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Effect of Comprehensive Nursing Intervention on the Maternal and Infant Outcomes of Pregnant Women with Gestational Diabetes Mellitus

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Abstract: *Objective:* To examine the effects of comprehensive nursing interventions on maternal and infant outcomes in pregnant women diagnosed with gestational diabetes mellitus (GDM). *Methods:* A quasi-experimental design was employed, involving 60 pregnant women with GDM who were purposively selected and randomly allocated into experimental and control groups, each comprising 30 participants. The experimental group received comprehensive nursing interventions and pregnancy monitoring, while the control group received standard nursing care. Data collection was conducted using demographic questionnaires, pregnancy indicators, and maternal-infant outcome measurement tools. The collected data were analyzed using Microsoft Excel and the Statistical Package for Social Sciences (SPSS). *Results:* The findings indicated significant improvements in fasting blood glucose, postprandial blood glucose, amniotic fluid index, and neonatal birth weight in the experimental group compared to the control group. However, no statistically significant differences were observed in body mass index (BMI) or pregnancy weight gain. Comprehensive nursing interventions were associated with a significant reduction in maternal complications, including polyhydramnios, postpartum hemorrhage, and preeclampsia, as well as neonatal complications such as neonatal pneumonia, macrosomia, and hypoglycemia. *Conclusion:* Comprehensive nursing interventions have a positive impact on maternal and neonatal outcomes in pregnant women with GDM.

Keywords: Comprehensive nursing interventions; Gestational diabetes mellitus (GDM); Maternal outcomes; Neonatal outcomes; Glycemic control

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1. Introduction

Gestational diabetes mellitus (GDM), the most prevalent metabolic disorder during pregnancy, induces varying degrees of maternal hyperglycemia and poses significant pregnancy-related risks [1]. It presents substantial health challenges for both mothers and infants, including complications such as preeclampsia, macrosomia, preterm birth,

and long-term metabolic disorders. The rising global prevalence of GDM highlights the urgent need for effective management strategies to mitigate adverse maternal and neonatal outcomes. Comprehensive nursing interventions have emerged as a holistic approach to addressing the multifaceted needs of pregnant women with GDM. These interventions typically include personalized education, dietary counseling, glucose monitoring, psychological support, and prenatal care, all aimed at optimizing maternal glycemic control and improving neonatal health outcomes. Unlike conventional care models, comprehensive nursing interventions empower patients with the knowledge and tools necessary to actively engage in their care, enhancing compliance with treatment protocols [2].

In China, the incidence of gestational diabetes ranges between 1% and 5%. GDM refers to the onset or detection of varying degrees of abnormal glucose metabolism during pregnancy and is one of the most common medical complications associated with pregnancy [3]. In recent years, improved living standards and increased attention to prenatal nutrition have led to excessive nutritional supplementation and reduced physical activity among some pregnant women, resulting in a rising prevalence of over-nutrition and GDM [4].

For neonates, poorly managed maternal blood glucose levels pose significant risks. Complications such as neonatal pneumonia, which impairs respiratory function, macrosomia, which increases the likelihood of birth trauma, and hypoglycemia shortly after birth are prevalent. Severe cases may result in sudden neonatal death. Additionally, long-term health risks include predispositions to obesity, type 2 diabetes, and metabolic disorders later in life. These outcomes underscore the importance of maintaining optimal blood glucose levels during pregnancy through timely and effective interventions. Comprehensive nursing interventions are critical in mitigating these risks by delivering tailored care, education, and support to ensure favorable maternal and neonatal outcomes [5,6].

Statistical data highlight the gravity of GDM-related complications. The incidence of polyhydramnios in pregnant women with GDM can reach 20% [7], while postpartum hemorrhage, a severe complication, accounts for 21.1% of maternal deaths. Furthermore, urinary tract infections affect approximately 29.7% of women with GD, and preeclampsia impacts 9–14% of pregnancies in China [8]. For neonates, 68.7% of neonatal respiratory diseases are attributed to neonatal pneumonia [9]. The prevalence of macrosomia among GDM patients ranges from 12.3% to 24.15%, while hypoglycemia and neonatal asphyxia affect 1–5% and approximately 5% of cases, respectively [10,11]. These statistics emphasize the urgent need for effective nursing interventions to address the health risks associated with GDM.

The nursing care of pregnant women with GDM has garnered significant attention both domestically and internationally, leading to numerous studies [12]. However, research in China has predominantly focused on isolated interventions, such as health education, dietary management, physical activity guidance, or psychological support, and their individual impacts on maternal and pregnancy outcomes. Comprehensive nursing approaches that integrate these elements into cohesive, continuous interventions remain underexplored [11].

Comprehensive nursing interventions involve a holistic model combining health education, medication management, dietary counseling, exercise therapy, psychological support, and continuous monitoring throughout pregnancy. This model leverages multi-dimensional strategies to optimize outcomes [13]. Evidence suggests that high-quality comprehensive nursing interventions effectively control blood glucose levels, reducing the incidence of adverse pregnancy outcomes in GDM [14]. Despite this, limited research has focused specifically on the impact of such interventions on maternal and neonatal outcomes in GDM patients.

This gap underscores the significance of the present study. By evaluating the effects of comprehensive nursing interventions on maternal and neonatal outcomes in pregnant women with GDM, the research aims to provide robust evidence supporting the adoption of comprehensive care models in clinical practice. The findings could serve as a foundation for improving the quality of nursing care, optimizing pregnancy outcomes, and addressing

the unique challenges posed by GDM [15].

2. Materials and methods

2.1. General information

This study included 60 pregnant women diagnosed with gestational diabetes mellitus (GDM) who were treated in a hospital in Shandong Province.

Inclusion criteria for maternal participants: (1) Age range: 20–35 years; (2) Single fetus; (3) Gestational age: 26–28 weeks; (4) Diagnosed with GDM; (5) Natural pregnancy with no pre-existing diabetes; (7) Availability of complete clinical data.

Exclusion criteria for maternal participants: (1) History of type 1 or type 2 diabetes before pregnancy; (2) Presence of high blood pressure, heart disease, or neurological disorders; (3) Gestational age > 40 weeks; (4) Uterine fibroids, malformation, or dysplasia; (5) Ovarian cysts, polycystic ovary syndrome, or similar diseases; (6) Complications such as infections, blood disorders, placenta previa, fetal intrauterine growth retardation, trauma, burns, or surgical diseases; (7) No history of previous abortions.

The study employed a purposive sampling method, focusing on pregnant women with GDM who met the eligibility criteria. A total of 60 participants were selected according to these criteria and randomly assigned to two groups: the control group and the experimental group.

2.2. Method

2.2.1. Control group

Participants in the control group received routine nursing care, which included:

(1) Regular prenatal check-ups as recommended by outpatient physicians.

(2) Basic health education, such as guidance on self-monitoring of blood glucose levels and precautions.

(3) Distribution of the Gestational Diabetes Handbook for detailed management guidance.

(4) Emotional well-being monitoring and addressing patient concerns during hospital visits.

2.2.2. Experimental group

This group received a structured, holistic, and comprehensive nursing intervention. Nurses provided personalized care plans addressing both physiological and psychological needs to promote better glycemic control and overall pregnancy management.

The comprehensive nursing intervention was implemented in three stages, based on gestational age:

(1) Stage 1 (26–28 weeks):

(a) Psychological intervention: Weekly telephone follow-ups and WeChat group chats provided education on GDM management and emotional support to reduce anxiety and stress.

(b) Health Education: Distribution of a Health Education Handbook and daily WeChat group discussions with experienced nurses.

(2) Stage 2 (28–36 weeks):

(a) Dietary intervention: Low-glycemic diet plans, nutritional education, and weekly dietary monitoring through telephone follow-ups.

(b) Exercise intervention: Guidance on safe exercises such as yoga and walking, with encouragement for

gradual increases in physical activity.

(c) Monitoring during pregnancy: Training on prenatal monitoring methods (e.g., blood sugar levels, fetal heart rate) through daily WeChat updates and weekly follow-ups.

(3) Stage 3 (36–40 weeks):

(a) Psychological intervention: Face-to-face counseling sessions to alleviate prenatal anxiety and stress related to hospitalization.

(b) Postpartum complication prevention: Education on hygiene, infection prevention, and postpartum care, with instructions provided to both patients and their family members.

2.3. Research instruments

(1) Demographic questionnaire: Collected data on age, education level, occupation, marital status, place of residence, economic status, mode of birth, and presence of comorbidities.

(2) Pregnancy indicators collection table: Designed by the researcher, this instrument recorded gestational indicators such as fasting glucose levels, two-hour postprandial glucose levels, amniotic fluid index, BMI, pregnancy weight gain, and neonatal birth weight.

(3) Maternal and infant outcomes collection table: This instrument consisted of two sections: maternal outcomes after delivery and neonatal outcomes, including complications or health conditions of infants born to mothers with GDM.

2.4. Data analysis

The collected data were organized and analyzed using the Statistical Package for Social Sciences (SPSS). To ensure data security, it was stored on a computer with restricted access and used exclusively for this experimental study. *T*-tests were conducted to compare pregnancy indicators between the experimental and control groups before and after the intervention. χ^2 tests were employed to analyze differences in categorical maternal and infant outcomes. This method ensured rigorous statistical evaluation and confidentiality throughout the study.

3. Result

This analysis evaluates the effectiveness of comprehensive nursing interventions on maternal and neonatal outcomes in pregnancies complicated by GDM by comparing the experimental and control groups.

Table 1. Significant differences in pregnancy indices between the experimental and control groups after comprehensive nursing intervention

Pregnancy index	Group	M ± SD	*t*	*P*	Interpretation	Decision
Fasting plasma glucose	Experimental	4.97 ± 0.15	-11.58	0.00	Significant	Reject H0
	Control	5.57 ± 0.24				
Postprandial blood glucose	Experimental	5.95 ± 0.28	-10.11	0.00	Significant	Reject H0
	Control	6.94 ± 0.46				
Amniotic fluid index	Experimental	17.69 ± 1.66	-2.33	0.02	Significant	Reject H0
	Control	18.74 ± 1.84				

Table 1 (Continued)

Pregnancy index	Group	M ± SD	*t*	*P*	Interpretation	Decision
Body mass index	Experimental	21.88 ± 1.38	-1.79	0.08	Not significant	Accept H0
	Control	22.50 ± 1.31				
Pregnancy weight gain	Experimental	2.25 ± 0.83	-1.27	0.21	Not significant	Accept H0
	Control	2.01 ± 0.63				
Birth weight	Experimental	3.21 ± 0.46	-2.63	0.02	Significant	Reject H0
	Control	3.53 ± 0.58				

Table 1 summarizes the mean (M) and standard deviation (SD) of pregnancy indices and the results of statistical tests comparing the experimental and control groups. Comprehensive nursing interventions demonstrated significant effects on fasting plasma glucose, postprandial blood glucose, amniotic fluid index, and birth weight, emphasizing their effectiveness in managing GDM.

The findings provide compelling evidence supporting the success of comprehensive nursing interventions in improving maternal outcomes. Significant reductions in fasting and postprandial glucose levels highlight the impact of dietary education, exercise, and glucose monitoring. These results align with prior research, which underscores the role of holistic care in minimizing GDM-related complications [13].

Reductions in amniotic fluid index and birth weight further underscore the benefits of comprehensive care, as these improvements lower risks associated with preterm labor, fetal distress, and delivery complications such as cesarean sections or birth injuries [16]. Although no significant differences were observed in BMI or pregnancy weight gain, trends indicate better weight management in the experimental group, highlighting the importance of balanced nutrition and physical activity.

Table 2. Number of maternal complications in the experimental and control groups

Complications	Experimental (*n*)	Control (*n*)
None	22	5
Polyhydramnios	4	9
Postpartum hemorrhage	1	4
Urinary tract infection	2	8
Preeclampsia	1	4

Table 2 reveals a significant reduction in maternal complications in the experimental group compared to the control group, demonstrating the efficacy of comprehensive nursing interventions. By improving glycemic control, psychological well-being, and preventive care, these interventions significantly reduce risks associated with GDM.

Table 3. Number of neonatal complications in the experimental and control groups

Complications	Experimental (*n*)	Control (*n*)
None	26	13
Neonatal pneumonia	0	2
Macrosomia	2	6
Neonatal hypoglycemia	0	5
Neonatal asphyxia	2	4

Table 3 demonstrates the significant benefits of comprehensive nursing interventions in reducing neonatal complications, including neonatal pneumonia, macrosomia, and neonatal hypoglycemia. These results underscore the importance of maternal glycemic control, fetal monitoring, and psychological support in promoting neonatal health.

The results of this study demonstrate that comprehensive nursing interventions are highly effective in reducing neonatal complications in pregnancies affected by gestational diabetes mellitus (GDM). Addressing critical aspects such as maternal glycemic control, fetal monitoring, and psychological support fosters a favorable environment for neonatal health. The findings emphasize the necessity for healthcare systems to integrate comprehensive nursing care into routine maternal care practices. Future research should prioritize the exploration of the long-term benefits of these interventions on neonatal development and their scalability in diverse clinical settings. Such research will further establish the pivotal role of comprehensive nursing interventions in enhancing maternal and neonatal outcomes in GDM pregnancies [17].

Table 4. Difference in pregnancy and neonatal outcomes between experimental and control groups

Complications	Statistics	Values	Interpretation	Decision
Pregnancy outcomes	χ^2	19.827	Significant	Reject H0
	df	4		
	P	0.001		
Neonatal outcomes	χ^2	14.000	Significant	Reject H0
	df	4		
	P	0.007		

The significant differences in neonatal outcomes between the experimental and control groups (**Table 4**) underscore the effectiveness of comprehensive nursing interventions in managing pregnancies complicated by GDM. By addressing the physiological, psychological, and educational needs of pregnant women, these interventions foster a supportive environment that promotes healthier outcomes for both mothers and their infants. The findings highlight the importance of adopting holistic care models within healthcare systems to ensure that pregnant women with GDM receive the necessary comprehensive support to achieve optimal health outcomes.

The χ^2 values and corresponding *P*-values in this study provide robust evidence for the critical role of comprehensive nursing interventions in improving neonatal outcomes. These findings form a strong basis for advocating the integration of such interventions into routine prenatal care, ultimately contributing to improved health outcomes for both mothers and their children.

4. Discussion

Comprehensive nursing interventions constitute a multifaceted approach that integrates health education, dietary management, psychological support, and prenatal monitoring. These interventions address the physiological and psychological needs of pregnant women, forming a foundation for improved maternal and neonatal outcomes. The significant improvements in neonatal outcomes observed in this study highlight the effectiveness of this holistic approach, as it targets the complex interplay of factors influencing maternal and fetal health.

Health education is pivotal in empowering pregnant women to manage their condition effectively. By providing tailored information about GDM, nurses enable women to make informed decisions regarding their health, thereby enhancing adherence to dietary plans and glucose monitoring protocols. Dietary interventions, in particular, play a critical role in regulating maternal blood glucose levels and mitigating risks associated with hyperglycemia. Psychological support further contributes by helping women manage stress, which positively influences both maternal and fetal outcomes. Prenatal monitoring facilitates the timely identification and management of potential complications, thereby enhancing the overall effectiveness of the intervention.

The findings of this study align with the research conducted by Long [18], which demonstrated that structured prenatal care reduces maternal complications such as postpartum hemorrhage and preeclampsia. Similarly, Liu and Zhu [19] observed that effective maternal glucose control enhances fetal development and reduces the risks of neonatal hypoglycemia and respiratory conditions. These parallels reinforce the importance of incorporating comprehensive nursing interventions into routine prenatal care, as they address both immediate and long-term challenges associated with GDM.

From a clinical perspective, the results of this study advocate for the widespread adoption of comprehensive nursing interventions in managing pregnancies complicated by GDM. Training healthcare providers in the implementation of these interventions can lead to improved maternal and neonatal health outcomes while reducing the burden of complications associated with GDM. Additionally, these findings underscore the need for healthcare systems to allocate resources, including training programs and digital tools, to support the implementation of holistic care models.

The significant improvements observed in neonatal outcomes also carry implications for healthcare policy. Policymakers are encouraged to integrate comprehensive nursing interventions into national maternal care guidelines, particularly for high-risk pregnancies. Such an approach not only enhances health outcomes but also reduces healthcare costs associated with the management of complications. By prioritizing holistic care, policymakers can establish a framework that supports improved outcomes for mothers and their infants.

While this study provides compelling evidence for the effectiveness of comprehensive nursing interventions, further research is necessary to explore their scalability and long-term benefits. Future studies should examine the implementation of these interventions in diverse healthcare settings, including low-resource environments, to evaluate their adaptability and impact. Additionally, longitudinal research could assess the long-term effects of improved maternal glycemic control on child health, including the risks of obesity and type 2 diabetes.

The significant differences in neonatal outcomes between the experimental and control groups underscore the effectiveness of comprehensive nursing interventions in managing pregnancies complicated by GDM. By addressing the physiological, psychological, and educational needs of pregnant women, these interventions create a supportive environment conducive to healthier outcomes for both mothers and their infants. The findings highlight the necessity for healthcare systems to adopt holistic care models, ensuring that pregnant women with GDM receive the comprehensive support required to achieve optimal health outcomes. Future research should

continue to expand on these findings, exploring innovative strategies to enhance the effectiveness and accessibility of comprehensive nursing interventions.

5. Conclusions

Comprehensive nursing interventions have demonstrated effectiveness in supporting pregnant women with GDM in managing pregnancy indicators, such as blood glucose levels and weight gain while reducing adverse maternal and neonatal outcomes.

By addressing the physiological and psychological needs of pregnant women with GDM, phased and comprehensive nursing interventions—including health education, dietary management, exercise routines, psychological support, and prenatal monitoring—have contributed to improved maternal and neonatal health outcomes.

These interventions significantly reduced maternal complications, such as preeclampsia and postpartum hemorrhage, as well as neonatal complications, including macrosomia and neonatal hypoglycemia. These findings underscore the critical importance of a multifaceted approach to GDM care.

Disclosure statement

The authors declare that they have no conflict of interest.

References

[1] Liu CQ, Zeng R, Wu K, 2024, Analysis of the Impact of Personalized Integrated Nursing Intervention on Clinical Effects and Pregnancy Outcomes in Patients with Gestational Diabetes. Diabetes New World, 2024(11): 132–135.

[2] Chuang MT, Liang YL, Chen TS, et al., 2023, Setting Up a Specialized Maternity Unit in a Tertiary Hospital: An Oasis for Pregnant Women with COVID-19 During the Pandemic. Taiwan J Obstet Gynecol, 62(6): 823–829. https://doi.org/10.1016/j.tjog.2023.08.001

[3] Peled T, Sela HY, Weiss A, et al., 2023, Association Between One Abnormal Value on 3-Hour Oral Glucose Tolerance Test and Adverse Perinatal Outcomes in Twin Gestation. Diabetes Res Clin Pract, 202: 110813. https://doi.org/10.1016/j.diabres.2023.110813

[4] Yi YP, 2022, Effect of Comprehensive Nursing Intervention on Blood Glucose Control and Delivery Outcomes in Patients with Gestational Diabetes Mellitus. Diabetes New World, 2022(9): 115–118 + 122.

[5] Ruiz Peláez E, Hurtado Algar EM, Martínez la Torre T, et al., 2024, Impact of the COVID-19 Lockdown on the O'Sullivan Test and Gestational Diabetes Mellitus Diagnosis in Pregnant Spanish Women. Aten Primaria, 56(12): 103006. https://doi.org/10.1016/j.aprim.2024.103006

[6] Xu L, 2021, Effect of Personalized Nursing on Blood Sugar Control and Pregnancy Outcomes in Patients with Gestational Diabetes Mellitus. Chinese Journal of Clinical Rational Drug Use, 14(2): 168–169.

[7] Yu GF, Du Y, 2017, Risk Factors for Gestational Diabetes and Its Impact on Pregnancy Outcomes. Maternal and Child Health Care of China, 32(17): 4071–4072.

[8] Xie C, Li Y, Meng G, et al., 2020, Influencing Factors Related to Complicated Urinary Tract Infection in Cases with Gestational Diabetes Mellitus. Journal of Military Surgeon in Southwest China, 22(6): 514–518.

[9] Lin L, Wu Y, Ma L, 2022, Effects of Radar Chart-Assisted Risk Control Nursing Model on Blood Glucose Control

and Pregnancy Outcomes in Patients with Perinatal Gestational Diabetes Mellitus. Diabetes New World, 2022(19): 159–162.

[10] Zhan X, 2022, Effect Observation and Nursing Satisfaction Analysis of Early Nursing Intervention on Patients with Gestational Diabetes Mellitus. Electronic Journal of Practical Gynecological Endocrinology, 9(31): 108–111.

[11] Chen X, Wang C, 2024, Effect of Early Comprehensive Nursing Intervention on Blood Glucose Control in Patients with Gestational Diabetes Mellitus. Electronic Journal of Practical Gynecological Endocrinology, 11(6): 129–131.

[12] Li D, Chen X, Lu Y, 2020, Effect of Comprehensive Nursing Intervention on Blood Sugar Control and Psychological State in Patients with Gestational Diabetes Mellitus. Heilongjiang Medical Journal, 33(4): 963–965.

[13] Lin W, Wen L, Shen H, 2020, Effect of Comprehensive Nursing Intervention on Perinatal Blood Sugar, Complications and Pregnancy Outcomes in Patients with Gestational Diabetes Mellitus. Chinese Manipulation and Rehabilitation Medicine, 11(18): 83–84.

[14] Shekaili HAA, Hashmi IA, Omari OA, 2024, Gestational Weight Gain and Its Association with Maternal and Neonatal Outcomes Among Pregnant Women with Normal Pre-Pregnancy Body Mass Index from a Middle Eastern Country. Midwifery, 130: 103929. https://doi.org/10.1016/j.midw.2024.103929

[15] Wong MMH, Chan MYM, Ng TP, et al., 2024, Impact of Carbohydrate Quantity and Quality on Maternal and Pregnancy Outcomes in Gestational Diabetes Mellitus: A Systematic Review and Meta-Analysis. Diabetes Metab Syndr, 18(1): 102941. https://doi.org/10.1016/j.dsx.2024.102941

[16] Wang X, 2022, Application Effect of Comprehensive Nursing Intervention in Patients with Gestational Diabetes Mellitus Complicated by Gestational Hypertension. Diabetes New World, 2022(11): 115–118 + 128.

[17] Sweeting A, Hannah W, Backman H, et al., 2024, Epidemiology and Management of Gestational Diabetes. Lancet, 404(10448): 175–192. https://doi.org/10.1016/S0140-6736(24)00825-0

[18] Long SQ, 2018, Application of Comprehensive Nursing Intervention in Patients with Neonatal Pneumonia. Jingchu Academic (22nd Issue), 2018: 5.

[19] Liu C, He J, Ma J, et al., 2019, Analysis of the application Value of High Frequency Pulmonary Ultrasound in the Diagnosis of Neonatal Pneumonia. Chinese Journal of Ultrasound in Medicine, 35(5): 405–408.