ORIGINAL RESEARCH

The Impact of Evidence-Based Care on Glycemic Control and Pregnancy Outcomes in Diabetic Pregnancies

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ABSTRACT

Objective • This study investigates the impact of evidence-based care on glucose levels and pregnancy outcomes in patients with gestational diabetes mellitus.

Methods • We employed a prospective cohort study design. We selected 120 patients with gestational diabetes admitted to our institution from May 2019 to May 2021. Using a computerized blind selection method, we divided these patients into two groups, each consisting of 60 patients. The control group received conventional care, while the observation group underwent evidence-based care in addition to conventional care. We compared changes in various glucose-related indices, pregnancy outcomes, and patient satisfaction before and after implementing evidence-based care in both groups.

Results • Before care, no statistically significant differences were observed in fasting C-peptide levels, HOMA-IR, and HbA1c between the two groups ($P > .05$). However, after care, the observation group exhibited significantly lower levels of HOMA-IR and HbA1c compared to the control group, with significantly higher fasting C-peptide levels ($P < .05$). Furthermore, the observation group experienced a lower incidence of various adverse pregnancy outcomes for both mothers and infants when compared to the control group. Patient satisfaction with care was notably higher in the observation group (88.33%) compared to the control group (55.0%), and this difference was statistically significant ($P < .05$).

Conclusions • Evidence-based nursing interventions can effectively enhance daily care for patients with gestational diabetes. These interventions lead to improved blood glucose control, increased patient compliance, reduced incidence of adverse pregnancy outcomes, and ensured the safety of pregnant women and newborns. These outcomes are achieved through disseminating knowledge, structured dietary and exercise plans, and psychological guidance. (*Altern Ther Health Med.* 2023;29(8):564-569).

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INTRODUCTION

Evidence-based nursing refers to the development of nursing plans and practice activities, where nursing professionals meticulously gather and systematize contemporary scientific research findings and evidence related to specific medical conditions. This process harmoniously integrates patient preferences, values, and the clinical expertise of nursing staff. Through a systematic and inclusive assessment of the patient's condition, evidence-based nursing formulates precise and scientifically grounded care plans. Its goal is to elevate the quality of nursing care, enhance patient satisfaction, and improve overall quality of life.[1]

The practice of evidence-based nursing involves a sequence of activities, including formulating pertinent questions, acquiring, evaluating, and applying research evidence, and appraising the outcomes of these applications.[2] Achieving success in evidence-based nursing requires well-versed nursing professionals with a strong foundation in their field, adept at retrieving and analyzing knowledge, and committed to a continuous process of learning and skill refinement in clinical practice. This commitment ensures the delivery of high-quality care to patients.

Evidence-based nursing is an important component of nursing practice, gaining widespread prominence across various domains such as clinical care, management, and education.[3] Its application extends to nursing practice across diverse medical specialties, including cardiovascular diseases, digestive system disorders, and oncology. This approach significantly aids nursing professionals in developing care plans grounded in the latest research evidence, thereby mitigating adverse effects, preventing complications, and ultimately enhancing the quality of life for patients.[4]

Gestational diabetes mellitus represents one of the more common complications during pregnancy, characterized by a multifaceted etiology involving factors such as inflammation, adipokines, and genetics.[5] This condition arises due to an increased glucose demand within the body during pregnancy, coupled with insufficient insulin resistance, resulting in disturbances in sugar metabolism, which may eventually progress to diabetes mellitus. Furthermore, the fetus developing in the womb of a patient with gestational diabetes experiences prolonged exposure to a hyperglycemic environment, elevating the risk of metabolic disorders postnatally. Additionally, the likelihood of the patient developing diabetes after childbirth is notably increased.

Bilirubin, a metabolic product originating from iron porphyrin compounds, notably hemoglobin, plays a crucial role within the human body. It serves dual roles as an antioxidant, functioning both intracellularly and extracellularly. Total bilirubin (TB) found in the serum comprises the collective levels of direct bilirubin (DBIL) and indirect bilirubin (IBIL). In clinical practice, the established reference range for total bilirubin typically falls within the span of 4.1 to 17.7 μmol/L. Any deviations from this range, be it below or above, hold the potential to induce notable physiological and pathological alterations.

The primary approach to managing gestational diabetes mellitus involves stringent blood glucose control aimed at minimizing the occurrence of complications and ensuring the well-being and safety of both the mother and the baby. During pregnancy and the postpartum period, patients and their families exhibit an increased demand for essential knowledge related to dietary choices, exercise routines, medication administration, and the importance of follow-up care. Timely detection and intervention, coupled with comprehensive health guidance, can substantially influence both the patients and the outcomes of childbirth.

A recent study[6] highlights that evidence-based care centers on the integration of the latest research findings. This approach considers the unique conditions and preferences of patients, crafting scientifically informed strategies involving medication, dietary adjustments, and exercise regimens. It also addresses the need for lifestyle modifications and offers sustained nursing interventions, ultimately elevating patient's self-management capabilities. Consequently, it effectively maintains optimal blood glucose levels and prevents adverse pregnancy outcomes. Moreover, another study[7] highlights that implementing a continuity-in-care model fosters a strong doctor-patient relationship and improves the patient's self-management capabilities. This approach results in reduced healthcare costs and improved treatment outcomes.

In another study,[8] individual variances such as the literacy level and glycemic control of gestational diabetes mellitus patients underwent a thorough assessment, considering psychological, physical, and social aspects. Subsequently, a personalized extended care plan was carefully crafted for each patient, covering detailed guidance on psychological well-being, dietary considerations, medication management, and exercise regimens, among other factors. The study demonstrated that developing a timely, quick, and evidence-based extended care plan proved efficacious in enhancing patients' self-management capabilities. This approach reinforced patient compliance and significantly improved their overall satisfaction.

Therefore, this study carefully examined the impact of evidence-based care on glycemic control and pregnancy outcomes among individuals grappling with gestational diabetes.

MATERIALS AND METHODS

Study Design and Population

This prospective cohort study included a cohort of 120 patients diagnosed with gestational diabetes, all of whom were admitted to our hospital between May 2019 and May 2021. Inclusion criteria were as follows: (1) All patients meeting the diagnostic criteria outlined in the "Guidelines for the Diagnosis and Management of Gestational Diabetes Mellitus (2014)"[9] were considered eligible for this study; (2) patients within the age range of 21 to 38 years; (3) patients provided voluntary informed consent; (3) patients having health records at our antenatal clinic; (4) participants underwent regular antenatal checkups; and (5) patients not concurrently experiencing other pregnancy complications. Exclusion criteria were as follows: (1) patients with conditions such as diabetic ketoacidosis, severe organ dysfunction, and intrauterine fetal insufficiency; (2) patients with poor treatment compliance; or (3) patients with inability to cooperate with the study were excluded.

Group Allocation

Participants were grouped, using a computerized blind selection method to facilitate an impartial approach, into two groups, each consisting of 60 participants. The control group comprised patients aged between 21 and 37 years, with a mean age of (30.5 ± 3.1) years. Their gestational ages ranged from 30 to 39 weeks, with a mean of (32.35 ± 2.43) weeks, and their body mass index (BMI) ranged from 53 to 75 kg, with a mean of (64.3 ± 2.24) kg. Within this group, 35 were primiparous, and 25 were in the transitional stage of pregnancy.

Conversely, the observation group encompassed patients aged between 23 and 38 years, with a mean age of (30.33 ± 2.25) years. Their gestational ages ranged from 28 to 39 weeks, with a mean of (33.49 ± 2.16) weeks, and their BMI ranged from 54 to 75 kg, with a mean of (64.5 ± 2.27) kg. In this group, 37 were primiparous, and 23 were in the transitional stage of pregnancy. Importantly, no statistically significant differences were observed in the data between the two groups ($P > .05$), rendering them suitable for comparison purposes.

Targeted Care For Gestational Diabetes in Control Group

In the control group, a targeted care for gestational diabetesroutine was implemented. This approach encompassed several key components.

Active Health Education. Patients received comprehensive health education, emphasizing the importance of adhering to medical appointments and enhancing compliance. Special emphasis was placed on the daily monitoring of blood glucose levels at prescribed times. Patients were instructed to strictly follow their physician's prescribed medication regimen, avoiding unauthorized medication adjustments.

Dietary Interventions. Dietary guidance was provided to help patients determine an appropriate total energy intake. Nutrient allocation was carefully balanced to ensure a diverse and well-rounded diet. Emphasis was placed on consuming smaller, more frequent meals, adhering to regular and standardized meal schedules, and maintaining controlled calorie intake. Patients were encouraged to avoid irregular eating patterns and overindulgence. Additionally, promoting fiber-rich foods like whole grains was emphasized, while liquid or semi-liquid foods like thin rice were discouraged.

Exercise Plans. Individualized exercise plans were developed for patients, featuring regular and reasonable physical activity routines. Patients were encouraged to engage in physical activity at least thrice a week, each lasting approximately 30 minutes. This approach aimed to educate and promote regular exercise habits. It is important to note that this care process was not continuous but focused on education and guidance to support patients in managing gestational diabetes effectively.

Provision of Evidence-Based Care in the Observation Group

Patients in the observation group received evidence-based care building upon the foundation of the control group, involving the following components.

Formation of an Evidence-Based Care Team. This team, comprised of experienced obstetric nurses, underwent comprehensive training in evidence-based care principles, relevant theoretical knowledge, implementation methods, and content. The team conducted literature reviews and gathered empirical evidence on nursing issues in gestational diabetes care. Under the leadership of the team leader, medical records and patient data were systematically reviewed and discussed, resulting in the formulation of an evidence-based care plan. Patients in this group received continuous care.

Identification of Evidence-Based Challenges. Pertinent challenges in caring for gestational diabetes patients, such as insufficient health and dietary knowledge, heightened negative emotions, limited exercise, and clinical medication, were identified and categorized.

Evidence-Based Interventions. (1) Health Education: Regular informational sessions on gestational diabetes were conducted to educate patients about its risks, daily care practices, and the importance of adhering to medical advice to enhance patient compliance; (2) Psychological Support: Patients received psychological care to address any anxiety, distress, or negative emotions they may experience. Tailored solutions were provided based on individual concerns, focusing on explaining the impact of emotional well-being on blood sugar and pregnancy outcomes; (3) Dietary Guidance: Patients were educated on the fundamentals of a balanced diet to regulate blood glucose levels. Individualized dietary plans were devised according to each patient's blood glucose levels, emphasizing a low-sugar, light diet and frequent, smaller meals; (4) Exercise Instructions: Exercise plans were tailored to each patient's specific condition and age, emphasizing activities like yoga and walking. Patients were advised to exercise one hour after meals, with session durations ranging from 30 to 45 minutes, scheduled three times a week or more. Before exercise, patients were reminded to monitor their blood glucose levels to prevent post-exercise hypoglycemia; (5) Medication Guidance: Patients received instruction on regular blood glucose monitoring and, if required, were provided with short- and intermediate-acting insulin treatment. Detailed explanations of insulin dosages and potential adverse reactions were given to improve patient compliance with medication.

Observation Indicators

The study encompasses the following observation indicators:

Comparison of Blood Glucose Levels. We assessed the differences in fasting blood glucose and 2-hour postprandial blood glucose values among pregnant women before and after the nursing intervention. Blood samples were collected from participants after an overnight fast and 2 hours after a standardized meal, with glucose levels measured using a standardized glucose monitoring device.

Perinatal Complications Assessment. We compared the occurrence of various complications during the perinatal period, including excess amniotic fluid, premature rupture of membranes, gestational hypertension, postpartum hemorrhage, and cesarean section. This evaluation was based on medical record reviews and participant interviews, with detailed information recorded for each participant.

Perinatal Infant Health Assessment. The incidence of health-related issues in perinatal infants, such as hyperbilirubinemia, asphyxia, hypoglycemia, hypocalcemia, malformation, and stillbirth, was evaluated. This assessment involved a thorough review of medical records and physical examinations of the newborns. This structured approach ensured a comprehensive evaluation of the impact of the nursing intervention on pregnant women and perinatal outcomes.

Statistical Analysis

Statistical analysis was conducted using SPSS version 26.0 (IBM, Armonk, NY, USA). Counting or categorical data were presented as [n (%)], and differences in measuring data between groups were analyzed using the chi-square test (χ^2 test) or t test. A significance level of $P < .05$ was adopted, indicating statistical significance.

RESULTS

Blood Glucose Levels in the Two Groups

Blood glucose levels in the two groups were as follows: Fasting Plasma Glucose (FPG) in the observation group was

Table 1. Comparison of blood glucose levels of patients in 2 groups ($\bar{x} \pm s$)

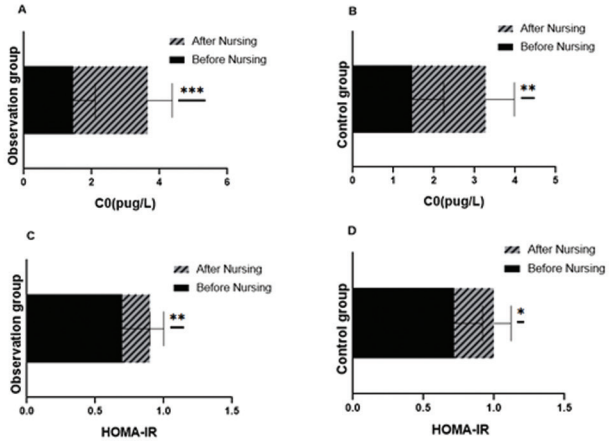
Group	Example	FPG (mmol/L)	2hPG (mmol/L)	HbA_{1c}(%)
Observation Group	60	5.54 ± 1.38	6.88 ± 1.26	6.90 ± 1.82
Control Group	60	6.23 ± 1.79	7.43 ± 1.38	8.42 ± 2.79
t value		2.365	2.280	3.535
P value		.020	.024	.000

Abbreviaitions: FPG (mmol/L), fasting plasma glucose levels measured in millimoles per liter; 2hPG (mmol/L), 2-hour postprandial glucose levels measured in millimoles per liter; HbA_{1c} (%), glycated hemoglobin levels measured as a percentage.

Table 2. Comparison of Adverse Events in the 2 Groups (n, %)

Group	Example	Premature Labor	Postpartum Hemorrhage	Hypertension During Pregnancy	Puerperal Infection
Observation Group	60	0 (0.0%)	2 (3.33%)	3 (5.00%)	2 (3.33%)
Control Group	60	4 (6.67%)	9 (5.00%)	13 (21.67%)	8 (13.33%)
χ^2 value		2.328	4.904	7.212	3.927
P value		.127	.027	.007	.048

Figure 1. Changes in the Levels of Blood Glucose-Related Indexes in the 2 Groups



Note: This figure illustrates the changes in blood glucose-related indexes within the two groups throughout the study. The figure visually represents how these indexes evolved after the nursing intervention, highlighting significant differences between the two groups.

(5.54 ± 1.38) mmol/L, and 2-hour Postprandial Glucose (2hPG) and Hemoglobin A_{1c} (HbA_{1c}) were significantly lower compared to those in the control group ($P < .05$). For detailed results, refer to Table 1.

Comparison of Adverse Events in the Two Groups

The comparison of adverse events in the two groups resulted in noteworthy findings. In the observation group, the incidence of adverse events was remarkably lower than that in the control group, with rates of 0.0% for preterm labor, 3.33% for postpartum hemorrhage, 5.00% for hypertension during pregnancy, and 3.33% for puerperal infection. These differences were statistically significant ($P < .05$). Detailed data are presented in Table 2 for reference.

Comparison of Changes in Blood Glucose-Related Index Levels in Both Groups

Significant changes were observed in both observation groups. In both groups, the level of C_0 significantly increased after the intervention compared to before ($P < .05$). Additionally, levels of HbA1c and HOMA-IR significantly decreased following the intervention compared to pre-intervention levels ($P < .05$). Furthermore, when comparing the two groups after the intervention, it was found that C_0 in the observation group was significantly higher than in the control group, while HOMA-IR in the observation group was significantly lower than in the control group ($P < .05$). These findings are illustrated in Figure 1 for visual reference.

Table 3. Nursing Satisfaction of the Two Groups [n, (%)]

Group	n	Very Satisfied	Satisfied	Generally Satisfied	Dissatisfied	Very Dissatisfied	Total Satisfaction Rate
Observation Group	60	30 (50.00%)	15 (25.00%)	8 (13.33%)	5 (8.30%)	2 (3.33%)	53 (88.33%)
Control Group	60	27 (45.00%)	13 (21.67%)	10 (16.67%)	11 (18.30%)	4 (6.67%)	33 (55.00%)
χ^2 value		0.301	0.186	0.261	2.596	0.175	16.416
P value		0.523	0.666	0.609	0.107	0.675	0.000

Abbreviaitions: Total Satisfaction Rate, overall percentage of patients satisfied with nursing care.

Table 4. Comparison of Pregnancy Outcomes in the two Groups [n,(%)]

Group	Example	Excessive Amniotic Fluid	Pregnancy Hypertension	Fetal Malformation	Premature Fetal Birth	Giant Baby
Observation Group	60	2 (3.33 %)	5 (8.33%)	2 (3.33%)	4 (6.66)	2 (3.33%)
Control Group	60	7(11.66 %)	18 (30.00%)	2 (3.33%)	10 (16.66)	8 (13.33%)
χ^2 value		1.922	9.090	0.259	2.911	3.927
P value		.166	.003	.611	.088	.048

Comparison of Nursing Satisfaction in the Two Groups

The comparison of nursing satisfaction between the two groups revealed that in the observation group, 50% of participants reported being "very satisfied," while 8.3% expressed dissatisfaction. The overall satisfaction rate in this group was 88.33%, significantly higher than that of the control group ($P < .05$). Detailed results are presented in Table 3.

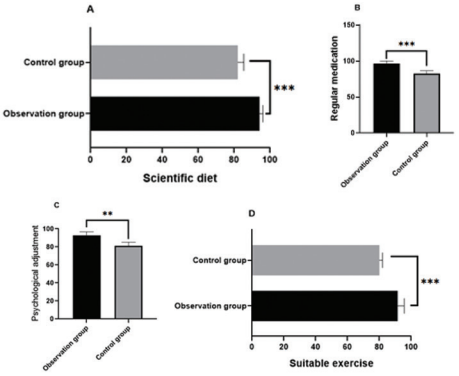
Comparison of Pregnancy Outcomes Between the Two Groups

The comparison of pregnancy outcomes between the two groups yielded significant outcomes. In the observation group, the incidence rates were as follows: 3.33% for excess amniotic fluid, 8.33% for Pregnancy Hypertension, 3.33% for fetal malformation, 6.66% for fetal preterm delivery, and 3.33% for macrosomia. All these rates were significantly lower compared to the control group; refer to Table 4 for details.

Comparison of Patient Compliance in Both Groups

When comparing patient compliance in both groups, significant differences were observed. In the observation group, patient compliance in various aspects was as follows: scientific diet (94.2 ± 1.9), regular medication (96.1 ± 3.8), psychological adjustment (92.6 ± 4.1), and appropriate exercise (91.6 ± 4.1). Notably, these values were significantly lower than those in the control group, as illustrated in Figure 2.

Figure 2. Comparison of Compliance of Patients in 2 Groups. **A**. scientific diet adherence, **B.** regular medication compliance, **C**. psychological adjustment adherence, and **D**. suitable exercise adherence. The bars represent the observation group (dark bars) and the control group (light bars). This figure visually displays how patient compliance varied across different aspects between the two groups, providing insights into the effectiveness of the interventions.



DISCUSSION

The etiology and pathogenesis of gestational diabetes are complicated and not yet fully understood. Pregnancy presents distinct challenges to glucose metabolism, marked by heightened glucose requirements, increased insulin resistance, and relatively inadequate insulin secretion in some pregnant women, potentially resulting in gestational diabetes.[10] This condition arises due to the significant disruptions in glucose metabolism, combined with the expansion of blood volume during pregnancy, leading to a relative insufficiency of insulin levels due to dilution. Additionally, hormones such as progesterone, estrogen, and lactogen further contribute to insulin resistance, leading to systemic metabolic disorders.[11]

Blood glucose and insulin resistance play critical roles in the pathogenesis of gestational diabetes. Insulin resistance refers to a diminished cellular response to insulin, resulting in reduced insulin-induced cellular activity and elevated blood glucose levels.[12] During pregnancy, the insulin sensitivity of pregnant mothers decreases due to placental hormones, while blood glucose levels rise in response to fetal needs.[13]

Gestational diabetes can develop when the pregnant woman's insulin secretion fails to meet the body's increased demand for insulin. Furthermore, insulin resistance can contribute to additional complications in pregnant individuals, including hypertension and cholestasis, amplifying the risk of gestational diabetes mellitus. The intricate relationship between blood glucose and insulin resistance highlights the importance of lowering blood glucose levels and alleviating insulin resistance as essential objectives in managing gestational diabetes.

A study by Kyto et al.[14] indicated notable improvements in fasting glucose, 2-hour postprandial glucose, and glycosylated hemoglobin levels within the observation group compared to the control group. These improvements were attributed to the multifaceted interventions implemented by the evidence-based team. We observed similar findings in our study, and the evidence-based team facilitated enhanced patient understanding of gestational diabetes through informative sessions and educational initiatives, which subsequently contributed to increased patient compliance. Furthermore, the evidence-based team tailored individualized diet and exercise plans, adapting them to each patient's specific condition. This comprehensive approach incorporating diet, exercise, psychology, and medication interventions within the observation group proved highly effective in regulating blood glucose levels and mitigating insulin resistance. Consequently, these efforts led to a reduction in the incidence of adverse pregnancy outcomes.

Evidence-based nursing represents a deliberate, explicit, and informed integration of scientific discoveries, clinical expertise, and patient preferences when formulating nursing strategies to inform clinical care decisions.[15] It draws upon valuable and credible scientific research findings as the foundation for asking pertinent questions, gathering empirical evidence, and applying this evidence to deliver optimal patient care. Evidence-based care combines three critical components: the most pertinent research foundation for care available, the clinical proficiency and expertise of the caregiver, and the patient's unique reality, values, and preferences.[16]

The foundation of evidence-based care commences with a profound emphasis on the gestational diabetes patient's specific circumstances. Adherence, synonymous with compliance, denotes the extent to which gestational diabetes patients adhere to their prescribed treatment regimens and align with medical guidance, often referred to as "patient cooperation".[17] The level of patient adherence significantly influences treatment outcomes and overall recovery. This study involved the participation of 120 pregnant women divided into two distinct groups; the evidence-based care administered by a dedicated team yielded notably higher levels of compliance across all facets within the observation group compared to the control group. This finding emphasizes the efficacy of the evidence-based care approach in enhancing patient adherence and improving treatment outcomes.

The difference in results between both groups is attributed to the control group relying on conventional nursing education. In some instances, pregnant patients in this group were influenced by familial and traditional beliefs, resulting in suboptimal compliance. Consequently, they struggled to effectively manage their blood glucose levels through diet, exercise, and medication, exacerbating their compliance issues. In contrast, the evidence-based care team took proactive measures to address these challenges within the observation group. They used phone calls and Weibo messages to encourage patients to adopt a healthy diet, moderate exercise, and adhere to their prescribed medication regimens.

Based on the study findings, it is evident that conducting patient-specific assessments to address individual issues through evidence-based care, developing tailored care plans, and employing diverse tools to monitor patients and enhance their adherence significantly contribute to mitigating the risk of adverse pregnancy outcomes. Existing research has highlighted that elevated patient compliance plays a

fundamental role in effectively managing blood glucose levels and safeguarding the well-being of both mothers and infants.

The outcomes of this study align with previous research,[18] demonstrating the significant impact of elevated blood glucose levels in gestational diabetes patients on various aspects of pregnancy and postpartum health. Notably, these high glucose levels have been associated with excessive fetal growth, an increased likelihood of cesarean delivery, and an accelerated fetal metabolism, potentially leading to complications like excessive amniotic fluid and a heightened risk of gestational hypertension. Furthermore, disturbances in blood glucose levels can elevate the risk of infections, consequently increasing the incidence of puerperal infections, which can hinder postpartum recovery.

The results of our study indicate a promising avenue for intervention. The continuous care provided to the observation group markedly improved their ability to manage blood glucose effectively. This, in turn, led to a significant reduction in adverse pregnancy outcomes within this group. These findings emphasize the importance of proactive glycemic control measures in gestational diabetes management, with the potential to mitigate the associated risks and improve maternal and infant health outcomes.

Gestational diabetes mellitus carries inherent metabolic risks for the pregnant mother, potentially triggering adverse neonatal events, most notably, the birth of macrosomic infants. In line with the findings of this study, effective glycemic control in the observation group significantly reduced the overall incidence of neonatal complications compared to the control group ($P < .05$). This observed reduction in neonatal complications can be attributed to several factors. Firstly, prolonged exposure of the fetus to elevated maternal blood glucose levels can predispose it to overgrowth, thereby increasing the likelihood of complications such as neonatal asphyxia and intrauterine distress. Furthermore, these infants are at a heightened risk of reflex hypoglycemia and hyperbilirubinemia shortly after birth, both of which can profoundly impact the well-being and health of the newborns. These findings highlight the critical importance of effective glycemic control in mitigating the risks associated with gestational diabetes and ensuring the health and vitality of both mother and child.

Study Limitations

This study has certain limitations that should be acknowledged. Firstly, the relatively modest sample size may restrict the statistical power and applicability of the study's findings to a broader population. Moreover, the methodology employed for patient selection and allocation to either the control or observation groups lacks explicit clarification, raising concerns regarding potential selection bias. The absence of information regarding the maintenance of blinding throughout the study introduces the possibility of bias. Furthermore, the study's limitation extends to its relatively short-term focus, as it lacks long-term follow-up data, impeding a comprehensive understanding of the sustained effects of evidence-based care. Lastly, the confinement of the study to a single institution raises questions regarding the generalizability of the results to a more diverse patient population. Future studies should explore the long-term impact of evidence-based care on gestational diabetes management across diverse healthcare settings and populations to enhance its broader clinical relevance.

CONCLUSION

In conclusion, evidence-based care plays a pivotal role in daily patient management. By facilitating knowledge dissemination, formulating tailored diet and exercise plans, and providing essential psychological guidance, it can significantly enhance patients' ability to control blood glucose levels, strengthen their adherence to treatment regimens, reduce the occurrence of adverse pregnancy outcomes, and ensure the well-being of both expectant mothers and newborns.

DATA AVAILABILITY

The data used to support this study is available from the corresponding author upon request.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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