

Original Article

Effect of high-quality nursing on blood glucose level, psychological state, and treatment compliance of patients with gestational diabetes mellitus

Jiaoli Zou, Jinhua Huang

The Affiliated Nanhua Hospital, Department of Endocrinology, Hengyang Medical School, University of South China, Hengyang 421002, Hunan Province, China

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Abstract: Objective: This study was designed to determine the effect of high-quality nursing on patients with gestational diabetes mellitus (GDM). Methods: A total of 114 patients diagnosed with GDM in our hospital between December 2016 and December 2018 were enrolled, and assigned to a high-quality group (HQ group; n=64) and a normal group (Nor group; n=50). Patients in the HQ group were nursed under the high-quality nursing mode, while those in the Nor group were nursed under the routine nursing mode. The following items of all patients were determined: Blood glucose index, serum lipids index, insulin resistance index, mental health level, treatment compliance, total effective rate of diabetes mellitus treatment, incidence of adverse reactions, and satisfaction. Results: Compared with the Nor group, the HQ group showed higher levels of fasting blood glucose, 2-hour postprandial blood glucose, total cholesterol, triglyceride, low-density lipoprotein-cholesterol, and lower levels of high-density lipoprotein-cholesterol, and also showed lower Homa IR and incidence of adverse reactions, with lower Hamilton anxiety scale (HAMA) and Hamilton depression scale (HAMD) scores, and showed higher treatment compliance, total effective rate of diabetes mellitus treatment, and overall satisfaction. Conclusion: High-quality nursing can effectively improve the blood glucose level and psychological state of patients with GDM, and contributes to higher treatment compliance.

Keywords: High-quality nursing, gestational diabetes mellitus, HAMA, HAMD, Homa IR

Introduction

Diabetes mellitus (DM) is a common metabolic disease [1]. As population aging becomes more severe, an increasing number of patients suffer from it [2]. DM is caused by hyperglycemia due to abnormal secretion of insulin and glucagon. It can be classified into type 1 diabetes mellitus (T1DM) and type 2 diabetes mellitus (T2DM), both of which are caused by polygenes [3, 4]. According to recent studies [5], pregnant women are prone to adverse consequences when suffering from DM [5], and they will face a greater risk after delivery [6]. During pregnancy, many complex metabolic reactions occur, and they are accompanied by significant changes in the body fluid environment, adipocyte factors, and inflammatory cytokines. In the complex metabolic reactions during pregnancy, if the body cannot produce enough insulin to meet

the extra needs during pregnancy, gestational diabetes will occur, which usually returns to normal after delivery. Gestational diabetes mellitus (GDM) includes T1DM and T2DM. As long as the body cannot overcome the high concentration of blood glucose during pregnancy, the body will suffer from GDM [7-9]. Therefore, it is particularly important to treat and nurse patients to lower their blood glucose concentration.

High-quality nursing is a widely adopted clinical mode, which aims at helping patients enjoy the best care, and requires nurses to provide whole-course nursing to patients to strive to ensure improvement of their life quality and rapid recovery [10]. Compared with routine nursing, high-quality nursing is patient-centered during the whole nursing process, under which the patient's situation can be comprehensively

and objectively controlled, and thus a reasonable nursing plan can be formulated accordingly. Under the high-quality nursing mode, a comfortable treatment environment should be provided for patients, and medical staff are required to communicate with patients during each link of the care process to establish a good doctor-patient relationship [11, 12]. For patients with serious diseases such as lung cancer, high-quality nursing can contribute to a faster recovery after operation [13]. There are few studies on the effect of high-quality nursing on patients with DM, especially GDM, and this study focused on the effect of high-quality nursing on treatment compliance and psychological state of patients with GDM.

Materials and methods

General materials

A total of 114 patients diagnosed with GDM in the Affiliated Nanhua Hospital, University of South China between December 2016 and December 2018 were enrolled, and they were assigned to a high-quality group (HQ group; $n=64$) and a normal group (Nor group; $n=50$). The HQ group was composed of 36 primiparas and 28 multiparas between 22 and 37 years old, with an average age of (26.87 ± 3.53) years, average body weight of (63.28 ± 5.08) kg, average body mass index (BMI) of (24.92 ± 3.04) kg/m², and average pregnancy duration of (24.98 ± 2.01) weeks. While the Nor group consisted of 29 primiparas and 21 multiparas between 20 and 38 years old, with an average age of (27.09 ± 3.14) years, average body weight of (62.93 ± 4.79) kg, average BMI of (25.24 ± 2.37) kg/m², and average pregnancy duration of (25.20 ± 2.24) weeks. Patients in the HQ group were nursed under the high-quality nursing mode, while those in the Nor group were nursed under the routine nursing mode. This study was approved by the Ethics Committee of our hospital, and patients and their families voluntarily signed informed consent forms after understanding the study.

The inclusion criteria of the study: Patients diagnosed with GDM in our hospital, patients with detailed clinical data, patients whose fasting blood glucose (FBG) was still higher than 7.0 mmol/L and 2-hour postprandial blood glucose (2hPG) was still higher than 11.1 mmol/L after 7 days of diet control. The exclusion criteria of

the study: Juvenile patients, patients with mental disease or consciousness disorders, patients unwilling to cooperate with treatment, patients with comorbid gestational hypertension, placenta previa, premature rupture of membranes, or hepatic renal dysfunction.

Methods

Patients in the Nor group were given routine nursing by general medical staff. The medical staff were required to understand the medication methods and medical history of patients to a certain extent and control various conditions of the patients' living ward including hygiene, comfort level, sound insulation effect of the ward, indoor temperature, and humidity. In addition, the medical staff were also arranged to monitor the vital signs of the patients, such as blood pressure, respiratory condition, and pulse, in real time and also control the fetus of the patients. Pregnant women had difficulty in moving, so the medical staff were also required to provide constant assistance when they moved around. Patients in the HQ group were given high-quality nursing by medical staff with long-term nursing experience who were familiar with patients with DM in the gynecology and obstetrics department. The medical staff were required to have a targeted understanding of the patient's DM history, ensure the hygiene and high comfort level of the patients' wards involving sound insulation effect, indoor temperature and humidity, and keep abreast of the medication of the patients. In addition, the medical staff were arranged to monitor patients' vital signs, such as blood pressure, respiratory conditions, and pulse, in real time and also control the fetus of the patients. The staff were also arranged to provide psychological counseling to patients to help them eliminate negative psychological emotions due to illness, help relax body and mind, and build a confidence in rehabilitation. Moreover, the staff were arranged to educate patients on health knowledge, explain some knowledge of obstetrics and gynecology and urology to patients and their families in detail, and encourage and help patients to have appropriate outdoor activity. The staff were also arranged to provide guidance about postpartum matters for patients at the time of their discharge, develop a diet plan that can help maintain the postprandial blood glucose within a normal range and

provide nutrition and heat for pregnancy for each patient according to the patient's conditions. Furthermore, the patients were required to avoid foods with high oil and salt, such as fried food and cured food, and were urged to quit smoking and drinking, develop better living habits, and insist on proper medication. Patients in the two groups were asked to take metformin hydrochloride tablets orally (trade name: Glucophage, Sino-American Shanghai Squibb Pharmaceutical Co., Ltd., State Food and Drug Administration (SFDA) approval number: H20023370) at 1.0-1.5 g/d during meals. Additionally, they were also subcutaneously injected with 16 U insulin (insulin aspart 30, manufacturer: Novo Nordisk A/S; specification: 100 U/mL and 3 ml/piece; SFDA approval number: S20133006) 10 min before breakfast and 8 U insulin 10 min before supper. The specific dosage was adjusted according to the blood glucose level of the patient. The medical staff were required to remind patients to take medicine after they were discharged from the hospital, and check in with the patients after three months.

Detection indexes

Blood glucose index: Related blood glucose indexes including FBG and 2hPG of patients in the two groups at admission and after 3 months of nursing were evaluated and compared.

Serum lipids index: Serum lipids indexes including total cholesterol (TC), triglyceride (TG), low-density lipoprotein-cholesterol (LDL-C), and high-density lipoprotein-cholesterol (HDL-C) of patients in the two groups at admission and after 3 months of nursing were evaluated and compared. The serum TC and TG in the patents were quantified using an automatic biochemistry analyzer, and serum LDL-C and HDL-C were quantified using an enzyme colorimetry.

Insulin resistance index: The level of serum lipids index and insulin resistance index (Homa IR) of patients in the two groups at admission and after 3 months of nursing was evaluated and compared [14]. The insulin resistance index (Homa IR) = $FPG \times FINS / 22.5$. A lower index indicated a better situation of the patient.

Psychological state: The psychological state of patients in the two groups at admission and after 3 months of nursing was evaluated and compared. The psychological state of each

patient was scored using the Hamilton depression rating scale (HAMD) and the Hamilton anxiety scale (HAMA) [15, 16], and higher HAMD and HAMA scores indicated more severe depression and anxiety, respectively.

Compliance: Treatment compliance of the two groups was evaluated and compared. The evaluation criteria were as follows: Complete compliance: The patient actively and strictly followed the doctor's advice, actively cooperated with clinical examination and nursing, and consciously adhered to long-term standardized treatment during treatment. Partial compliance: The patient occasionally disobeyed advice during treatment, but obeyed them after being reminded. Non-compliance: The patient did not follow the doctor's advice often or refused treatment during treatment and nursing.

Total effective rate of DM treatment: The total effective rate of DM treatment in the two groups was counted. The criteria for evaluation of the total effective rate were as follows: Markedly effective: $FPG < 7.1$ mmol/L and $2hPPG < 8.3$ mmol/L or FPG and 2hPPG were lowered by over 30% after treatment. Effective: The clinical symptoms were ameliorated and $FPG < 8.3$ mmol/L and $2hPPG < 10.0$ mmol/L, or FPG and 2hPPG were lowered by 10%-29%. Ineffective: There was no significant change in symptoms and blood glucose. Total effective rate = (The rate of markedly effective treatment + the rate of effective treatment).

Incidence of adverse reactions: The pregnancy outcomes of the two groups were analyzed and compared, and the incidence of adverse reactions including hypoglycemia, polyhydramnios, premature rupture of membranes, and gestational hypertension between the two groups were compared.

Satisfaction: At the time of discharge, the satisfaction of the two groups was investigated and compared. The nursing satisfaction of each patient was explored using a nursing satisfaction questionnaire, and satisfaction scores of the two groups were compared. The questionnaire content and evaluation criteria were self-made. The questionnaire had a full score of 100 points, with a score between 85 and 100 points for satisfaction, a score higher than 70 points for basic satisfaction, and a score lower than 70 points for dissatisfaction.

Table 1. General data of the two groups

Group	The high-quality group (n=64)	The normal group (n=50)	t/X ²	P-value
Age (Y)	26.87±3.53	27.09±3.14	0.35	0.730
Average pregnancy duration (weeks)	24.98±2.01	25.20±2.24	0.55	0.582
Body mass (kg)	63.28±5.08	62.93±4.79	0.37	0.709
BMI (kg/m ²)	24.92±3.04	25.24±2.37	0.61	0.54
Parturient type			0.04	0.851
Primipara	36 (56.25)	29 (58.00)		
Multipara	28 (43.75)	21 (42.00)		
Smoking			0.38	0.540
Yes	40 (62.50)	28 (56.00)		
No	24 (37.50)	22 (44.00)		
Fond of drinking			0.14	0.707
Yes	44 (68.75)	36 (72.00)		
No	20 (31.25)	14 (28.00)		
Obesity			0.35	0.55
Yes	48 (75.00)	35 (70.00)		
No	16 (25.00)	15 (30.00)		
History of hypertension			0.09	0.760
Yes	34 (53.12)	28 (56.00)		
No	30 (46.88)	22 (44.00)		
Type of diabetes mellitus			0.04	0.832
Type 1 diabetes mellitus	32 (50.00)	24 (48.00)		
Type 2 diabetes mellitus	32 (50.00)	26 (52.00)		

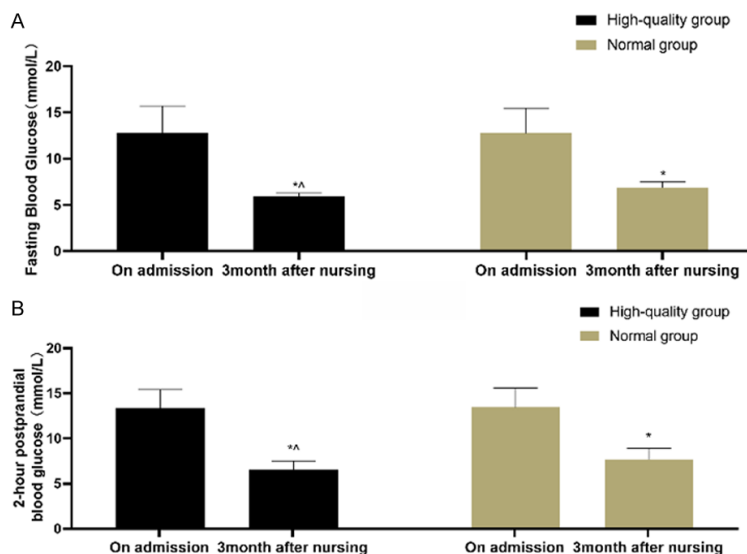


Figure 1. Changes in blood glucose indexes of the two groups. A. FBG: After treatment, the level of FBG in both groups changed significantly, and the level of it in the high-quality group was notably lower than that in the normal group ($P < 0.05$). B. 2hPG: After treatment, the level of 2hPG in both groups changed significantly, and the level of it in the high-quality group was notably lower than that in the normal group ($P < 0.05$). Notes: * indicates $P < 0.05$ vs. the situation before treatment; ^ indicates $P < 0.05$ vs. the normal group.

Statistical analyses

The data were analyzed comprehensively and statistically using SPSS 19.0 (Asia Analytics Formerly SPSS, China). Enumeration data were analyzed using the chi-squared test, and measurement data were expressed as ($\bar{X} \pm S$), and analyzed by the t test. $P < 0.05$ indicated a significant difference.

Results

General materials

There was no significant difference between the two groups in general data including sex, age, BMI, smoking history, drinking history, and obesity (All $P > 0.05$) (Table 1).

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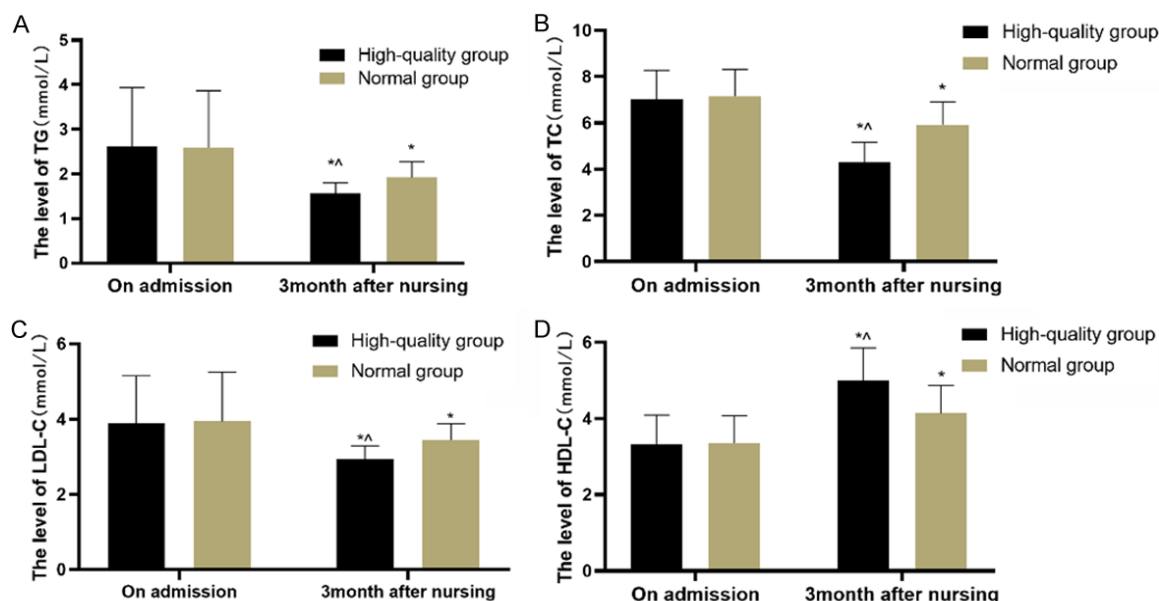


Figure 2. Changes in serum lipids indexes of the two groups. A. TG: After treatment, the level of TG in both groups changed significantly, and the level of it in the high-quality group was notably lower than that in the normal group ($P<0.05$). B. TC: After treatment, the level of TC in both groups changed significantly, and the level of it in the high-quality group was notably lower than that in the normal group ($P<0.05$). C. LDL-C: After treatment, the level of LDL-C in both groups changed significantly, and the level of it in the high-quality group was notably lower than that in the normal group ($P<0.05$). D. HDL-C: After treatment, the level of HDL-C in both groups changed significantly, and the level of it in the high-quality group was notably higher than that in the normal group ($P<0.05$). Notes: * indicates $P<0.05$ vs. the situation before treatment; ^ indicates $P<0.05$ vs. the normal group.

The levels of blood glucose in the HQ group were better than those in the Nor group

The blood glucose indexes of the two groups were tested, and compared. It was found that after treatment, the levels of FBG and 2hPG in both groups changed significantly, and the levels in the HQ group were significantly lower than those in the Nor group (both $P<0.05$) (Figure 1).

The levels of serum lipids indexes in the HQ group were better than those in the Nor group

The serum lipids indexes of the two groups were tested. It came out that after treatment, the levels of serum lipids indexes in both groups changed significantly, and the HQ group showed significantly lower levels of TG, TC, and LDL-C and significantly higher HDL-C level than the Nor group (all $P<0.05$) (Figure 2).

The insulin resistance index of the HQ group was lower than that of the Nor group

The Homa IR of the two groups was investigated. It was found that after treatment, the level of Homa IR of both groups changed significantly, and the level in the HQ group was significantly

lower than that in the Nor group (both $P<0.05$) (Table 2).

The HAMD and HAMA scores of the HQ group were significantly lower those of the Nor group

Investigation on the HAMD and HAMA scores of the two groups showed that after treatment, HAMD and HAMA scores of both groups changed significantly, and the HAMD and HAMA scores of the HQ group were significantly lower than those of the Nor group (both $P<0.05$) (Figure 3).

The treatment compliance of the HQ group was higher than that of the Nor group

Comparison of the total compliance rate between the two groups showed that the total compliance rate of the HQ group was significantly higher than that of the Nor group ($P<0.05$) (Table 3).

The incidence of adverse pregnancy outcomes in the HQ group was lower than that in the Nor group

Investigation on the incidence of adverse reactions in the two groups showed that the inci-

Table 2. Homa IR of the two groups

Item	The high-quality group (n=64)	The normal group (n=50)	t	P-value
Before nursing	5.09±0.32	5.12±0.34	0.48	0.630
After 3 months of nursing	1.94±0.21	3.25±0.27	29.15	<0.001
T	65.84	30.46		
P-value	<0.001	<0.001		

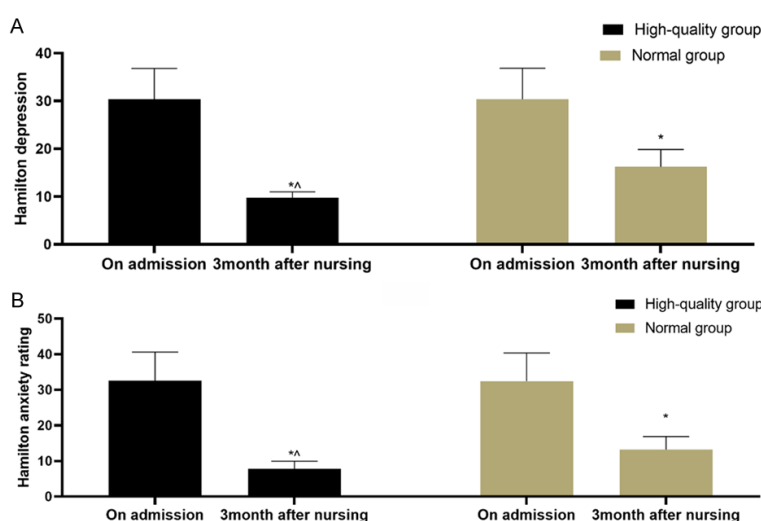


Figure 3. HAMD and HAMA scores of the two groups. A. HAMD: After 3 months of nursing, HAMD scores of both groups decreased, and HAMD score of the high-quality group was notably lower than that of the normal group ($P < 0.05$). B. HAMA: After 3 months of nursing, HAMA scores of both groups decreased, and HAMA score of the high-quality group was notably lower than that of the normal group ($P < 0.05$). Notes: * indicates $P < 0.05$ vs. the situation before treatment; ^ indicates $P < 0.05$ vs. the normal group.

Table 3. Treatment compliance of the two groups

Item	The high-quality group (n=64)	The normal group (n=50)	χ^2	P-value
Complete compliance	52 (81.25)	27 (54.00)	-	-
Partial compliance	9 (14.06)	14 (28.00)	-	-
Non-compliance	3 (4.69)	9 (18.00)	-	-
Total compliance rate (%)	61 (95.31)	41 (82.00)	5.28	0.022

dence in the HQ group was significantly lower than that in the Nor group ($P < 0.05$) (Table 4).

The total effective rate of DM treatment in the HQ group was higher than that in the Nor group

Investigation on the total effective rate of the two groups showed that the total effective rate of the HQ group was significantly higher than that of the Nor group, suggesting that in terms

of DM, the recovery of the HQ group was better than that of the Nor group ($P < 0.05$) (Table 5).

The satisfaction of the HQ group was higher than that of the Nor group

Investigation on satisfaction of the two groups revealed that the satisfaction of the HQ group was significantly higher than that in the control group ($P < 0.05$) (Table 6).

Discussion

GDM occurs for the first time at the beginning or during pregnancy. It is gradually becoming a major worldwide public health problem due to its impact on pregnancy. This disease has multiple potential effects on both mothers and children, and it easily causes complications. Therefore, screening, diagnosis, treatment, and postoperative nursing are of great importance in lowering the harm of the disease to mothers and children and related complications [17, 18]. In this study, we explored some nursing modes on the disease after treatment. In the discussion, we analyze the influence of different nursing methods on GDM from recovery and psychological state.

From the perspective of psychological state, HAMA and HAMD scores of patients nursed under high-quality nursing mode were lower than those of patients nursed under routine nursing mode, and the treatment compliance of the former group was higher than that of the latter group. The advantages of high-quality nursing are as follows: It is a whole-course nursing mode, under which medical staff are required to take care of patients throughout the whole process, and to help patients enjoy the best feeling. In addition, this nursing mode can assist the

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Table 4. Comparison of complication rate between the two groups

Item	The high-quality group (n=64)	The normal group (n=50)	X ²	P-value
Hypoglycemia	3 (4.69)	3 (6.00)	-	-
Polyhydramnios	0 (0.00)	2 (4.00)		
Premature rupture of membranes	0 (0.00)	1 (2.00)		
Gestational hypertension	1 (1.56)	4 (8.00)	-	-
Incidence of adverse reactions (%)	4 (6.25)	10 (20.00)	4.93	0.026

Table 5. Total effective rates of the two groups

Item	The high-quality group (n=64)	The normal group (n=50)	X ²	P-value
Markedly effective	38 (59.38)	22 (44.00)	-	-
Effective	24 (37.50)	20 (40.00)	-	-
Ineffective	2 (3.12)	8 (16.00)	-	-
Total effective rate (%)	62 (96.88)	42 (84.00)	5.82	0.016

Table 6. Satisfaction of the two groups

Item	The high-quality group (n=64)	The normal group (n=50)	X ²	P-value
Satisfaction	48 (75.00)	21 (42.00)	-	-
Moderate satisfaction	12 (18.75)	18 (36.00)	-	-
Dissatisfaction	4 (6.25)	11 (22.00)	-	-
Satisfaction (%)	60 (93.75)	39 (78.00)	6.09	0.014

patient in reaching the best state psychologically and physiologically, thus accelerating the recovery [19, 20]. During high-quality nursing, psychological counseling takes an essential part in the nursing of patients, and is the key factor to eliminate negative emotions and help them reach the best psychological state. In addition, during high-quality nursing, healthy education for patients and their families can effectively enhance patients' confidence. In contrast, under the routine nursing mode, nurses basically care for patients for the purpose of completing work, so they often lack communication with patients, and often ignore their needs and cannot comprehensively take care of them [21]. Due to the decline of nursing requirements, the nursing quality for patients drops easily sharply. Therefore, the better improvement of psychological state in the HQ group during postoperative nursing can be explained. Moreover, under the high-quality nursing mode, there is good communication between medical staff and patients during the treatment, so patients will better follow the instructions of medical staff during operation, and the treatment compliance will be higher.

From the recovery of patients, patients in the HQ group showed better blood glucose, serum lipid recovery, and minimized insulin resistance. For patients with DM, there are usually some abnormal changes in serum lipids levels. Serum lipids indexes such as TG and HDL-C are important in some types of DM, and increase of TG will trigger the catabolism of HDL. T2DM can easily induce low-grade chronic inflammation and may affect the plasma lipid levels, and inflammation stimulates the secretion of TG in the liver, degrades HDL and lowers its level [22]. For patients with DM, serum lipid indexes including TG increase, while

HDL-C decreases, which leads to an increase in insulin resistance and blood glucose indexes [23]. For pregnant women, when they suffer from DM, they can face dangers and crises. Pregnant women with GDM are at risk of pregnancy-induced hypertension and other symptoms, and even face the possibility of death with their children, due to the disease [24]. Patients need a good attitude to face the disease during treatment and recovery after treatment, so as to recover from the disease, while negative emotions such as anxiety and depression will only aggravate the disease and various related indicators [25, 26]. Based on the above analysis, high-quality nursing can improve the psychological and emotional state of patients to make them feel at ease, and health education can not only improve patients' treatment compliance by enhancing their confidence, but also promote patients to use drugs correctly and thus reduce adverse reactions caused by insulin use and pregnancy. Therefore, high-quality nursing can improve patients' psychological state and treatment compliance, thus accelerating their recovery and improving their satisfaction after operation.

This study still has some shortcomings. For example, we have only counted the adverse reactions related to pregnancy, but have not specifically analyzed the pregnancy after nursing. In the future research, we will pay attention to this to better improve the nursing scheme and better ensure the health and safety of patients and fetuses.

To sum up, high-quality nursing can effectively improve the blood glucose level and psychological state of patients with GDM, and can contribute to higher treatment compliance.

Disclosure of conflict of interest

None.

Address correspondence to: Jinhua Huang, The Affiliated Nanhua Hospital, Department of Endocrinology, Hengyang Medical School, University of South China, 336 Dongfeng Road, Hengyang 421002, Hunan Province, China. Tel: +86-15096005281; E-mail: hjh2523090558@163.com

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