

Original Article

Impact of dietary management using teach-back method on glucose and lipid metabolism and quality of life in patients with hepatitis B complicated by diabetes

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Abstract: Objective: To investigate the impact of dietary management using teach-back method on glucose and lipid metabolism and quality of life in patients with hepatitis B complicated with diabetes. Methods: A total of 110 patients with hepatitis B complicated with diabetes admitted to our hospital were selected as the study subjects, and divided into Group A (n=60) and Group B (n=50) in accordance with different intervention measures. Group A was treated with dietary management using teach-back method, while Group B was treated with conventional dietary management. The two groups received follow-up observations. The changes in indices of glucose and lipid metabolism within 12 months after intervention were recorded and compared between the two groups, and the changes in treatment adherence, dietary adherence and quality of life scores were compared between the two groups before and after intervention. Results: The results showed that at month 1-12 after intervention, Group A had lower levels of fasting plasma glucose (FPG), 2-h post-load plasma glucose (2hPG), hemoglobin A1c (HbA1c), triglycerides (TG), and total cholesterol (TC) compared with Group B ($P < 0.05$). The comparison of treatment adherence revealed that the good and excellent adherence rate in Group A was noticeably higher than that in Group B after intervention (93.33% VS. 70.00%) ($P < 0.05$). The scores of dietary adherence attitude and behavior and quality of life in Group A were also remarkably higher than those in Group B after intervention ($P < 0.05$). Conclusion: The dietary management using teach-back method can effectively improve the indices of glucose and lipid metabolism, treatment adherence, dietary adherence, and quality of life in patients with hepatitis B complicated with diabetes.

Keywords: Dietary management using teach-back method, hepatitis B complicated by diabetes, glucose and lipid metabolism, quality of life, impact

Introduction

Hepatitis B virus (HBV) infection is a major global health problem [1]. An investigation by World Health Organization and relevant reports revealed that HBV infection occurred in about 2 billion people worldwide, and is highly prevalent in specific regions, especially the Asia-Pacific region [2, 3]. An epidemiological investigation on HBV infection was conducted in China in 2006, and the results exhibited that the positive rate of hepatitis B surface antigen in the population aged 1-59 years in China was 7.18%, amounting to about 93 million patients with chronic HBV infections in China provided that China had a population of 1.3 billion in 2006 [4, 5]. Hepatitis B Cirrhosis (HBC)

occurred in about 0.4%-14.2% of patients with HBV infection, seriously affecting the normal life of patients [6].

Diabetes mellitus, commonly known as diabetes, is a metabolic disease characterized by abnormally high blood sugar levels. Clinical practice indicates that long-term hyperglycemia will cause obvious injuries to eyes, kidneys, heart, blood vessels, and nerves, resulting in dysfunction of vital organs [7]. An epidemiological study suggests that global patients with diabetes occupy about 5.7% of the total population worldwide, and there are additional 7 million patients with diabetes across the globe every year [8]. Due to the aging population and the adjustment of dietary structure,

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the number of patients with diabetes has been on the rise in China. An investigation indicates that the prevalence rate of diabetes in population aged over 20 years reaches 6.19%, adding downward pressure to the society [9, 10].

An epidemiological investigation shows that the ratio of patients with hepatitis B complicated by diabetes is 3.26%, which may be related to dysmetabolism induced by hepatic functional disorders [11]. An investigation of patients with cirrhosis demonstrates that about 50% of patients with cirrhosis experience a decline in carbohydrate tolerance, of which about 25% of patients with cirrhosis suffer from diabetes, and diabetes will further expedite the progression of chronic liver diseases, thus forming a vicious circle [12]. Dietary intervention is a common clinical intervention for patients with hepatitis B complicated with diabetes. However, the traditional dietary intervention, subjected to patients' factors or environmental factors, is challenging to be implemented [13]. Dietary management using teach-back method is a novel dietary intervention approach recently. The teach-back method is a way of enhancing patients' understanding of clinical intervention and implementation ability by asking patients to state the information provided by the health professional in their own words [14]. A study on patients with hypertension suggests that dietary management using teach-back method can significantly improve the clinical symptoms, dietary adherence and nutritional status of patients [15].

This study aims at exploring the feasibility of dietary management using teach-back method in treating patients with hepatitis B complicated with diabetes, and investigating the impact of dietary management using teach-back method on indices of glucose and lipid metabolism and quality of life of patients with hepatitis B complicated by diabetes, so as to provide a clinical reference for improvement of the prognosis of patients with hepatitis B complicated with diabetes.

Materials and methods

General data

A total of 110 patients with hepatitis B complicated by diabetes admitted to our hospital from January 2019 to December 2019 were select-

ed as the study subjects, and divided into Group A (n=60) and Group B (n=50) in accordance with different intervention measures. Group A was treated with dietary management using teach-back method, while Group B was treated with conventional dietary management.

Inclusion criteria: (1) clinically diagnosed as hepatitis B complicated by diabetes [16]; (2) clear consciousness and ability to cooperate with the investigation; (3) complete clinical data; (4) the investigation has been approved by The First People's Hospital of Fuyang Hangzhou Ethics Committee for implementation; (5) voluntary signing of informed consent form by patients or their families.

Exclusion criteria: (1) complicated by psychiatric disorders; (2) language or communication disorders; (3) malignancies; (4) pregnancy or lactation; (5) complicated by systemic immune system diseases; (6) complicated by systemic infection; (7) alcohol or drug addicts.

Rejection criteria: (1) voluntary withdrawal during the investigation; (2) loss to follow up during the investigation; (3) failure to follow the doctor's advice and treated with other interventions during the investigation.

Intervention methods

Group B was treated with conventional dietary management alone. The patients in the control group were informed of dietary precautions, and were instructed to vigorously conduct exercises to improve their immunity. Based on the treatment in Group B, Group A was additionally treated with dietary management using the teach-back method. The specific measures are as follows: (1) An intervention group consisting of a head nurse, a nutritionist and two nurses was established. The members in this group understood the dietary precautions for patients with hepatitis B complicated by diabetes through consulting literature, past cases and superiors and experts, formulated corresponding recipes, and established the intervention protocol; (2) The intervention protocol was implemented, subjects' health records were established, the inpatients were provided with the printed dietary plans, the patients were instructed to follow the dietary guidance, and training on the dietary management using

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the teach-back method and major intervention approaches was provided. The next day, nurses examined the patients' mastery of the dietary management using teach-back method through providing opportunities for the patients to describe the dietary precautions in their own words, and conducted targeted intensive education based on patients' description. The next day, nurses examined the patients' mastery of the dietary guidance using teach-back method again, so as to ensure that patients and their families comprehensively master the essentials of the dietary guidance using teach-back method. For out-of-hospital patients, the training and education on dietary guidance using teach-back method were provided via WeChat official account, video chat, follow-ups and other channels. Additionally, patients' comprehensive mastery of health knowledge was necessary; (3) Follow-up visits were performed for patients with a poor adherence, and measures (e.g., family supervision and periodic follow-up visits) were implemented to ensure the smooth implementation of intervention protocol. The 12-month follow-up visits were performed for the observation of interventions in the two groups.

Observational indices and evaluation criteria

Analysis of changes in indices of glucose and lipid metabolism during intervention: According to the intervention methods, the two groups were treated with different interventions. The return visits of patients were followed up every month during intervention. During intervention, the blood glucose indices (FPG, 2hPG and HbA1c, which were measured by an automatic glucose meter) and blood lipid indices (TG and TC, which were measured by a fully automatic biochemical analyzer) in the two groups were recorded, and the change trend of the aforementioned indices was analyzed. The differences in the aforementioned indices were compared between the two groups at different time points.

Analysis of changes in the ratios of patients with treatment adherence before and after intervention: The treatment adherence in the two groups was evaluated and analyzed before and after intervention. The diabetes treatment adherence questionnaire, comprising 20 items scored by 1-4 points, was adopted. The full

score of the questionnaire is 80 points. A higher score indicated a higher treatment adherence. > 60 points indicated an excellent adherence, 48-60 points indicated a good adherence, and < 48 points indicated a poor adherence [17]. The ratios of dimensions of adherence in the two groups were evaluated before intervention and at month 12 after intervention, and the differences were compared between groups.

Analysis of changes in dietary adherence in the two groups before and after intervention: The dietary adherence attitudes and behaviors in the two groups were evaluated before intervention and at month 12 after intervention. The dietary adherence attitudes questionnaire consists of four dimensions (i.e., social restriction attitude, health attitude, self-care attitude and acceptance attitude), with a total score of 100 points. A higher score indicated a higher dietary adherence. Dietary adherence behaviors comprise five dimensions (i.e., liquid restriction behavior, adherence in potassium intake, self-care adherence, adherence in difficulties, and adherence in salt intake), with the full score of 100 points. A higher score indicated a dietary adherence. Upon the evaluation of conditions of patients in the two groups, the differences between groups and the differences within groups before and after intervention were compared [18].

Analysis of changes in quality of life scores in the two groups before and after intervention: The quality of life in the two groups was evaluated before intervention and at month 12 after intervention. The 36-Item Short Form Survey (SF-36), comprising three dimensions (i.e., physiology, psychology and body), is a commonly used clinical tool for evaluation of quality of life. This study explored the quality of life in the two groups before and at month 12 after intervention, and compared the differences between groups before and after intervention and the differences within groups before and after intervention.

Statistical method

The collected data were input into an EXCEL table for processing, and SPSS 22.0 was adopted for statistical analysis. The validity of collected data was detected using normal distribution. The enumeration data conforming to

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Table 1. Comparison of general clinical indices between the two groups (mean \pm SD)/[n (%)]

General clinical data		Group A (n=60)	Group B (n=50)	t/X ²	P
Gender	Male	37	28	0.547	0.362
	Female	23	22		
Average age (year)		45.98 \pm 4.33	46.01 \pm 4.29	0.036	0.987
Average weight (kg)		64.29 \pm 3.91	64.34 \pm 3.89	0.066	0.917
Average course of disease (years)		5.49 \pm 1.22	5.51 \pm 1.29	0.083	0.934
Marital status	Married	10	10	0.652	0.204
	Unmarried	50	40		

normal distribution were expressed using [n (%)]. The differences between groups were analyzed using chi-square test. The measurement data were expressed using mean \pm standard deviation (mean \pm SD). The differences between groups were analyzed using t test, and the comparison of differences in continuous variables in the two groups was detected using t test. The OS in the two groups was investigated using Kaplan-Meier approach. $P < 0.05$ indicated a statistically significant difference, and the study graphs were plotted using GraphPad Prism 8 [19].

Results

Comparison of general socio-demographic data between the two groups

The socio-demographic data (e.g., gender, marital status, average course of disease, and mean weight) in the two groups were collected, respectively, and the differences were compared between the two groups. The comparison of differences in the aforementioned indices between groups suggested that there was no marked difference in the aforementioned indices between groups ($P > 0.05$), and the aforementioned indices in the two groups were comparable (**Table 1**).

Analysis of changes in indices of glucose and lipid metabolism during intervention

The indices of glucose and lipid metabolism in the two groups were measured at month 0-12 after intervention. The differences between groups and within groups were compared. The results revealed that the glucose metabolism indices (FPG, 2hPG and HbA1c) in the two groups showed a significant downward trend with intervention time, and the differences in the aforementioned indices were statistically significant between at month 12 after interven-

tion and before intervention ($P < 0.05$). At month 1, 6 and 12 after intervention, the comparison between groups exhibited that the levels of FPG, 2hPG and HbA1c in Group A were significantly lower than those in control group after intervention ($P < 0.05$) (**Figure 1**). The lipid metabolism indices (TG and TC) in the two groups showed a downward trend. After intervention, the levels of TG and TC in Group A were remarkably lower than those in Group B ($P < 0.05$) (**Figure 2**).

Analysis of changes in the ratios of patients with treatment adherence before and after intervention

The comparison of ratios of patients with treatment adherence between the two groups before and after intervention revealed that before intervention, there were 4 patients with an excellent adherence and 34 patients with a good adherence in Group A, with the excellent and good treatment adherence rate of 63.33%, and there were 5 patients with an excellent adherence and 23 patients with a good adherence in Group B, with the excellent and good rate of 56.00%, and there was no noticeable difference between the two groups ($P > 0.05$). After intervention, there were 33 patients with an excellent adherence and 23 patients with a good adherence in Group A, with the excellent and good treatment adherence rate of 93.33%, and there were 15 patients with an excellent adherence and 20 patients with a good adherence in Group B, with the excellent and good rate of 70.00%, and there was no obvious difference between the two groups ($P < 0.05$) (**Table 2**).

Analysis of changes in dietary adherence in the two groups before and after intervention

The scores of dietary adherence attitudes and behaviors in the two groups were evaluated

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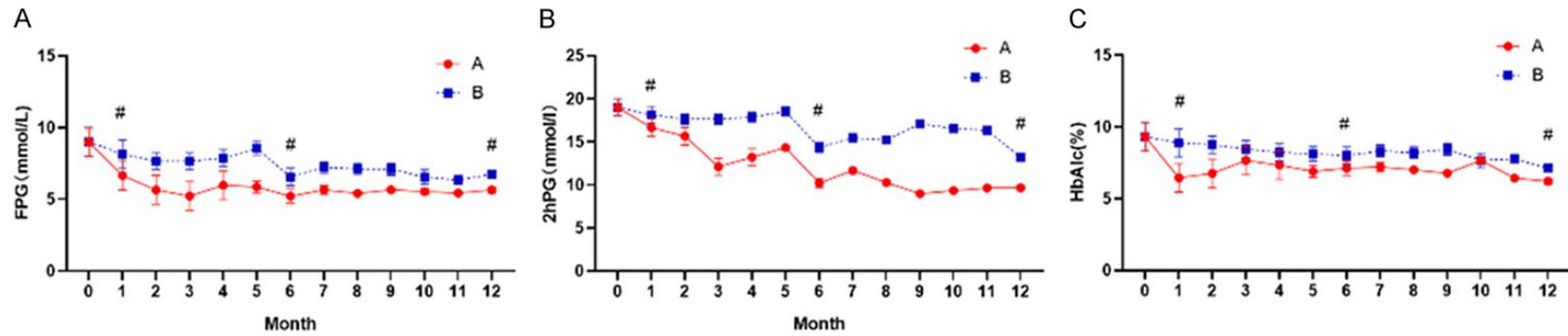


Figure 1. Analysis of changes in indices of glucose metabolism during intervention. The analysis reveals that the glucose metabolism indices FPG (A), 2hPG (B) and HbA1c (C) in the two groups show a downward trend after intervention. The differences between groups are compared at month 1, 6 and 12 after intervention, and the results demonstrate that the levels of aforementioned indices in Group A are markedly lower than those in Group B ($P < 0.05$). #indicates a statistically significant difference in the same indices between the two groups at the same time points.

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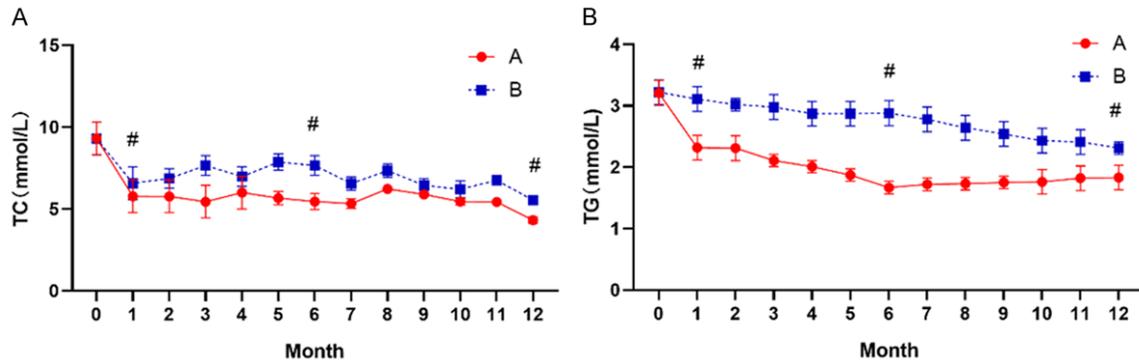


Figure 2. Analysis of changes in indices of lipid metabolism during intervention. The comparison exhibits that there is no noticeable difference in indices of lipid metabolism (TC and TG) between the two groups before intervention ($P > 0.05$). At month 1, 6 and 12 after intervention, the levels of TC and TG in Group A are remarkably lower than those in Group B ($P < 0.05$). #indicates a statistically significant difference in the same indices between the two groups at the same time points.

Table 2. Analysis of treatment adherence in the two groups before and after intervention [n (%)]

Groups	n	Before intervention				After intervention			
		Excellent	Good	Poor	Excellent and good rate	Excellent	Good	Poor	Excellent and good rate
Group A	60	4 (6.67)	34 (56.67)	22 (36.67)	38 (63.33)	33 (55.00)	23 (38.33)	4 (6.67)	56 (93.33)
Group B	50	5 (10.00)	23 (46.00)	22 (44.00)	28 (56.00)	15 (30.00)	20 (40.00)	15 (30.00)	35 (70.00)
χ^2	-	-	-	-	0.611	-	-	-	10.391
P	-	-	-	-	0.434	-	-	-	0.001

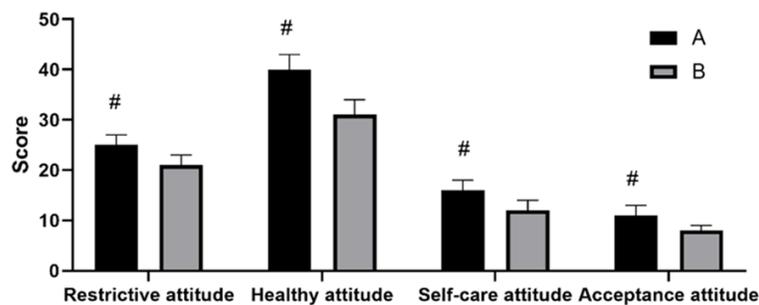


Figure 3. Analysis of changes in dietary adherence attitude in the two groups before and after intervention. The comparison shows that the scores of social restriction attitude, health attitude, self-care attitude and acceptance attitude in Group A are higher than those in Group B after intervention ($P < 0.05$). #indicates a statistically significant difference in the same indices between the two groups.

before and after intervention. The comparison of differences between groups showed that after intervention, the scores of social restriction attitude, health attitude, self-care attitude and acceptance attitude in Group A were higher than those in Group B ($P < 0.05$) (Figure 3), and the scores of liquid restriction behaviors, potassium intake, self-care adherence,

adherence in difficulties, and adherence in salt intake in Group A were higher than those in Group B ($P < 0.05$) (Figure 4).

Comparison of quality of life scores between the two groups before and after intervention

The qualities of life in the two groups were evaluated using SF-36 before and after intervention. The comparison of differences between groups demonstrated that the scores of physical, physiological and psychological functions in Group A were significantly higher than those in Group B at month 12 after intervention ($P < 0.05$) (Figure 5). The comparison of the differences between groups showed that the scores of SF-36 in the two groups after intervention were notably higher than those in the two groups before intervention ($P < 0.05$).

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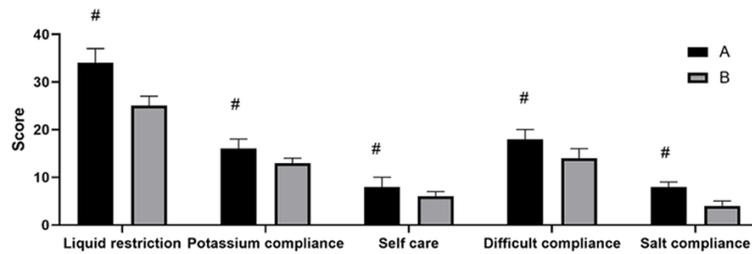


Figure 4. Analysis of changes in dietary adherence behavior in the two groups before and after intervention. The comparison demonstrates that the scores of liquid restriction behaviors, potassium intake, self-care adherence, adherence in difficulties, and adherence in salt intake in Group A are obviously higher than those in Group B ($P < 0.05$). #indicates a statistically significant difference in the same indices between the two groups.

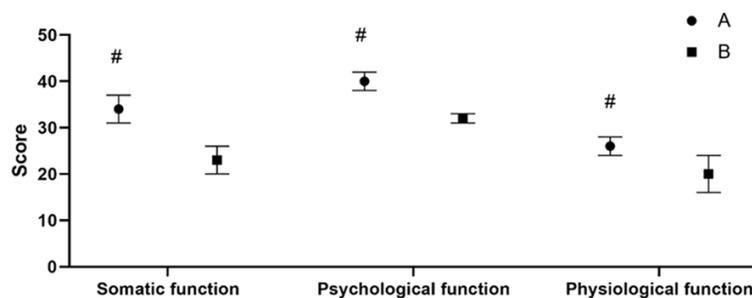


Figure 5. Comparison of quality of life scores between the two groups after intervention. The comparison of the scores of dimensions of SF-36 between the two groups after intervention suggests that the scores of physical, physiological and psychological functions in Group A are significantly higher than those in Group B ($P < 0.05$). #indicates a statistically significant difference in the same indices between the two groups.

Discussion

With a rise in the standard of living condition of Chinese residents recently, there is a year-on-year increase in the incidence rate of multiple chronic diseases [20]. Diabetes is a metabolic disease characterized by glucose, fat and protein metabolism disorders induced by the comprehensive action of multiple factors. Currently, it is believed that insulin resistance is a leading cause of diabetes [21]. The exact pathogenesis of diabetes remains unknown, resulting in a lack of radical treatment and a rise in the number of patients with diabetes. Hepatitis B is a common infectious disease. Clinical studies suggest that patients with HBV infection who do not receive timely and effective interventions, may suffer from life-threatening cirrhosis or even liver cancer at the late stage. Therefore, the early clinical diagnosis and intervention are highly recommended for patients with hepatitis

B, so as to improve the prognosis [22]. The number of patients with hepatitis B complicated with diabetes has been rising recently. The statistics show that the incidence rate of diabetes secondary to chronic viral hepatitis is as high as 17.5%, which is 10 times as much as that in healthy individuals [23]. Clinical practice suggests that glucose in human body is primarily transformed and metabolized in liver, and processes (e.g., glucose storage and decomposition) are regulated by liver. The decline in the hepatic function markedly affects the metabolism and transformation of glucose in the body, and even results in abnormal carbohydrate tolerance or diabetes [24].

In this study, the impact of dietary management using teach-back method on glucose and lipid metabolism and quality of life of patients with hepatitis B complicated with diabetes was analyzed through grouping. The results demonstrated that the glucose metabolism indices (FPG, 2hPG, and HbA1c) and lipid metabolism indices (TC and TG) in Group A were markedly lower than those in Group B at different time points after intervention ($P < 0.05$). A study on 100 peritoneal dialysis patients showed that compared with the control group treated with conventional dietary management, the intervention group treated with dietary management using teach-back method had a markedly higher score of dietary knowledge after intervention. At the time of discharge, the scores in the intervention group (13.25 ± 2.66 points) were obviously higher than those in the control group (10.43 ± 2.32 points). The scholar believes that dietary management using teach-back method is a health education method, and can deepen patients' understanding of the importance of dietary management through interactions so as to improve patients' attitudes [25]. The author believes that dietary

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management using teach-back method, unlike the traditional passive dietary management model, focuses on giving full play to patients' subjective initiatives and improving patients' sense of responsibility for their dietary management through interactions, so that patients can actively cooperate with treatment and conduct dietary management. As a result, remarkable effects on the improvement of patients' indices of glucose and lipid metabolism can be obtained. This has been demonstrated by the changes in the ratios of patients with treatment adherence in the two groups before and after intervention, suggesting that dietary management using teach-back method can remarkably improve patients' treatment adherence, and thus positively promote the follow-up treatment.

In this study, the changes in the scores of dietary adherence and quality of life after intervention were further analyzed, and the results revealed that the scores of social restriction attitude, health attitude, self-care attitude, acceptance attitude, liquid restriction behaviors, potassium intake, self-care adherence, adherence in difficulties, and adherence in salt intake in Group A were higher than those in Group B after intervention. A scholar found that dietary management was conducive to improving the quality of life of patients with chronic diseases, because a good endocrine function could effectively improve their conditions [26]. A scholar believes that patients with chronic metabolic diseases should be informed of the importance of dietary management and necessary drug treatment, and should be instructed to avoid developing adverse dietary habits that can aggravate their conditions [27]. We believe that dietary management using teach-back method can improve patients' inherent dietary concepts, adverse dietary habits, nutritional status, and living habits, promote the development of good dietary behaviors, and help to establish a reasonable dietary structure through interventions using multimedia approaches.

In summary, the dietary management using teach-back method can effectively improve the indices of glucose and lipid metabolism, treatment adherence, dietary adherence, and quality of life in patients with hepatitis B complicated by diabetes. Therefore, the dietary

management using teach-back method is worthy of clinical promotion and implementation. The innovations of this study lie in the investigation of the implementation effects of dietary management using teach-back method on the indices of glucose and lipid metabolism, dietary adherence, and treatment adherence of patients with hepatitis B complicated by diabetes as well as reliable data, providing a theoretical basis for the future follow-up studies. The deficiencies of this study lie in the failure to rule out the impact of underlying health conditions on the intervention results as well as potentially biased study results.

Disclosure of conflict of interest

None.

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