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Original Article

Factors influencing dietary compliance among patients with gestational diabetes mellitus: a retrospective analysis

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Abstract: Objective: Gestational diabetes mellitus (GDM) poses significant health risks during pregnancy, with dietary adherence being crucial for effective management. This study aims to identify factors influencing dietary compliance to enhance patient outcome. Methods: This retrospective cohort study analyzed 189 GDM patients from Wuhan Children's Hospital between January 2021 and June 2023. The patients were categorized into good and poor dietary adherence groups using the Perceived Dietary Adherence Questionnaire. Variables such as demographic data, disease duration, educational attainment, income, employment status, obstetric history, and dietary sources, were collected. Knowledge levels were evaluated using the Gestational Diabetes Mellitus Knowledge Questionnaire (GDMKQ), and social support was assessed by the Medical Outcomes Study Social Support Survey. Results: A multifactorial logistic regression model was developed to predict poor dietary compliance, and the risk factors included lower educational attainment (Coefficient: 1.249; Odds Ratio (OR): 3.487), lower income (Coefficient: 2.282; OR: 3.602), and takeout breakfasts (Coefficient: 0.838; OR: 2.311). Improved GDM knowledge (Coefficient: -0.344; OR: 0.709) and social support levels (Coefficient: -0.072; OR: 0.931), unemployment (Coefficient: -0.935; OR: 0.392), and obstetric history (Coefficient: -0.980; OR: 0.375) were protective factors against poor compliance. The multifactorial logistic regression model was formulated as follows: *Logit* (*P*) = $\beta 0$ + $\beta 1$ (*Educational Level*) + $\beta 3$ (*Employment Status*) + $\beta 4$ (*Obstetric History*) + $\beta 5$ (*Breakfast Source*) + $\beta 6$ (*GDMKQ Scores*) + $\beta 7$ (*Social Support*). The model demonstrated robust predictive power with an area under the curve (AUC) of 0.854 in internal validation and 0.972 in external validation. Calibration plots indicated good agreement between predicted and observed outcomes, supporting the model's reliability and clinical utility. Conclusion: The study identified key demographic, behavioral, and social determinants affecting dietary compliance in GDM patients. Critical factors include education levels, household income, employment, breakfast source, GDM knowledge, and social support. These insights can inform interventions to enhance dietary adherence and optimize GDM management strategies in clinical settings. Our multifactorial logistic regression model displays high predictive accuracy and serves as a practical tool for assessing dietary compliance risks, facilitating personalized patient care.

Keywords: Gestational diabetes mellitus, dietary compliance, logistic regression model, social support, education level

Introduction

Gestational Diabetes Mellitus (GDM) is a common metabolic disorder that emerges during pregnancy, characterized by glucose intolerance which typically resolves after childbirth [1]. Globally, the prevalence of GDM is estimated to affect approximately 5-10% of pregnancies, with variations depending on the population studied and diagnostic criteria used [2]. Factors such as maternal age, obesity, and ethnicity are significant contributors to the prevalence of GDM [3]. If left unmanaged, GDM can pose serious health risks to both the mother

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and the child. Maternal complications include preeclampsia, need for Caesarean delivery, and type 2 diabetes postpartum [4]. For the infant, there is a heightened risk for macrosomia, birth injuries, and development of obesity and diabetes later in life [5]. Hence, clinical management of GDM is crucial for improving perinatal outcomes and long-term health for both mothers and children.

Current strategies for managing GDM primarily focus on dietary modifications, physical activity, and pharmacotherapy if lifestyle changes prove insufficient [6]. Dietary therapy remains the cornerstone of GDM management, because it helps stabilize blood glucose levels and provide optimal nutrition for fetal development with minimal risk [7]. However, dietary compliance among patients with GDM is often challenging, influenced by numerous cultural, social, and economic factors [8]. Several studies [9, 10] have examined the efficacy of dietary interventions, yet there remains significant variability in adherence across populations. The complexity of complying with a GDM dietary regimen often parallels individual perceptions of the disease, nutritional literacy, and support from health care providers [11].

While there is substantial literature on dietary management of GDM, factors influencing patients' adherence to prescribed dietary guidelines are not thoroughly understood [12, 13]. Most existing studies focus on general trends and outcomes rather than delving into specific sociocultural and psychological factors affecting dietary compliance [14, 15]. Additionally, there is a limited exploration of the barriers faced by diverse demographic groups, leading to a gap in personalized dietary counseling approaches. Understanding the individual and systemic barriers that affect dietary compliance could help formulate targeted interventions, thereby enhancing therapeutic outcome.

The importance of addressing these gaps cannot be understated. By understanding the multifaceted influences on dietary compliance, healthcare practitioners can develop more effective educational and behavioral strategies tailored to individual patient needs. This understanding can lead to significant improvements in clinical outcomes, reducing the incidence of adverse events associated with GDM. Our study seeks to contribute to the limited knowledge base regarding the practical aspects of dietary adherence in GDM management and analyze the influencing factors through a retrospective analysis We explored both intrinsic and extrinsic factors such as patient psychology, health literacy, socioeconomic status, and the quality of healthcare support. By addressing these variables, we hope to improve the approach to dietary counseling in GDM, improve management, and promote better health outcomes for both mothers and children.

Materials and methods

Inclusion and exclusion criteria

Inclusion Criteria: (1) Diagnosis of GDM according to established standards, including a 75 g oral glucose tolerance test conducted between 24 and 28 weeks of gestation, where a fasting blood glucose level of 5.1 mmol/L, a 1-hour postprandial level of 10.0 mmol/L, or a 2-hour postprandial level of 8.5 mmol/L were met or exceeded [16]; (2) Normal cognitive ability allowing for verbal communication and cooperation throughout the research process; (3) Absence of severe complications related to diabetes; (4) Complete and accessible medical records; (5) Singleton pregnancy.

Exclusion Criteria: (1) Those suffering from severe diseases affecting critical organs, such as the liver, kidneys, or heart; (2) Those exhibiting cognitive impairments or mental health disorders; (3) Those with pre-existing diabetes prior to pregnancy; (4) Those with malignant tumors.

This study was approved by the Ethics Committee of Wuhan Children's Hospital.

Grouping criteria

This retrospective cohort study included 189 patients diagnosed with GDM at Wuhan Children's Hospital between January 2021 and June 2023. Participants were divided into two groups based on dietary adherence: a good adherence group (n = 118) and a poor adherence group (n = 71). Additionally, another 31 patients diagnosed with GDM during the same period were also classified into a good adherence group (n = 20) and a poor adherence group (n = 11).

To assess dietary adherence in this study, the Perceived Dietary Adherence Questionnaire (PDAQ) was utilized. This nine-item questionnaire, developed by Asaad et al. [17] in 2015, employs a seven-point Likert scale to evaluate food consumption over the past seven days. Higher scores indicate greater adherence, with the exception of items 4 and 9, which assess unhealthy dietary choices (i.e., foods high in sugar or fat). For these particular items, higher scores signify lower adherence. Patients were classified as having good dietary adherence if they maintained a healthy diet for at least four days during the week [18].

To ensure sufficient statistical power, a power analysis was conducted based on preliminary data indicating an expected effect size of d = 0.5 with α = 0.05 and power (1-β) = 0.80. This analysis suggested a minimum sample size of N = 64 participants per group to detect a significant difference between the two groups. Considering an anticipated dropout rate of approximately 10%, the final sample size was set to the current level.

Data collection

Data collection involved a comprehensive review of patient medical records to compile general demographic information, including age, pre-pregnancy body mass index (BMI), duration of diabetes, educational attainment, household monthly income per capita, payment method, employment status, residence, obstetric history, fasting blood glucose levels, and 1- and 2-hour postprandial blood glucose levels. Additionally, sources of dietary intake for breakfast, lunch, and dinner were recorded.

The Gestational Diabetes Mellitus Knowledge Questionnaire (GDMKQ) is a 15-item multiple-choice survey designed to assess basic knowledge concerning GDM, including its risk factors, dietary considerations, treatment options, management strategies, and complications or outcomes. Each item presents four options, of which one is correct. Each correct response earns one point, resulting in a total score ranging from 0 to 15. A score of 8 or below indicates inadequate knowledge, whereas a score above 8 signifies adequate knowledge about GDM. The questionnaire has demonstrated good reliability [19].

Social support was measured using the 19-item Medical Outcomes Study Social Support Survey (MOS-SSS). Each item is rated on a scale of 1 to 5, reflecting the frequency of support received, from "none of the time" to "all of the time". To calculate the scores for each subscale - emotional/informational (8 items), tangible (4 items), affectionate (3 items), and positive social interaction (3 items) - the following formula was applied: (observed subscale score/maximum subscale score) × 100. The overall social support score was then computed, with higher total scores indicating a greater perceived level of social support. The scale exhibited a Cronbach's alpha value exceeding 0.70 [20].

Statistical methods

Data analysis was conducted using SPSS version 29.0 (SPSS Inc., Chicago, IL, USA). Categorical variables were presented as n (%). For sample sizes of 40 or more with a theoretical frequency (T) of 5 or greater, the chi-square test was employed using basic formulas. When the sample size was 40 or more, but the theoretical frequency ranged from 1 to less than 5, the chi-square test with continuity correction was applied. For sample sizes less than 40 or cases where the theoretical frequency was less than 1, Fisher's exact probability test was utilized for statistical analysis. The Shapiro-Wilk test was employed to assess the normality of continuous variables. Continuous variables demonstrating a normal distribution were expressed as mean ± SD and subjected to a t-test with corrected variances. A two-tailed *p*-value of < 0.05 was considered significant.

Variables that exhibited significant differences by both difference analysis and correlation analysis were included as covariates in the logistic regression analysis. The multifactorial logistic regression model was formulated as follows: *Logit* (*P*) = β0 + β1 (*Educational Level*) + β3 (*Employment Status*) + β4 (*Obstetric History*) + β5 (*Breakfast Source*) + β6 (*GDMKQ Scores*) + β7 (*Social Support*). These covariates consisted of educational attainment, household monthly income per capita, employment status, obstetric history, sources of breakfast, GDMKQ scores, and levels of social support. The predictive efficacy of the combined factors for poor dietary adherence was evaluated using the area under the receiver operating characteristic (ROC) curve (AUC).

Table 1. General characteristics of patients

	Good Compliance group (n = 118)	Poor Compliance group (n = 71)	t/χ^2	P
Age	28.29 ± 3.69	29.04 ± 4.11	1.292	0.198
Pre-pregnancy BMI	22.18 ± 1.62	21.95 ± 1.94	0.883	0.379
Duration of disease			0.009	0.926
< 3 months	64 (54.24%)	39 (54.93%)		
≥ 3 months	54 (45.76%)	32 (45.07%)		
Educational level			19.836	< 0.001
Junior high school or below	47 (39.83%)	52 (73.24%)		
High school or above	71 (60.17%)	19 (26.76%)		
Average monthly household income per capita			15.054	< 0.001
< 3000 CNY	39 (33.05%)	44 (61.97%)		
≥ 3000 CNY	79 (66.95%)	27 (38.03%)		
Payment method			0.495	0.920
Medical insurance	39 (33.05%)	23 (32.39%)		
Out-of-pocket	19 (16.1%)	10 (14.08%)		
Public-funded healthcare	25 (21.19%)	18 (25.35%)		
Other	35 (29.66%)	20 (28.17%)		
Employment status (Yes/No)	61 (51.69%)/57 (48.31%)	21 (29.58%)/50 (70.42%)	8.828	0.003
Place of residence			0.483	0.487
Urban area	79 (66.95%)	44 (61.97%)		
Rural area	39 (33.05%)	27 (38.03%)		
Obstetric history			10.294	0.001
Primigravida	78 (66.1%)	30 (42.25%)		
Multigravida	40 (33.9%)	41 (57.75%)		
Fasting blood glucose (mmol/L)			0.243	0.622
< 5.10	87 (73.73%)	50 (70.42%)		
≥ 5.10	31 (26.27%)	21 (29.58%)		
Blood glucose 1 hour after meal (mmol/L)			0.384	0.535
< 10.00	57 (48.31%)	31 (43.66%)		
≥ 10.00	61 (51.69%)	40 (56.34%)		
Blood glucose 2 hours after meal (mmol/L)			0.250	0.617
< 8.50	39 (33.05%)	26 (36.62%)		
≥ 8.50	79 (66.95%)	45 (63.38%)		

BMI: body mass index.

Results

General characteristics of patients

In this retrospective study, we analyzed the general characteristics of patients with GDM by comparing a good compliance group (n = 118) to a poor compliance group (n = 71) (**Table 1**). The two groups exhibited no significant differences in age (28.29 ± 3.69 vs. 29.04 ± 4.11, *P* = 0.198), pre-pregnancy BMI (22.18 ± 1.62 vs. 21.95 ± 1.94, *P* = 0.379), or duration of disease (*P* = 0.926). However, educational level and average monthly household income per capita were significantly associated with dietary compliance (*P* < 0.001). Specifically, a higher proportion of patients with junior high school education or below (39.83% in good compliance vs. 73.24% in poor compliance) and those with an income of less than 3000 CNY (33.05% vs. 61.97%) were found in the poor compliance group. Employment status also significantly differed, with a higher percentage of employed individuals in the good compliance group (51.69% vs. 29.58%, *P* = 0.003). Obstetric history revealed that primigravida patients were more frequent in the good compliance group (66.1% vs. 42.25%, *P* = 0.001). Other factors, including payment method, place of residence, and various blood glucose measurements,

Table 2. Dietary sources among patients

	Good Compliance group (n = 118)	Poor Compliance group (n = 71)	t/χ^2	P
Source of breakfast			15.433	< 0.001
Prepared at home	105 (88.98%)	48 (67.61%)		
Work-provided meal	6 (5.08%)	5 (7.04%)		
Takeout	7 (5.93%)	18 (25.35%)		
Source of lunch			0.782	0.676
Prepared at home	73 (61.86%)	48 (67.61%)		
Work-provided meal	37 (31.36%)	18 (25.35%)		
Takeout	8 (6.78%)	5 (7.04%)		
Source of dinner			1.709	0.426
Prepared at home	112 (94.92%)	64 (90.14%)		
Work-provided meal	2 (1.69%)	3 (4.23%)		
Takeout	4 (3.39%)	4 (5.63%)		

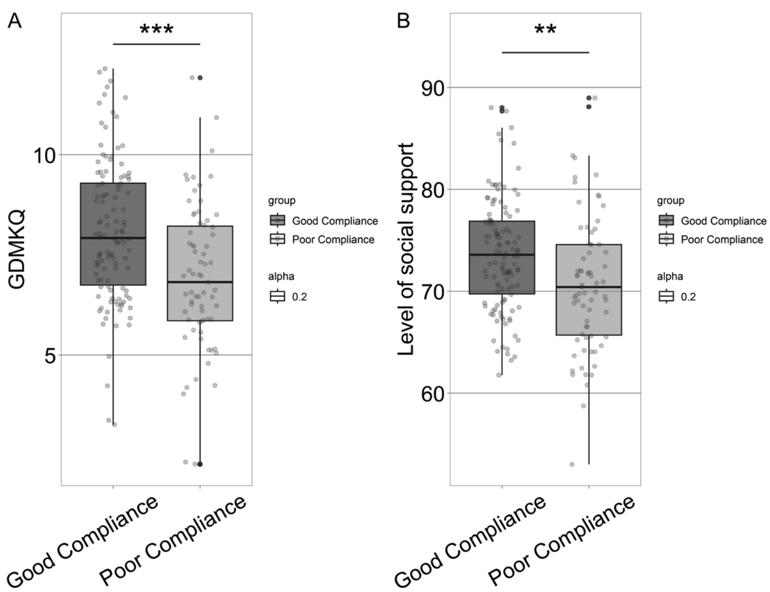

Figure 1. Knowledge and social support levels among patients with gestational diabetes mellitus. A: Gestational diabetes mellitus knowledge questionnaire (GDMKQ); B: Level of social support. **: P < 0.01; ***: P < 0.001.

showed no significant differences between the two groups (all $P > 0.05$). These findings suggest that educational attainment, household income, employment status, and obstetric history significantly influence dietary compliance among patients with GDM.

Dietary sources among patients

We evaluated dietary sources among patients with GDM, comparing those with good compliance to those with poor compliance (**Table 2**). A significant difference was observed in the source of breakfast, with a higher proportion of the good compliance group preparing breakfast at home (88.98% vs. 67.61%, $P < 0.001$). In contrast, dietary sources for lunch and dinner did not demonstrate statistically significant differences between the groups; for lunch, 61.86% of the good compliance group sourced their meal from home compared to 67.61% in the poor compliance group ($P = 0.676$), while for dinner, home-prepared meals were also similar at 94.92% for the good compliance group versus 90.14% for the poor compliance group ($P = 0.426$). These findings indicate that breakfast preparation is a distinguishing factor between dietary compliance levels in GDM patients, whereas lunch and dinner sources did not significantly differ between groups.

GDM knowledge and social support levels among patients

In our analysis of GDM knowledge and social support levels among patients, significant differences were identified between the two groups (**Figure 1**). The good compliance group scored higher on the GDMKQ, achieving an average score of 8.07 ± 1.76 compared to 6.89 ± 1.88 in the poor compliance group ($P < 0.001$). Additionally, the average level of social

Table 3. Unifactorial logistic regression analysis of factors influencing poor compliance

	Coefficient	Std Error	Wald	*P* Value	OR	95% CI
Educational level (Junior high school or below)	1.419	0.327	4.335	< 0.001	4.134	2.206-7.999
Average monthly household income per capita (< 3000 CNY)	1.194	0.313	3.814	< 0.001	3.301	1.800-6.161
Employment status (Employment)	-0.935	0.319	2.935	0.003	0.392	0.207-0.726
Obstetric history (Primigravida)	-0.980	0.309	3.171	0.002	0.375	0.203-0.684
Source of breakfast (Takeout)	0.838	0.228	3.674	< 0.001	2.311	1.500-3.697
GDMKQ	-0.371	0.094	3.963	< 0.001	0.690	0.569-0.823
Level of social support	-0.081	0.027	2.989	0.003	0.923	0.873-0.971

GDMKQ: gestational diabetes mellitus knowledge questionnaire.

Table 4. Multifactorial logistic regression analysis of factors influencing poor compliance

	Coefficient	Std Error	Wald	*P* Value	OR	95% CI
Educational level (Junior high school or below)	1.249	0.389	3.209	0.001	3.487	1.626-7.479
Average monthly household income per capita (< 3000 CNY)	1.282	0.397	3.228	0.001	3.602	1.654-7.844
Employment status (Employment)	-0.891	0.393	-2.268	0.023	0.410	0.190-0.886
Obstetric history (Primigravida)	-1.211	0.400	-3.024	0.002	0.298	0.136-0.653
Source of breakfast (Takeout)	0.711	0.261	2.727	0.006	2.036	1.221-3.394
GDMKQ	-0.344	0.110	-3.124	0.002	0.709	0.572-0.880
Level of social support	-0.072	0.032	-2.232	0.026	0.931	0.874-0.991

GDMKQ: gestational diabetes mellitus knowledge questionnaire.

support was significantly greater in the good compliance group (73.54 ± 5.43) than in the poor compliance group (70.73 ± 6.78, *P* = 0.004). These results emphasize the importance of enhanced medical knowledge and social support levels.

Logistic regression analysis

In our analysis of dietary compliance among patients with GDM, unifactorial logistic regression indicated several significant predictors for poor compliance (**Table 3**). Higher educational level was associated with increased odds of good compliance (OR, 4.134; 95% CI, 2.206-7.999; *P* < 0.001), as was higher average monthly household income per capita (OR, 3.301; 95% CI, 1.800-6.161; *P* < 0.001). Patients not employed showed a decreased likelihood of poor compliance (OR, 0.392; 95% CI, 0.207-0.726; *P* = 0.003), as did those having a more extensive obstetric history (OR, 0.375; 95% CI, 0.203-0.684; *P* = 0.002). Obtaining breakfast from takeout sources increased the odds of poor compliance (OR, 2.311; 95% CI, 1.500-3.697; *P* < 0.001). Higher scores on the GDMKQ and increased levels of social support were associated with lower odds of poor compliance (OR, 0.690; 95% CI, 0.569-0.823; *P* < 0.001 and OR, 0.923; 95% CI, 0.873-0.971; *P* = 0.003, respectively).

Multifactorial logistic regression confirmed these associations, with high educational level and household income per capita remaining significant predictors of good compliance (OR, 3.487; 95% CI, 1.626-7.479; *P* = 0.001 and OR, 3.602; 95% CI, 1.654-7.844; *P* = 0.001, respectively) (**Table 4**). Employment status, obstetric history, and takeout breakfast were also significant factors, supporting the unifactorial findings. Moreover, increased GDMKQ scores and social support continued to correlate inversely with poor compliance (OR, 0.709; 95% CI, 0.572-0.880; *P* = 0.002 and OR, 0.931; 95% CI, 0.874-0.991; *P* = 0.026, respectively).

Performance of the developed model

Figure 2 illustrates through various graphical representations the model's performance in predicting dietary compliance among patients with GDM. The nomogram presented in **Figure 2A** integrates several predictors such as educational level, average monthly household income per capita, employment status, obstetric history, source of breakfast, knowledge about gestational diabetes (GDMKQ), and level of social support, offering a tool to calculate an individual's probability of poor dietary compliance. The calibration plot (**Figure 2B**) reflects a good agreement between predicted probabili-

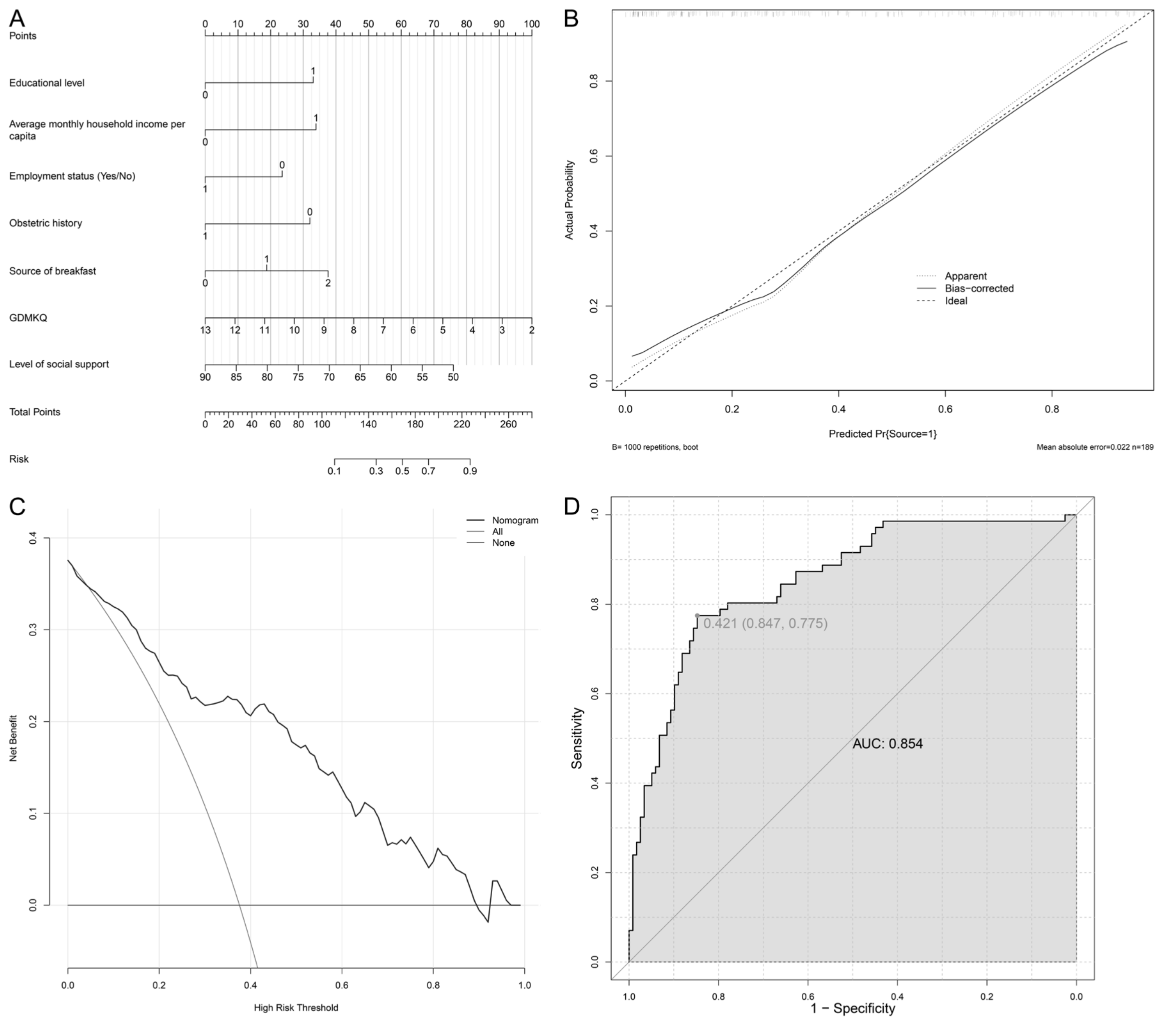

Figure 2. Performance of the established multifactorial logistic regression model. A: Nomogram; B: Calibrate plot; C: Decision curve analysis (DCA) curve; D: Receiver operating characteristic (ROC) curve. AUC: area under the curve.

ties and actual observed outcomes, with a nearly ideal alignment along the 45-degree line, indicating the model's accuracy. The decision curve analysis curve (**Figure 2C**) suggests that the model provides a net benefit across a wide range of threshold probabilities, highlighting its clinical value. Finally, the ROC curve (**Figure 2D**) demonstrates excellent discriminative ability, with the AUC being 0.854 indicating a high level of sensitivity and specificity in predicting poor dietary compliance. Collectively, these analyses confirm the robustness and reliability of the multifactorial logistic regression model in assessing risk factors associated with dietary compliance among patients with GDM.

External validation

Our external validation cohort allowed a comparison between two groups: 20 patients in the good compliance group and 11 in the poor compliance group (**Table 5**). The mean age and pre-pregnancy BMI were similar between the two groups (mean age: 27.98 ± 3.14 years vs. 28.56 ± 3.51 years, P = 0.641; BMI: 22.62 ± 1.73 vs. 22.55 ± 1.58, P = 0.913). Duration of disease also showed no significant differences, with similar distributions in both groups (< 3 months: 50% vs. 54.55%; ≥ 3 months: 50% vs. 45.45%). In contrast, educational level emerged as a significant factor (P = 0.031), with a higher proportion of patients with education at high school level or above in the good compliance group (70% vs. 27.27%). Income was another significant factor (P = 0.023), with the majority of the good compliance group earning ≥ 3000 CNY/month (65% vs. 18.18%). Employment status was significant (P = 0.021), with more employed patients in the good compliance

Table 5. General data of patients in the external validation groups

	Good Compliance group (n = 20)	Poor Compliance group (n = 11)	t/χ^2	P
Age	27.98 ± 3.14	28.56 ± 3.51	0.471	0.641
Pre-pregnancy BMI	22.62 ± 1.73	22.55 ± 1.58	0.110	0.913
Duration of disease			None	1
< 3 months	10 (50%)	6 (54.55%)		
≥ 3 months	10 (50%)	5 (45.45%)		
Educational level			None	0.031
Junior high school or below	6 (30%)	8 (72.73%)		
High school or above	14 (70%)	3 (27.27%)		
Average monthly household income per capita			None	0.023
< 3000 CNY	7 (35%)	9 (81.82%)		
≥ 3000 CNY	13 (65%)	2 (18.18%)		
Payment method			None	1
Medical insurance	6 (30%)	3 (27.27%)		
Out-of-pocket	3 (15%)	2 (18.18%)		
Public-funded healthcare	5 (25%)	3 (27.27%)		
Other	6 (30%)	3 (27.27%)		
Employment status (Yes/No)	15 (75%)/5 (25%)	3 (27.27%)/8 (72.73%)	None	0.021
Place of residence			None	1
Urban area	12 (60%)	7 (63.64%)		
Rural area	8 (40%)	4 (36.36%)		
Obstetric history			None	0.021
Primigravida	15 (75%)	3 (27.27%)		
Multigravida	5 (25%)	8 (72.73%)		
Fasting blood glucose (mmol/L)			None	0.676
< 5.10	16 (80%)	8 (72.73%)		
≥ 5.10	4 (20%)	3 (27.27%)		
Blood glucose 1 hour after meal (mmol/L)			None	1
< 10.00	9 (45%)	5 (45.45%)		
≥ 10.00	11 (55%)	6 (54.55%)		
Blood glucose 2 hours after meal (mmol/L)			None	1
< 8.50	7 (35%)	4 (36.36%)		
≥ 8.50	13 (65%)	7 (63.64%)		

BMI: body mass index.

group (75% vs. 27.27%). A difference was also observed in obstetric history (*P* = 0.021), where the good compliance group had a higher proportion of primigravida (75% vs. 27.27%). Factors such as payment method, place of residence, fasting blood glucose, and postprandial blood glucose showed no significant differences between the groups, indicating these did not influence dietary compliance significantly.

In the analysis of factors influencing dietary compliance among patients with GDM, significant differences were observed between the good compliance group and the poor compliance group regarding breakfast source, GDMKQ score, and level of social support (**Table 6**). The majority of patients in the good compliance group prepared breakfast at home (95%) compared to 54.55% in the poor compliance group, with statistical significance (*P* = 0.013). The GDMKQ scores were notably higher in the good compliance group (8.24 ± 1.31) than in the poor compliance group (6.86 ± 1.42), indicating better understanding and awareness of the disease (*P* = 0.011). Furthermore, levels of social support were significantly higher in the

Table 6. Comparison of breakfast sources, knowledge questionnaires and social support between the two groups

	Good Compliance group (n = 20)	Poor Compliance group (n = 11)	t/χ^2	P
Source of breakfast			None	0.013
Prepared at home	19 (95%)	6 (54.55%)		
Work-provided meal	0 (0%)	1 (9.09%)		
Takeout	1 (5%)	4 (36.36%)		
GDMKQ	8.24 ± 1.31	6.86 ± 1.42	2.726	0.011
Level of social support	71.09 ± 4.84	67.06 ± 4.45	2.279	0.030

GDMKQ: gestational diabetes mellitus knowledge questionnaire.

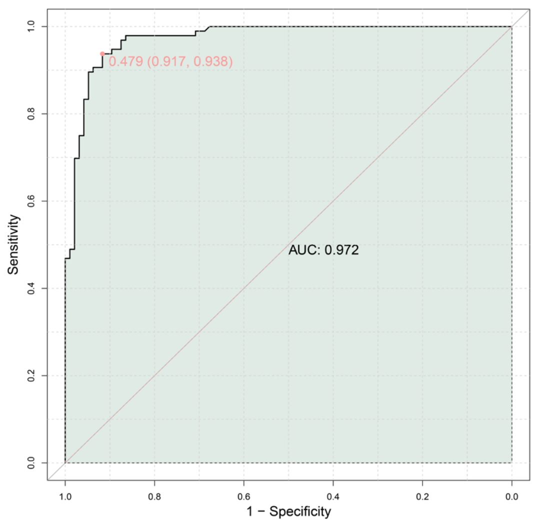

Figure 3. Predictive value of established multifactorial logistic regression for poor dietary compliance in external validation.

good compliance group (71.09 ± 4.84) compared to the poor compliance group (67.06 ± 4.45), with a *P* value of 0.030, suggesting that increased social support assists with better dietary adherence.

The predictive value of the established multifactorial logistic regression model for poor compliance with GDM management was evaluated through external validation (**Figure 3**). The model demonstrated good discrimination, with an AUC of 0.972. The true positive rate was 0.917, indicating high sensitivity at this threshold. Notably, the model maintained a specificity of 0.938, suggesting a low rate of false positives across the range of thresholds tested. These findings suggest that the model accurately predicts poor dietary compliance in patients with GDM and may serve as a useful tool for clinical decision-making.

Discussion

Innovative aspects of this study include the development of a multifactorial logistic regression model that identifies predictors of poor dietary compliance among GDM patients. This model offers valuable insight into the role of educational attainment, household income, employment status, obstetric history, breakfast source, GDM knowledge, and social support. These findings can inform the design of targeted interventions aimed at improving dietary adherence, thereby contributing to the clinical management of GDM.

Education was identified as a critical determinant of dietary compliance. Our findings corroborate those of Lim et al. [21], who noted that patients with higher levels of education exhibited better dietary adherence. This could be attributed to increased health literacy, allowing individuals to understand GDM management protocols better and make informed dietary choices [22]. Educational attainment may also equip individuals with critical thinking skills to evaluate and navigate healthcare information, increasing their capability to adhere to prescribed dietary guidelines [23]. Moreover, individuals with higher education levels might have greater access to health-related information resources, which can aid in managing their condition effectively [24]. Conversely, limited education may restrict understanding of the complex management of GDM, thus reducing adherence to dietary protocols [25].

Income emerged as a significant factor, with lower-income associated with poorer dietary compliance. This finding aligns with studies such as the one conducted by Zhou et al., which noted that financial resources dictate access to quality food [26]. Unhealthy foods often cost less than nutritious alternatives, which could lead to poor dietary choices among those with lower incomes. Financial constraints may also limit access to healthcare resources that provide support and education on managing GDM [26]. Furthermore, stress associated with financial insecurity could contribute to lower compliance, as stress can worsen self-care behaviors, including diet [27].

Employment status also plays a role, with employed individuals showing better dietary adherence. Similar observations have been made by Huang et al., noting that employment status might enhance dietary compliance through structured routines, which can facilitate meal planning and adherence to dietary guidelines [28]. In contrast, unemployment may be associated with stress, social isolation, and reduced routine, all of which can worsen adherence to dietary regimens [29].

Obstetric history, particularly the status of being a primigravida, was correlated with better adherence to dietary recommendations. This finding is consistent with Malta et al. [30], suggesting that primigravida patients may be more cautious and concerned about their pregnancy, leading to increased compliance with dietary guidelines. The novelty of the experience may prompt these women to strictly adhere to medical advice to ensure the well-being of their unborn child [31]. However, further research is needed to explore this relationship, as multiparous women might have insights from previous pregnancies that could also promote adherence.

The source of breakfast was another significant factor influencing dietary compliance. Studies like Du et al., have shown that preparing meals at home may reflect a conscientious approach to food choices, which aligns with dietary recommendations for managing GDM [32]. Home preparation allows for control over ingredients and portion sizes, which can directly influence glucose management. Those who rely on external, potentially less healthful sources for breakfast may have less control over the nutritional content and portion sizes, resulting in poorer compliance.

The role of knowledge about GDM, as measured by the GDMKQ, was pivotal. Higher knowledge scores were associated with better dietary adherence, underscoring the importance of education in disease management. This finding is supported by Angwenyi et al. [33], who emphasized that knowledge empowers patients with the understanding necessary to manage their diet effectively. It enables them to comprehend the consequences of dietary lapses and appreciate the benefits of adhering to dietary recommendations [34]. This highlights the need for healthcare providers to focus on patient education as a key component in managing GDM.

Social support similarly appeared to moderate dietary compliance positively. Patients reporting greater social support had better adherence to dietary recommendations. This finding is in line with Gerszi et al., who noted that social support can function as a buffer against stress and provide motivation and encouragement to adhere to dietary regimens [35]. Support from family, friends, and healthcare providers can offer practical assistance, such as help with meal preparation and emotional support, enhancing adherence. This finding supports the integration of family and social networks into the dietary management plans for patients with GDM [36].

These findings collectively have implications for clinical practice. They highlight the need for healthcare providers to adopt a multifaceted approach when advising patients with GDM, considering not only medical but also socioeconomic and psychosocial factors. Educational interventions should be tailored to enhance health literacy among patients, especially those with lower educational backgrounds. Interventions targeted at improving dietary adherence should consider patients' socio-economic status, employment situation, and their obstetric history. Healthcare providers should be attentive to these contextual factors and offer individualized support that addresses the unique challenges faced by each patient.

Moreover, this study underscores the importance of i knowledge dissemination for routine care for GDM patients. Providing comprehensive education about GDM and its management should be a cornerstone of treatment. Creating awareness and understanding of the condition can significantly enhance self-management practices among patients. Finally, fostering environments that provide emotional and practical social support will be critical for improving dietary compliance, including engaging family members and significant others in the educational process.

The clinical significance of this study lies in its potential to inform the development of personalized interventions that target the identified predictors of poor dietary compliance. By improving dietary adherence, healthcare providers can better manage GDM, reducing the risk of maternal and neonatal complications and enhancing long-term health outcome. The multifactorial logistic regression model introduced here provides a practical assessment tool for identifying patients at risk of poor dietary compliance, enabling timely and appropriate intervention.

While providing valuable insight into the factors influencing dietary compliance among patients with GDM, this study has several limitations. Firstly, as a retrospective analysis, it relies on existing records, which may lack granularity and lead to biases in data collection. Secondly, the study's observational nature restricts the ability to infer causality between the identified factors and dietary compliance. Thirdly, the sample was drawn from a single hospital, which may not adequately represent the broader population, limiting the generalizability of the findings. Additionally, social support and dietary adherence were self-reported, which could introduce self-report bias. While the study identified significant associations, it did not explore all possible influencing factors, such as psychological health or lifestyle behaviors, which could also affect dietary adherence. Lastly, the study did not directly measure the dietary intake of participants or monitor their adherence longitudinally. Future research could incorporate direct measures of dietary intake, such as food diaries or biomarkers, and follow-up assessments to better understand the dynamics of dietary adherence during pregnancy.

Conclusion

While our study provides critical insight into factors affecting dietary compliance among GDM patients, further research is needed to explore these associations in more detail and across diverse populations. Understanding the nuances of these influencing factors will allow for the development of robust intervention strategies that can effectively enhance dietary adherence. The potential social and health policy implications underscore the need for advocacy and support systems geared toward reducing barriers to access to nutritious food and health education for pregnant women, particularly those with GDM.

Disclosure of conflict of interest

None.

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