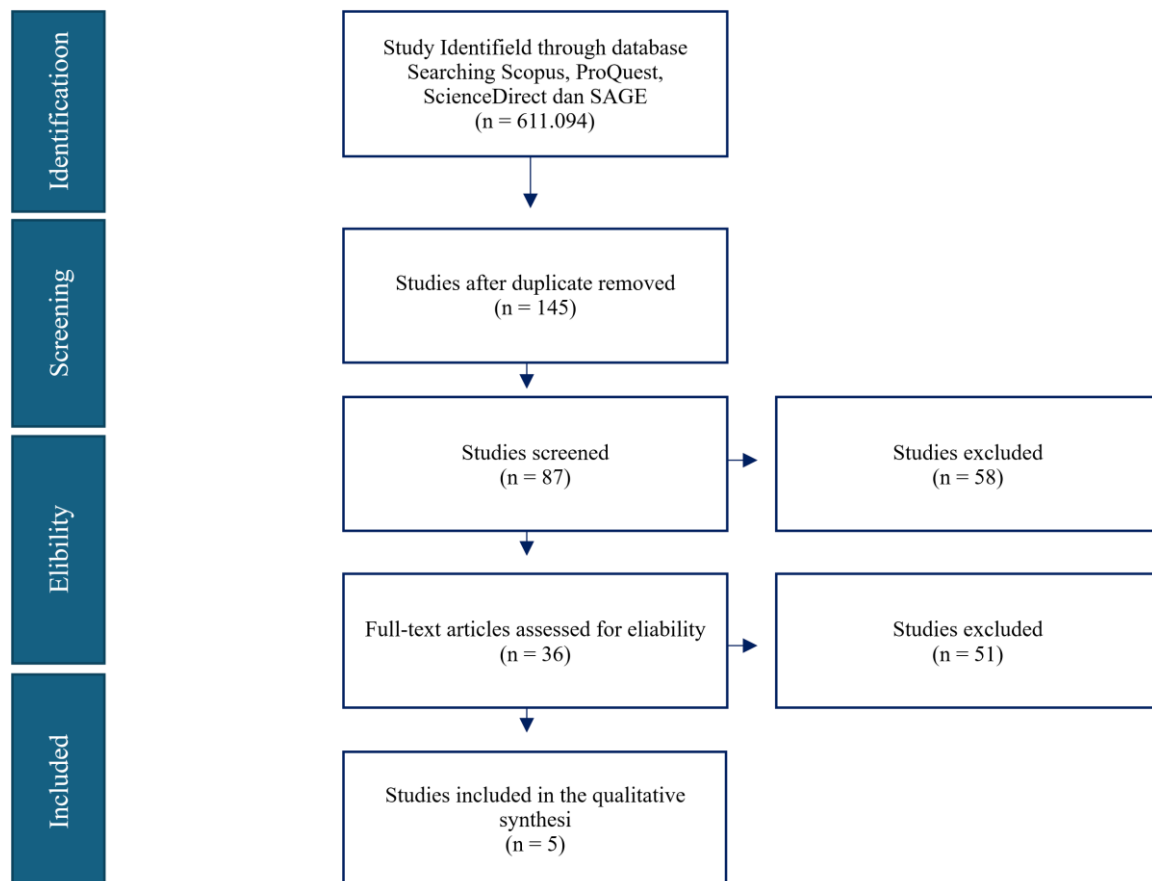
Figure 1. Flowchart of the study selection process

Risk of Bias

Assessment of the risk of bias in the preparation of a systematic review is essential to ensure that the conclusions drawn from the combination of studies are reliable and valid (Page et al., 2021). In this systematic review, study selection was carried out in two stages: first, selection based on the title and abstract by two reviewers working independently. If there is a difference of opinion, the difference of opinion will be discussed and mediated by a third reviewer. Full text selection is carried out by all researchers in turn to minimize the risk of bias. Articles that have been agreed upon by all authors are then assessed or scored using the JBI critical appraisal checklist according to the research design.

Article Extraction

Table 2. Results of article data extraction after the selection process

No	Title And Author	Country	Study Design	Population	Intervention	Results
1	Research on the application effect of self-transcendence nursing model in patients with gestational diabetes mellitus: a randomised controlled trial (Xu et al., 2025)	China	RCT	124 Patients with GDM	The intervention programme based on the Self-transcendence theory model of care	The observation group had shorter durations for both pre-delivery hospitalization (1.12±0.31 days) and total hospital stay (7.54±1.45 days) compared to the control group, which recorded 1.56±0.42 days and 10.23±2.32 days, respectively. Statistical analysis showed no significant differences between the groups in terms of gestational age and insulin usage (P>0.05). Following the intervention, both groups experienced a decrease in overall Diabetes Distress Scale (DDS) scores, including reductions in emotional burden, physician-related distress, and interpersonal stress. At the same time, scores for healthy eating, regular physical activity, consistent blood glucose monitoring, and treatment adherence—as measured by the Chinese version of the Diabetes Management Self-Efficacy Scale (C-DMSES)—improved in both groups. Notably, the observation group demonstrated significantly greater improvements in both overall DDS and C-DMSES scores compared to the control group, with the differences being statistically significant (P<0.05). Additionally, the observation group showed lower rates of preterm birth and neonatal mortality.
2	The relationship between quality of life and some mental problems in women with gestational diabetes mellitus (GDM): a cross-sectional study (Nazarpour et al., 2024)	Iran	cross-sectional study	150 women with GDM	questionnaire, the GDM-related quality of life questionnaire (GDMQoL-36), and the depression, anxiety, and stress scale (DASS)	The average scores (mean ± SD) for quality of life related to gestational diabetes mellitus (GDM) and the Depression, Anxiety, and Stress Scale (DASS) were 55.51 ± 8.87 and 27.12 ± 19.43, respectively. Among the participants, 40% experienced symptoms of depression, 61.3% reported anxiety, and 42% showed signs of stress. A significant inverse relationship was observed between the overall quality of life score related to GDM and the total

No	Title And Author	Country	Study Design	Population	Intervention	Results
						DASS score, including its subscales for depression, anxiety, and stress (P < 0.001). Additionally, the quality of life score was significantly associated with various demographic and socioeconomic factors, such as age, body mass index (BMI), length of marriage, education levels of both women and their spouses, employment status of both partners, income level, and overall socioeconomic status. Results from multiple linear regression analysis indicated that depression, level of education, and occupation were significant predictors of GDM-related quality of life.
3	Cardiac structural, functional and energetic assessments during and after pregnancy in women with gestational diabetes mellitus, preeclampsia and healthy pregnancy (Thirunavukarasu et al., 2024)	American	cohort study	90 gestational age-matched individuals in the third trimester of their first singleton pregnancy (30 GDM, 22 preeclampsia, 38 uncomplicated HP)	Cardiovascular magnetic resonance spectroscopy and imaging	During the third trimester, women with GDM or preeclampsia showed higher BMI, larger LV mass (HP: 90[85,94]g, GDM: 103[96,112]g, Preeclampsia: 118[111,125]g; P=0.001), and lower PCr/ATP ratio (HP: 2.2[2.1,2.4], GDM: 1.9[1.7,2], Preeclampsia: 1.9[1.8,2.1]; P=0.0004) as well as lower GLS (HP: 20[18,21]%, GDM: 18[17,19]%, Preeclampsia: 16[14,17]%; P=0.01) compared with the HP group. After pregnancy, there were no significant changes in LV mass, PCr/ATP ratio, or GLS in any group. No significant differences were found in LV mass, PCr/ATP ratio, or GLS between the GDM and preeclampsia groups either during or after pregnancy. In addition, the Overweight-NC group did not show significant differences in LV mass (53[43.63]g), PCr/ATP ratio (2.0[1.8,2.2]), or GLS (-19[17.21]%) compared with the GDM or preeclampsia groups during or after pregnancy.
4	Comparing the effect of individual counseling with counseling on social	Iran	RCT	84 women with GDM were in the	Counseling using GATHER (G = Greeting, A = Ask, T = Tell, H = Help, R = Return) and WhatsApp	The findings revealed statistically significant differences among the three groups in terms of self-care practices and quality of life (p = 0.001). Furthermore, a significant difference was also observed in

No	Title And Author	Country	Study Design	Population	Intervention	Results
	application on self-care and quality of life of women with gestational diabetes (Ghasemi et al., 2021)			experimental groups and 42 in the control group		fasting blood glucose levels between the groups following the intervention (p = 0.005).
5	Use of mobile tness app to improve pelvic oor muscle training in puerperal women with gestational diabetes mellitus: A randomized controlled trial (He et al., 2025)	China	RCT	72 women with GDM	The control group performed PFMT based on routine postpartum PFMT training instruction. The experimental group performed PFMT based on Keep.	Following the intervention, the test group demonstrated higher adherence to pelvic floor muscle training (PFMT) compared to the control group, along with significant enhancements in pelvic floor muscle strength, self-efficacy, and knowledge-attitude-practice (KAP) scores (p < 0.05). Additionally, their incontinence scores were notably reduced (p < 0.05). Both groups experienced improvements in pelvic floor muscle recovery after the intervention (p < 0.05). Overall, the use of the Keep application effectively enhanced PFMT adherence, decreased urinary incontinence, improved KAP scores and self-efficacy, and strengthened pelvic floor muscles in postpartum women with GDM, thereby accelerating pelvic floor recovery after childbirth.

DISCUSSION

Several studies have explored different approaches to improving the care and quality of life of women with gestational diabetes. One study conducted by He et al (2025) examined the effectiveness of using a mobile fitness application to improve pelvic floor muscle training in puerperal women. The results of this study showed that the use of the application significantly increased patient compliance in performing the exercises, which resulted in increased pelvic floor muscle strength compared to the control group. The application also allows for real-time monitoring of progress and feedback, which encourages users to be more disciplined in carrying out the exercises (He et al., 2025). This innovation is very useful in increasing adherence to exercise, but further research is needed on the long-term effectiveness of this application (Karingga et al., 2023b, 2023a) and the social factors that influence its success. In addition, the involvement of health workers in monitoring and providing further feedback can increase the effectiveness of the use of this application.

In addition, a randomized controlled trial evaluated the impact of a self-transcendence nursing model in patients with gestational diabetes. The study found that a self-transcendence-based intervention improved patients' emotional well-being and quality of life. Compared with a control group, patients receiving this intervention experienced decreased levels of stress and anxiety, and demonstrated higher adherence to their disease management (Xu et al., 2025).

This model provides insight that gestational diabetes management should not only focus on blood sugar control, but also the psychological well-being of pregnant women. Implementation of this model in clinical practice needs to be supported by health worker training so that interventions can be carried out optimally.

From a psychological perspective, another study highlighted the relationship between quality of life and mental health problems in women with gestational diabetes. The study found that women with lower quality of life tended to experience higher levels of anxiety and depression. Factors such as good social support, more stable glucose control, and adequate health education play a role in improving their quality of life. Therefore, psychosocial interventions are an important aspect in the management of gestational diabetes to reduce the psychological impacts that accompany it. This study confirms that gestational diabetes care should not only focus on blood glucose control, but should also consider the patient's mental health as part of a holistic care approach (Nazarpour et al., 2024). This study emphasizes the importance of integrating mental health interventions into gestational diabetes care. Psychosocial support programs, such as cognitive-behavioral therapy or support groups for pregnant women with gestational diabetes, may be a solution to reduce their psychological burden.

Meanwhile, based on a cardiovascular perspective, another study examined the changes in cardiac structure, function, and energy in women with gestational diabetes and preeclampsia during and after pregnancy. The study revealed that women with these conditions experience increased cardiac workload, which is at risk for future cardiovascular disorders. Therefore, long-term monitoring of cardiac health is recommended for this group to reduce the risk of further complications. This study highlights the importance of cardiovascular evaluation in patients with gestational diabetes to detect structural changes in the heart earlier and prevent potential risk of heart disease later in life (Thirunavukarasu et al., 2024). Counseling approaches are also an important aspect in gestational diabetes care. A study compared the effectiveness of individual counseling with counseling through social applications on self-care and quality of life in women with gestational diabetes. The results showed that both methods were able to improve quality of life and reduce fasting blood sugar levels after the intervention. However, social application-based counseling has advantages in terms of flexibility and accessibility, allowing patients to get support more easily compared to face-to-face counseling. This study confirms that the use of communication technology in health services can be an effective solution to improve patient adherence to gestational diabetes care (Ghasemi et al., 2021).

Gestational diabetes requires a multidisciplinary approach in its management, including aspects of digitalization of care, psychosocial support, cardiovascular monitoring, and the effectiveness of counseling methods. Implementation of the results of this study in clinical practice needs to be supported by policies that facilitate the use of technology and broader psychosocial approaches (Karingga et al., 2023a). Overall, these findings suggest that innovations in care, whether through digital technology, nursing interventions, cardiovascular monitoring, or psychosocial approaches, have great potential to improve the quality of life of women with gestational diabetes. Adaptation of more comprehensive care strategies can help optimize the management of this condition and have a positive impact on maternal and fetal health.

CONCLUSION

Gestational diabetes requires a multidisciplinary approach that includes digital technology, psychosocial support, cardiovascular monitoring, and effective counseling. Studies have shown that fitness apps can improve adherence to pelvic floor muscle exercises, while self-transcendence nursing models benefit maternal emotional well-being. Psychosocial interventions such as cognitive behavioral therapy and support groups help reduce anxiety and depression. Thus, this systematic review found findings that emphasize the importance of integrating technology and psychosocial approaches in gestational diabetes care. For implementation, it is recommended that maternal health policies support the use of digital applications, psychological counseling services, and routine cardiovascular screening in health care facilities.

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