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Original Article

Using multi-disciplinary teams to treat obese patients helps improve clinical efficacy: the general practitioner's perspective

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Abstract: Objective: This paper aims to explore the influences of multi-disciplinary teams (MDT) from the general practitioner's (GP's) perspective on the clinical efficacy of treating obese patients. Methods: Admitted to our hospital from January 2018 to October 2019, 127 obese patients were divided into two groups based on the different models of diagnosis and treatment each underwent. The routine diagnostic and treatment model was administered to the patients in the control group (60 cases), and the MDT model was administered to the patients in the research group (67 cases). The weight loss success rates in both groups were observed. Before and after the treatment, the blood glucose, blood lipid, tumor necrosis factor-α (TNF-α), adiponectin (APN), leptin (LP), and recombinant human fibroblast growth factor 21 (FGF-21) levels were measured. The SAS and SDS scores were evaluated. Results: After the treatment, the weight loss success rate in the research group was significantly higher than it was in the control group, and the FPG and the 2hPBG levels were significantly lower in the research group. Compared with the control group, the TC, TG, and LDL-C levels were remarkably lower in the study group, and the HDL-C levels were remarkably higher in the research group. The TNF-α, LP, and FGF-21 levels were significantly lower in the research group, and the APN levels were significantly higher. The research group had significantly lower SAS and SDS scores and higher GSES scores. Conclusion: MDTs from the GP's perspective are conducive to increasing the weight loss success rate and improving the blood glucose, blood lipid and adipokine levels in obese patients.

Keywords: General practitioners, obesity, multi-disciplinary teams, clinical efficacy

Introduction

Obesity refers to a certain degree of being significantly overweight and having a thick layer of fat, which is a state caused by the excessive accumulation of body fat, especially triglycerides (TG) [1]. The fat stored in obese patients exceeds 20% of their ideal body weight. Obesity is a chronic metabolic disease caused by the interaction of genetic, environmental, and other factors [2, 3], and its pathogenesis is that energy intake exceeds energy consumption [4]. The incidence of obesity has shown a certain upward trend with the improvement of the material standards of living, so the disease has become the most prevalent in the world [5]. Generally divided into primary and secondary obesity [6], the disease has many pathogenic factors such as genetic factors, environmental factors, abnormal endocrine regulation, inflammation, and intestinal flora [7]. Excessive fat accumulation and being overweight are two major clinical signs of obese patients [8]. Obesity, the risk factor and pathological basis of many chronic non-communicable diseases [9], is usually accompanied by hypertension, diabetes mellitus (DM), and cardio-cerebrovascular diseases, and patients with severe obesity often suffer from mental problems such as inferiority, depression, and poor social adaptability [10]. Body mass index, (BMI) = weight/height/height (kg/m^2) [11]. Studies have shown that the BMI of most individuals is significantly correlated with their body fat percentage, which better reflects the severity of their obesity [12]. According to the international BMI threshold value established by the World Health Organization (WHO), a BMI between 25.0 and 29.9 is deemed overweight, and a value greater than or equal to 30 is deemed obesity [13].

Obesity, a chronic disease, has become a major global public health problem that seriously endangers human life and health and reduces the quality of life (QOL), so it is of great clinical significance to actively and effectively treat obese patients [14]. Generally, the patients are treated with lifestyle interventions, drug therapies, or weight-loss surgery, but the traditional diagnosis and treatment model is relatively simple, but it lacks long-term monitoring and follow-ups, which results in unsatisfactory treatment results and weight-loss failure [15, 16]. Since the cause and pathogenesis of obesity is complex and multi-factorial, its treatment should be multifaceted and comprehensive [17]. Using multi-disciplinary teams (MDTs) is currently the best model for diagnosing and treating the disease [18]. According to some studies, MDTs have a short-term efficacy in treating obesity and can improve the mental health and QOL of obese patients. Moreover, all participants who have received long-term treatment maintain their weight after the treatment [19]. As we all know, being overweight and obese are chronic diseases, so it is more beneficial for general practitioners (GPs) to participate in the management of the disease [20]. GPs go deep into the public to understand the social environments, family situations, and living habits of patients, which is more conducive to managing obesity. Moreover, they have more opportunities to contact overweight and obese patients, so patients can seek help and receive education and guidance from them at any time. More importantly, the management of these patients requires long-term and repeated contact with medical professionals, and only exclusive GPs can provide the best assistance [21].

At present, there are few studies on the treatment of obesity with MDTs from the GP's perspective. In this study, obese patients were treated using MDTs from the GP's perspective, so as to explore the MDTs' effects on the success rate of weight loss and the levels of blood glucose, blood lipids, and adipokines.

Materials and methods

General information

Admitted to Tiantai County People's Hospital of Zhejiang from January 2018 to October 2019, 127 obese patients were divided into two groups based on the different models of diagnosis and treatment each underwent. The routine model of diagnosis and treatment was administered to the patients in the control group (60 cases), and MDT was administered to the patients in the research group (67 cases). The control group consisted of 28 males and 32 females, who ranged in age from 22-50 years old, with an average age of (36.26±4.06). The research group consisted of 31 males and 36 females, who ranged in age from 24-48 years old, with an average age of (35.73±4.12).

Inclusion and exclusion criteria

Inclusion criteria: (1) Patients who met the diagnostic criteria for obesity [22], (2) Patients who had been treated for more than 6 months, and (3) Patients who had complete clinical data. This study was approved by the ethics committee of our hospital. All the patients and their families were informed of the study, and they all signed an informed consent form.

Exclusion criteria: (1) Patients with end-stage diseases such as malignant tumors, (2) Patients with severe organic (such as heart, liver and kidney) disease complications, (3) Patients with a cognitive, language, or hearing impairment, (4) Patients with mental illness complications or with a family history of mental illness, and (5) Patients who withdrew from this study halfway.

Therapeutic methods

The patients in the control group underwent the conventional treatment model, which included simple health education, lifestyle interventions, auxiliary drug and surgical treatment when necessary.

The patients in the research group underwent treatment using MDTs from the GP's perspective. The specific methods were as follows:

1. An MDT obesity team was established, whose participating departments consisted of basic GPs, the Department of General Medicine, the Department of Endocrinology, the Department of Mental Health, the Department of TCM Physiotherapy, the Nutrition Department, and the General Surgery Department in our hospital.

2. The training and assessment of the basic GPs: All the GPs involved in the study were assessed uniformly. Those who passed the

assessment joined the team, otherwise, they were trained and assessed again.

3. Implementation of the diagnostic and treatment model: Screening for obesity was conducted, and an appointment was made with the General Practice Clinic to continue screening for primary obesity. Then, an appointment with the outpatient services of the obesity MDT was made to formulate the weight loss and health education plans. Basic GPs were responsible for the lifestyle interventions, physicians were responsible for the drug interventions, and provincial hospitals were responsible for the surgeries for the patients who needed surgical treatment. The patients were followed up by basic GPs to gather the follow-up information. The members of the MDT outpatient services evaluated the patients once every three months and adjusted the plans, until their weights reached the standard.

4. Constituent MDT departments and the implementation of their main responsibilities: Basic GPs screened out the obese patients, helped them to make an appointment for the outpatient services of general medicine, implemented the specific obesity intervention measures, and conducted regular education, evaluation and patient follow-up. The doctors in the Department of General Medicine conducted general physical examinations on the patients, screened out those with primary obesity, and helped to make an appointment for the outpatient services of MDT if necessary, as well as the supervision of the implementation by basic GPs via telephone, doing a good job of bridging. The doctors in the Department of Endocrinology assisted in screening out the patients with secondary obesity, and regulated their blood glucose, lipids, and pressure. The doctors in the General Surgery Department evaluated the surgeries of those who required surgery and conducted post-operative follow-ups. The doctors in the Nutrition Department provided diet and exercise guidance for the patients. The doctors in the Department of Mental Health diagnosed the psychological states of the obese patients, provided consultation for them, and gave them proper guidance. The doctors in the Department of Physiotherapy instructed the patients to exercise correctly.

Outcome measures

(1) The weight loss success rates (weight loss >10%) in the two groups were observed.

(2) Before and after the treatment, the blood glucose parameters [the fasting plasma glucose (FPG) the 2-hour postprandial blood glucose (2hPBG), and the HbA1c levels] in both groups were measured.

(3) Before and after the treatment, the of blood lipid parameters [the total cholesterol (TC), the TG, the high-density lipoprotein cholesterol (HDL-C), and the low-density lipoprotein cholesterol (LDL-C) levels] were measured.

(4) Before and after the treatment, the serum adipokine [the tumor necrosis factor-α (TNF-α), adiponectin (APN), leptin (LP), and recombinant human fibroblast growth factor 21 (FGF-21) levels] levels were measured using enzyme-linked immunosorbent assays (ELISA). The quantification was conducted according to the kits' instructions of the human TNF-α ELISA (Gelatin & Protein Co., Ltd., Shanghai, China, JK-(a)-4948) kits, the human Adiponectin ELISA kit, and the human Leptin ELISA and human FGF-21 ELISA kits (Shanghai Hengfei Biotechnology Co., Ltd., Shanghai, China, CSB-E13400h-1, E-EL-H0113km-1, EK0994).

(5) Psychological states: The Self-Rating Anxiety Scale (SAS) and the Self-Rating Depression Scale (SDS) [23] were used to assess the patients' anxiety and depression statuses before and after the treatment. The SAS has a total possible score of 100 points. A score of 50-70 points indicates mild anxiety, a score of 71-90 points indicates moderate anxiety, and a score of >90 points indicates severe anxiety. Higher SAS scores indicate more serious anxiety. The SDS has a total score of 100 points. A score of 50-70 points indicates mild depression, a score of 71-90 points indicates moderate depression, and a score of >90 points indicates severe depression. Higher SDS scores indicate more serious depression.

(6) Sense of self-efficacy: Before and after the treatment, the General Self-Efficacy Scale (GSES) [24] was used to evaluate the patients' sense of self-efficacy in both groups. This scale consisted of 10 items with 1-4 points for each item, and higher GSES scores indicated a stronger self-efficacy.

Statistical methods

SPSS 24.0 (IBM Corp, Armonk, NY, USA) was used for the statistical analysis, and GraphPad Prism 7 was used to plot the figures. The count

Table 1. Comparison of the general information [n (%)] ($\bar{x}$ ± sd)

Categories	Research group (n=67)	Control group (n=60)	t/χ^2 value	*P* value
Gender			0.002	0.964
Male	31 (46.27)	28 (46.67)		
Female	36 (53.73)	32 (53.33)		
Age (Years)	35.73±4.12	36.26±4.06	0.728	0.4675
BMI (kg/m^2)	38.27±5.05	38.31±5.32	0.043	0.965
Marital status			0.132	0.715
Married	28 (41.79)	27 (45.00)		
Unmarried	39 (58.21)	33 (55.00)		
Place of residence			0.522	0.469
City	40 (59.70)	32 (53.33)		
Countryside	27 (40.30)	28 (46.67)		
Nationality			0.617	0.432
Han	50 (74.63)	41 (68.33)		
Ethnic minorities	17 (25.37)	19 (31.67)		
Educational background			0.632	0.426
≥ Senior high school	36 (53.73)	28 (46.67)		
< Senior high school	31 (46.27)	32 (53.33)		
History of smoking			0.243	0.621
Yes	24 (35.82)	19 (31.67)		
No	43 (64.18)	41 (68.33)		
History of drinking			0.057	0.810
Yes	21 (31.34)	20 (33.33)		
No	46 (68.66)	40 (66.67)		
History of hypertension			0.339	0.560
Yes	17 (25.37)	18 (30.00)		
No	50 (74.63)	42 (70.00)		
History of DM			0.107	0.742
Yes	26 (38.81)	25 (41.67)		
No	41 (61.19)	35 (58.33)		

Table 2. Comparison of the weight loss success rates [n (%)]

Groups	Weight loss ≥10%	Weight loss <10%	Weight loss success rate (%)
Research group (n=67)	41 (61.19)	26 (38.81)	41 (61.19)
Control group (n=60)	18 (30.00)	42 (70.00)	18 (30.00)
χ^2	-	-	12.380
P	-	-	0.0004

data were expressed as [n (%)] and compared between groups using chi-square tests. When the theoretical frequency in a test was less than 5, the comparisons were conducted using chi-square tests with corrections for continuity. The measurement data were expressed as the mean ± standard deviation ($\bar{x}$ ± sd) and were compared between groups using independent samples t tests, with the comparisons within groups before and after the treatment conducted using paired t tests. When P<0.05, a difference was statistically significant.

Results

Comparison of the general information

There were no significant differences between the research and control groups in the general baseline data such as gender, age, BMI, pathological types, clinical stages, marital status, place of residence, nationality, educational backgrounds, history of smoking, history of drinking, history of hypertension, or history of DM (P>0.05) (**Table 1**).

Comparison of the weight loss success rates

After the treatment, the weight loss success rates in the research group was 61.19%, which was significantly higher than the 30.00% in the control group (P<0.05) (**Table 2**).

Comparison of the blood glucose parameters

Before the treatment, there were no significant differences in FPG, 2hPBG, or HbA1c levels between the research and control groups (P>0.05). After the treatment, the three parameters in both groups were reduced significantly, and they were remarkably lower in the research group (P<0.001) (**Figure 1**).

Comparison of the blood lipid parameters

Before the treatment, there were no significant differences in the TC, TG, HDL-C, or LDL-C levels between the research and control groups (P>0.05). After the treatment, the TC, TG, and

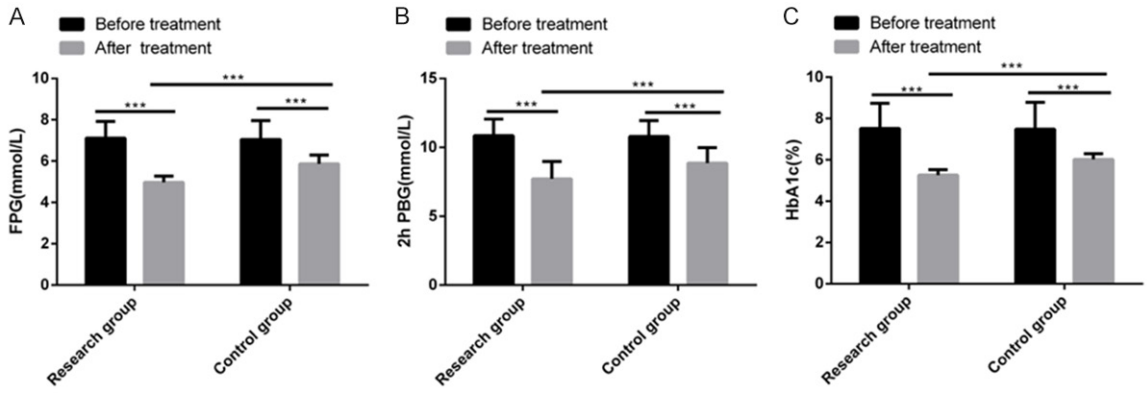

Figure 1. Comparison of the blood glucose parameters. A: Before the treatment, there was no significant difference in FPG levels between the research and control groups. After the treatment, this parameter in both groups was reduced significantly, and it was significantly lower in the research group. B: Before the treatment, there was no significant difference in the 2hPBG between the research and control groups. After the treatment, this parameter in both groups was significantly reduced, and it was significantly lower in the research group. C: Before the treatment, there was no significant difference in the HbA1c levels between the research and control groups. After the treatment, this parameter in both groups was reduced significantly, and it was significantly lower in the research group. Note: *** indicates P<0.001.

LDL-C levels in both groups were significantly reduced, and they were significantly lower in the research group. The HDL-C levels in both groups rose significantly, and the levels were significantly higher in the research group (P< 0.001) (**Figure 2**).

Comparison of the adipokines

Before the treatment, there were no significant differences in the TNF-α, APN, LP, or FGF-21 levels between the research and control groups (P>0.05). After the treatment, the TNF-α, LP, and FGF-21 levels in both groups were significantly reduced, and they were significantly lower in the research group. The APN levels in both groups rose significantly, and they were remarkably higher in the research group (P< 0.001) (**Figure 3**).

Comparison of the SAS and SDS scores

Before the treatment, there were no significant differences in the SAS and SDS scores between the research and control groups (P>0.05). After the treatment, the both groups' scores were reduced significantly, and they were remarkably lower in the research group (P<0.001) (**Figure 4**).

Comparison of the GSES scores

Before the treatment, there were no significant differences in the GSES scores between the research and control groups (P>0.05). After the treatment, the scores in both groups rose remarkably, and they were significantly higher in the research group (P<0.001) (**Figure 5**).

Discussion

Obesity is a disease caused by metabolic disorders, and it is also a risk factor for many diseases [25]. For example, obese patients are at an increased risk of type 2 diabetes mellitus, hypertension, coronary heart disease, and non-alcoholic fatty liver disease so obesity is the second-most preventable cause of death in the world [26]. Its occurrence not only seriously affects patients' physical health, it also leads to psychological problems (such as feelings of inferiority, depression, and anxiety), which greatly reduces patients' QOL [27, 28]. With the advent of the modern bio-psycho-social medical model, it is a research hotspot to seek an effective treatment scheme for the disease in clinical practice [29-31]. In this study, the therapeutic scheme of using MDTs from the GP's perspective for obese patients was discussed, in order to provide a valid basis for clinical practice.

As reported by previous studies, the first-line treatment for obese patients is lifestyle changes and drug therapies, but it is difficult to achieve the goal of long-term weight loss and weight maintenance due to the side effects of the drugs [32]. In our study, the therapeutic

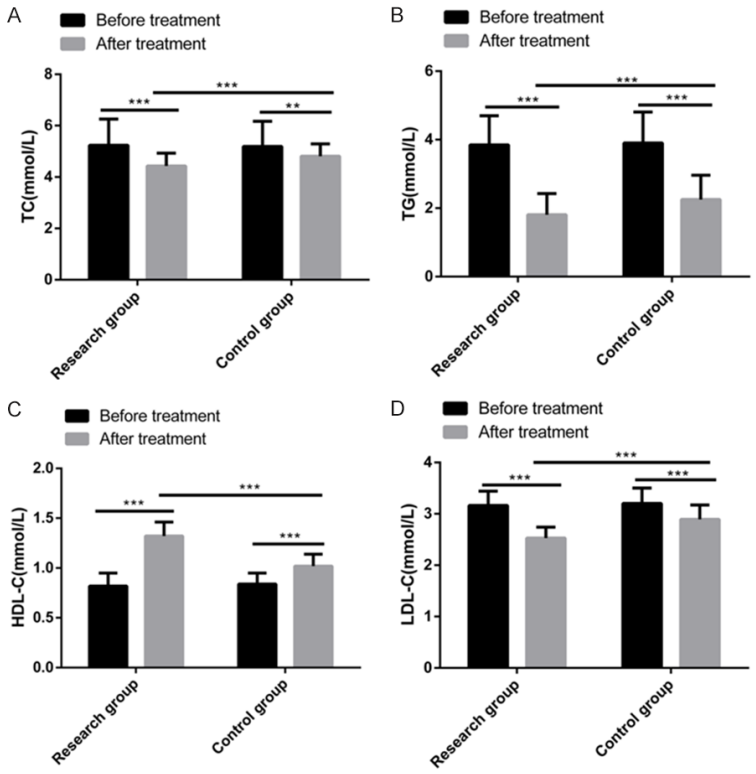

Figure 2. Comparison of the blood lipid parameters. A: Before the treatment, there was no significant difference in the TC levels between the research and control groups. After the treatment, this parameter in both groups was significantly reduced, and it was significantly lower in the research group. B: Before the treatment, there was no significant difference in the TG levels between the research and control groups. After the treatment, this parameter in both groups was reduced significantly, and it was significantly lower in the research group. C: Before the treatment, there was no significant difference in the HDL-C levels between the research and control groups. After the treatment, this parameter in both groups rose significantly, and it was significantly higher in the research group. D: Before the treatment, there was no significant difference in the LDL-C levels between the research and control groups. After the treatment, this parameter in both groups was reduced significantly, and it was significantly lower in the research group. Note: ** indicates P<0.01. *** indicates P<0.001.

scheme of MDTs from the GP's perspective was applied to the patients, thus avoiding the long-term lack of supervision and the drug side effects. The weight loss success rate was significantly higher in the research group, which indicates that this therapeutic scheme can increase the success rate and help patients adhere to long-term lifestyle interventions and maintain their weight. After the treatment, the FPG, 2hPBG, and HbA1c levels were significantly lower in the research group, suggesting that the patients in the research group had better blood glucose control and glucose metabolism than the patients in the control group. According to Sukhdev et al., drug therapies and surgical interventions cannot maintain weight loss for a long time, and they cause side effects instead [33]. In this study, after the 6-month treatment, the long-term patient follow-ups showed that there was no weight regain or side effects, and the patients had better blood glucose control than those treated with the routine treatment. This may be because the multidisciplinary diagnosis and treatment model can enhance patients' self-efficacy, thus they insist on weight loss treatment for a long time and reduce the occurrence of weight regain. After the treatment, the TC, TG, and LDL-C levels in the research group were reduced significantly and were lower than the corresponding levels in the control group. The HDL-C level in the research group rose remarkably and was significantly higher than it was in the control group. This shows that this therapeutic scheme is more conducive to controlling blood lipids. At the same time, the TNF-α, LP, and FGF-21 levels in the research group reduced significantly and were significantly lower than those in the control group. The APN levels in the research group rose significantly and were significantly higher than they were in the control group. This indicates that this therapeutic scheme has more advantages in improving the patients' adipokines. This is because we used a multi-disciplinary model to intervene in the patients' health behaviors. At the same time, we also carried out long-term tracking and adjustment, so as to effectively control the adipokine levels. APN is a protective factor that affects insulin secretions and glucose regulation. In our study, its levels were remarkably higher in the research group, showing that adipokines can be better balanced through this therapeutic scheme. The research of El Husseny et al. found that increasing the APN levels can improve insulin sensitivity, pro-

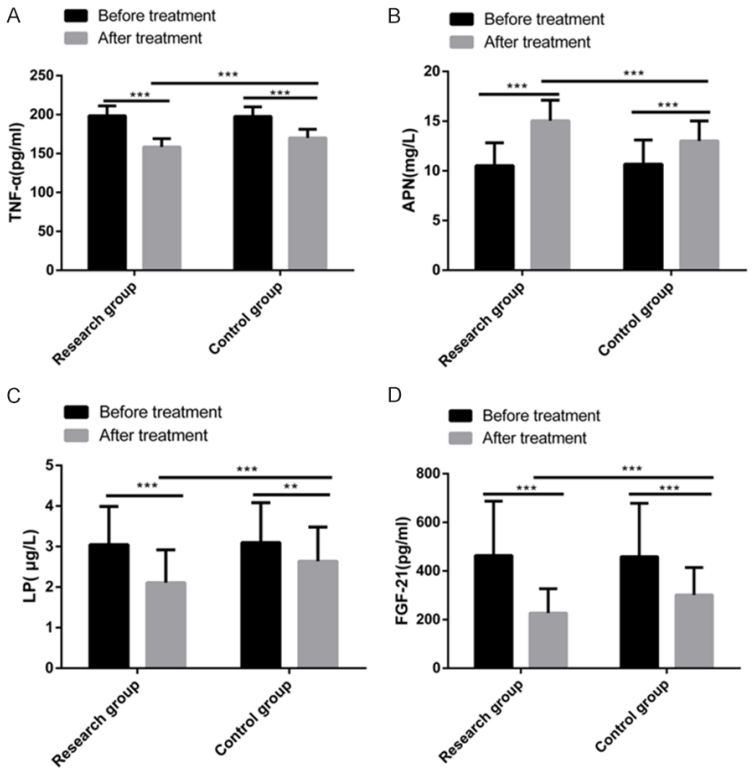

Figure 3. Comparison of the adipokine levels. A: Before the treatment, there were no significant differences in the TNF-α levels between the research and control groups. After the treatment, the levels in both groups were reduced significantly, and they were significantly lower in the research group. B: Before the treatment, there were no significant differences in the LP levels between the research and control groups. After the treatment, the levels in both groups were reduced significantly, and they were significantly lower in the research group. C: Before the treatment, there were no significant differences in the FGF-21 levels between the research and control groups. After the treatment, the levels in both groups were reduced significantly, and they were significantly lower in the research group. D: Before the treatment, there were no significant differences in the APN levels between the research and control groups. After the treatment, the levels in both groups rose remarkably, and they were significantly higher in the research group. Note: ** indicates P<0.01. *** indicates P<0.001.

tect blood vessels, and reduce the incidence and the mortality rate of cardiovascular diseases caused by obesity [34]. In our study, the SAS and SDS scores were significantly lower in the research group, which demonstrates that this therapeutic scheme can significantly relieve the patients' anxiety and depression. As reported by Gill and other researchers, the surgical treatment of obese patients is a simple scheme that cannot relieve their anxiety and depression [35]. According to Gomes et al., obesity is a major factor that causes severe depression and anxiety, and diet therapy and physical exercise can alleviate patients' depression and anxiety to some extent [36]. In our study, the MDT model was adopted, rather than a single model of diagnosis and treatment, so the treatment effects on the patients are better than those in previous research results. In a study by Boker Lund et al., obesity management in which GPs are involved can significantly improve patients weight management and lifestyle changes [37], which is similar to our research results. Finally, we evaluated the general self-efficacy of the patients, and found that the GSES scores were remarkably higher in the research group. This suggests that the model of MDTs from the GP's perspective can improve the patients' sense of general self-efficacy more significantly, so as to better enhance the treatment effects and make the patients cooperate with the doctors in the treatment plans. As reported by Ashman et al., the participation of GPs in obesity management can significantly improve the patients' sense of self-efficacy, and help build an excellent doctor-patient relationship with GPs [38], which is similar to our research results. According to Durrer Schutz and other researchers, GPs are essential to obesity management and weight regain. They are very important for the health education, lifestyle interventions and the monitoring and counseling of mental health in obese patients, so the participation of GPs in MDT is critical [39].

This study confirms that the MDTs from the GP's perspective model can bring more benefits to obese patients, but it still needs improvement. For instance, we can further evaluate the treatment compliance of obese patients, and make long-term follow-up records to analyze the risk factors causing treatment failure and weight regain, so that the medical staff can adjust the diagnosis and treatment model, thereby improving the therapeutic effects.

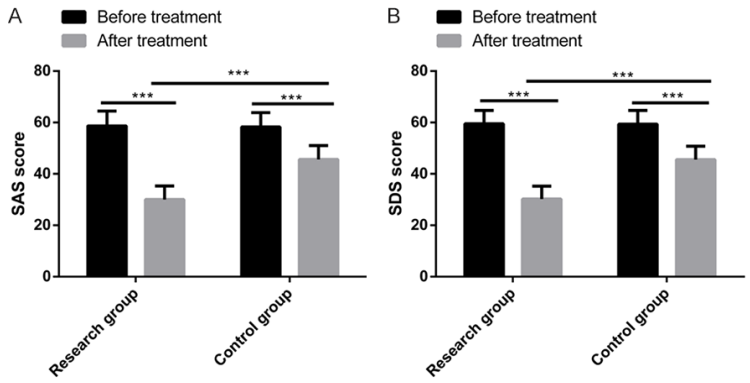

Figure 4. Comparison of the SAS and SDS scores. A: Before the treatment, there were no significant differences in the SAS scores between the research and control groups. After the treatment, the scores in both groups were significantly reduced, and they were significantly lower in the research group. B: Before the treatment, there were no significant differences in the SDS scores between the research and control groups. After the treatment, the scores in both groups were significantly reduced, and they were significantly lower in the research group. Note: *** indicates P<0.001.

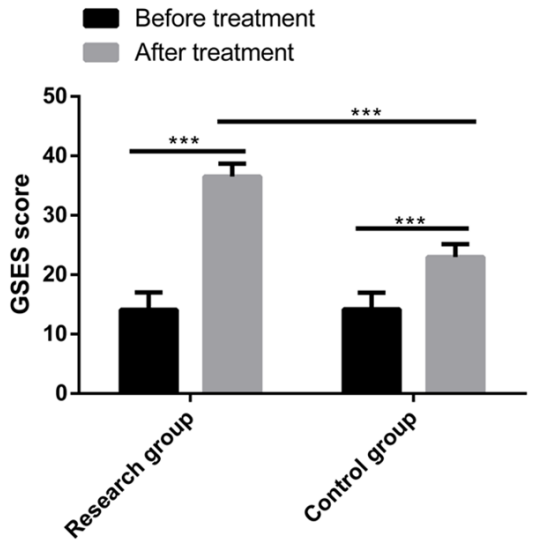

Figure 5. Comparison of the GSES scores. Before the treatment, there were no significant differences in the GSES scores between the research and control groups. After the treatment, the scores were significantly higher in the research group. Note: *** indicates P<0.001.

Therefore, supplementary research will be gradually carried out in the future from the above perspective.

In summary, for obese patients, MDTs from the GP's perspective are conducive to increasing the weight loss success rate, improving the blood glucose, blood lipid and adipokine levels, and relieving negative emotions (such as anxiety and depression), as well as enhancing their sense of general self-efficacy.

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Disclosure of conflict of interest

None.

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