

Original Article

Influence of lifestyle guidance and mental care on internal secretion, carbohydrate metabolism and pregnancy in obese patients with polycystic ovary syndrome

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Abstract: Objective: We aim to discuss the influence of lifestyle guidance and mental care on internal secretion, carbohydrate metabolism and pregnancy in obese patients with polycystic ovary syndrome (PCOS). Methods: In total, 84 obese PCOS patients were selected as subjects of study for a retrospective analysis and divided into an observation group (44 cases) and a control group (40 cases) according to care methods. The patients of the control group received routine care and those of the observation group received lifestyle guidance and mental care on the basis of routine care. The weight and body mass index (BMI), levels of luteinizing hormone (LH), ratio between LH, follicle-stimulating hormone (LH/FSH), testosterone (T), fasting blood glucose (FBG), fasting insulin (FINS), the homeostasis model assessment of insulin resistance (HOMA-IR), the self-rating anxiety scale (SAS) and self-rating depression scale (SDS) were calculated. Results: After care, the weight, BMI, the levels of LH, LH/FSH and T, HOMA-IR and FINS, SDS and SAS scores of the observation group were lower than those of in the control group ($P < 0.05$). The pregnancy rate of the observation group at 8 weeks, 12 weeks and 24 weeks after care was higher than that of in the control group ($P < 0.05$). Conclusion: Lifestyle guidance and mental care can improve the endocrine hormone levels, correct carbohydrate metabolism disorder, relieve the mental states of anxiety and depression and enhance the pregnancy rate in obese PCOS patients.

Keywords: Obese PCOS, lifestyle guidance, mental care, internal secretion, carbohydrate metabolism, pregnancy

Introduction

Polycystic ovary syndrome (PCOS) is a common gynecological disease in clinical practice. It is reported that the incidence of PCOS was about 2%-28% around the world and about 5.6% in China [1]. The clinical symptoms of PCOS include obesity, infertility and hypertrichosis, etc., which are major reasons for infertility in women of childbearing age. Meanwhile, these symptoms may cause carbohydrate metabolism disorder, dyslipidemia and endometrial lesions, etc., which will greatly reduce the living quality of patients [2, 3]. Obese PCOS is a common clinical issue and the incidence of metabolic syndrome is higher in obese PCOS patients than that in non-obese PCOS ones [4]. Obesity can increase harm caused by hyperandrogenism in PCOS patients and further aggravate ovulation failure and metabolic disorder.

Previous research [5, 6] shows that intervention in obese PCOS patients was conducive to improving metabolic disorder, accelerating ovulation and enhancing pregnancy rate. Ren LY [7] found that after nutrition and exercise intervention, the pregnancy rate of obese PCOS infertile patients reached 82.0%, which was significantly higher than that of the group receiving conventional dietary advice and management intervention. Lin H *et al.* [8] used cognitive behavioral therapy to intervene in infertile obese women with PCOS in their cognition, behavior and emotion. The treatment environment score and treatment tolerance score of the patients' reproductive life quality were significantly improved, and the pregnancy rate in the intervention group was slightly higher than that of in the control group, but there was no significant difference in two groups. In this study, the lifestyle guidance and mental care

Table 1. Comparison of general data in two groups [$\bar{x} \pm s$, n (%)]

Group	<i>n</i>	Average age (years old)	Failure times of in vitro fertilization-embryo transplantation	Education level		
				Junior high school	Senior high school/technical secondary school	Junior college or above
Observation group	44	28.32±2.46	7 (15.91)	3 (6.82)	12 (27.27)	29 (65.91)
Control group	40	28.56±2.71	5 (12.50)	5 (12.50)	13 (32.50)	22 (55.00)
χ^2/t		0.426	0.199		1.313	
<i>P</i>		0.672	0.656		0.519	

were strengthened in obese PCOS patients to observe the influence on internal secretion, carbohydrate metabolism and pregnancy. The report is shown below.

Material and methods

General data

The clinical data of 84 obese PCOS patients who were admitted to our hospital from February 2016 to March 2019 were collected for retrospective analysis. Inclusion criteria: this study included (1) patients in conformity with the diagnostic criteria on obese PCOS proposed by Rotterdam in 2003 [9]; (2) those aged 20-35 years old; (3) those with the body mass index (BMI) of 25-35 kg/m²; (4) those without childbearing history; (5) those who were able to complete the questionnaire independently without communication barriers; and (6) those who signed the Informed Consent Form willingly. Exclusion criteria: this study excluded (1) patients complicated with severe hypohepatia, pulmonary dysfunction, renal insufficiency and cardiac dysfunction; (2) those complicated with diseases of adrenal glands and hyperprolactinemia; (3) those whose mates were infecund; (4) who were infecund due to fallopian tube issues; and (5) those with a history of mental diseases. The patients were divided into a control group ($n=40$) and an observation group ($n=44$) according to caring methods. The difference in general data of two groups had no statistical significance ($P>0.05$), but had comparability, as shown in **Table 1**.

Methods

The control group received routine care: (1) health education: the patients were taught knowledge related to being obese with PCOS and relevant daily precautions, etc. (2) General dietary instruction: the dietary guidelines were

distributed and interpreted to instruct patients to arrange their diets according to guidelines, mainly focusing on food with high protein, high fiber and low calories. (3) Self-observation record: the patients were instructed to record their daily diet and measure and record their weight weekly. (4) Follow-up visit: the patients were followed over the telephone once a fortnight so that their questions could be answered and the problems could be solved. The patients returned to the doctor once a month for analysis in terms of diet, movement and weight, etc., as recorded by patients so as to adjust the intervention program. The intervention lasted for 6 months in succession.

The observation group received lifestyle guidance and mental care on the basis of routine care: (1) dietary instruction: the dietary program was formulated for patients: the ratio of dietary energy was 40%-45% protein, 30%-35% lipid and 20%-25% carbohydrate. The food mainly consisted of plants, such as fresh fruits and vegetables and nuts, etc., and cooked with vegetable oil. Greasy food is not recommended and sweet and spicy food are decreased. (2) Movement instruction: the patients did aerobic exercise more than 3 times every week and the most appropriate time was 1 h after breakfast or 1 h after dinner. They could choose proper movements according to their own exercise habits and preferences, such as jogging and setting-up exercise, etc. The movement time was kept between 40 min and 60 min and the exercise heart rate target was $(220-\text{age}) \times 60\%$. (3) Care in heart rate: such symptoms as obesity, hypertrichosis and infertility caused by being obese with PCOS could increase the mental pressure of patients and make them have anxiety and depression, which affected their enthusiasm in cooperating with intervention programs. Therefore, medical workers provide psychological counseling, actively listen to

patients, analyze the psychological problems and offer persuasion and guidance, and even invite psychologists to provide professional psychological guidance if necessary. The intervention lasted for 6 months in succession.

Evaluation criteria

(1) The weight and body mass index (BMI) were measured in the two groups. (2) Internal secretion: the venous blood of patients was collected during 2-4 d of their menstrual period and centrifuged for 10 min at the speed of 3,000 r/min. Roche Cobas E602 Analyzer was used to measure luteinizing hormone (LH), ratio between LH and follicle-stimulating hormone (LH/FSH) and testosterone (T) level. (3) Carbohydrate metabolism: the venous blood was collected on empty stomach before and after nursing. The glucose oxidase method was used to measure the fasting blood glucose (FBG) with kits purchased from Guangzhou Jinde Biotechnology Co., Ltd. and chemiluminescence was used to measure the fasting insulin (FINS) with kits purchased from Beijing Kemidongya Biotechnology Co., Ltd. The computational formula of HOMA-IR=FBG (mmol/L)×FINS (mIU/L)/22.5 was used to calculate the homeostasis model assessment of insulin resistance (HOMA-IR). (4) Mental states: the self-rating anxiety scale (SAS) and self-rating depression scale (SDS) designed by Zung in America were used to evaluate the mental states of patients before and after nursing. There were 20 items in each scale. The 20 items of SAS included: 1. I feel more nervous and anxious than usual (anxiety); 2. I feel afraid for no reason at all (afraid); 3. I get upset easily or feel panicky (panic); 4. I feel like I'm falling apart and going to pieces (insane); 5. I feel that everything is all right and nothing bad will happen (unfortunate presentiment); 6. My arms and legs shake and tremble (trembling arms and legs); 7. I am bothered by headaches neck and back pain (body pain); 8. I feel weak and get tired easily (fatigue); 9. I feel calm and can sit still easily (akathisia); 10. I can feel my heart beating fast (palpitation); 11. I am bothered by dizzy spells (dizziness); 12. I have fainting spells or feel like I'm going to faint (sense of syncope); 13. I can breathe in and out easily (dyspnea); 14. I get feelings of numbness and tingling in my fingers and toes (tingling in fingers and toes); 15. I am bothered by stomach aches or indigestion (stomach ache or indigestion);

16. I have to empty my bladder often (ascheturasis); 17. My hands are usually dry and warm (hidrosis); 18. My face gets hot and blushes (facial flushing); 19. I fall asleep easily and get a good night's rest (sleep disorders); 20. I have nightmares (nightmares). The 20 items of SDS included: 1. I feel down hearted and blue (melancholy); 2. Morning is when I feel the best (serious in the morning and mild at night); 3. I have crying spells or feel like it (crying easily); 4. I have trouble sleeping at night (sleep disorders); 5. I eat as much as I used to (anorexia); 6. I still enjoy sex (sexual interest decreased); 7. I notice that I am losing weight (loss of weight); 8. I have trouble with constipation (constipation); 9. My heart beats faster than usual (palpitation); 10. I get tired for no reason (fatigue); 11. My mind is not as clear as it used to be (difficulty thinking); 12. I do not find it easy to do the things I used to (ability decreased); 13. I am restless and can't keep still (uneasiness); 14. I do not feel hopeful about the future (desperation); 15. I am more irritable than usual (irritability); 16. I do not find it easy to make decisions (decision difficult); 17. I do not feel that I am useful and needed (feeling of uselessness); 18. My life is not full (feeling empty in life); 19. I feel that others would be better off if I were dead (unworthiness); 20. I do not enjoy the things I used to do (loss of interest). It is divided into 4 grades, and the scores of each item are added together to get a score, which is then converted into a standard score. The total standard score is 25-100 points. The lower the scores were, the better the mental states of anxiety and depression was. (5) Pregnancy situation: The human chorionic gonadotrophin was positive.

Statistical analysis

SPSS 25.0 statistical software was used for analysis. The measurement data were expressed as mean ± standard deviation. The t test of two independent samples was used to compare the mean between the two groups. Paired t test was used to compare the mean before and after intervention in the same group. Univariate analysis of variance was used to compare the mean between groups. Pairwise comparison of homogeneity of variance was performed using LSD method, while heterogeneity of variance was used Dennett T3 test. Comparison of rates was performed by Chi-square test. $P < 0.05$ was considered as statistical difference.

Influence of lifestyle guidance and mental care on PCOS

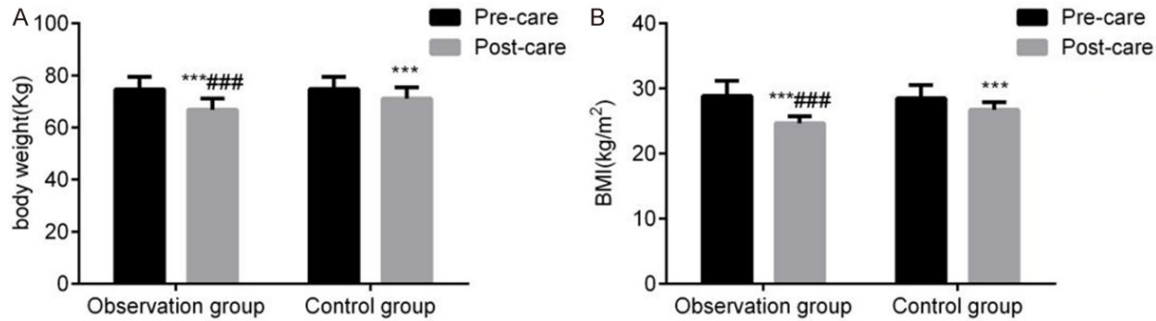


Figure 1. Comparison of weigh and BMI level in two groups ($\bar{x} \pm s$). Notes: *** $P < 0.001$ comparison with that before care; and ### $P < 0.001$ comparison with the control group. A: Weight; B: Body mass index.

Results

Comparison of general data in two groups

There was comparability in age, failure times of *in vitro* fertilization-embryo transplantation (IVF-ET) and education level in two groups ($P > 0.05$), as shown in **Table 1**.

Lifestyle guidance and mental care could significantly improve the weight and BMI level of patients

There was no statistical difference in weight and BMI level of two groups before care ($P = 0.902, 0.431$). The weight and BMI level of two groups reduced after care, which indicated that the difference had statistical significance ($P = 0.000, 0.000$). Therein, the weight and BMI level of the observation group were lower than those of the control group ($P = 0.000, 0.000$), which implied that lifestyle guidance and mental care could significantly improve the weight and BMI level of patients and showed better curative effect in comparison with the routine care model, as shown in **Figure 1**.

Lifestyle guidance and mental care could improve the internal secretion level of patients

There was no statistical difference in LH, LH/FSH and T level of the two groups before care ($P = 0.458, 0.646, 0.714$). There was no obvious difference in LH, LH/FSH and T levels of control group before and after care ($P = 0.212, 0.078, 0.384$). LH, LH/FSH and T levels of the observation group reduced after care ($P = 0.000, 0.000, 0.000$). Therein, LH, LH/FSH and T levels in the observation group were lower than those of the control group after care ($P = 0.000, 0.000, 0.000$), which implied that lifestyle guidance and mental care could improve the inter-

nal secretion level of patients, as shown in **Figure 2**.

Lifestyle guidance and mental care could improve carbohydrate metabolism levels of patients

There was no statistical difference in FBG, HOMA-IR and FINS of two groups before care ($P = 0.780, 0.464, 0.728$). There was no obvious difference in FBG in the two groups before and after care ($P = 0.501, 0.711$). HOMA-IR and FINS reduced after care in the two groups (observation group: $P = 0.000, 0.000$; control group: $P = 0.000, 0.000$). Therein, HOMA-IR and FINS of the observation group were lower than those of the control group after care ($P = 0.000, 0.000$), which implied that lifestyle guidance and mental care could improve carbohydrate metabolism in patients, as shown in **Figure 3**.

Lifestyle guidance and mental care could improve the anxious and depressive moods of patients

There was no statistical difference in SDS and SAS scores of the two groups before care ($P = 0.678, 0.306$). The scores of two groups reduced after care ($P = 0.000, 0.000$). Therein, the scores of the observation group were lower than those of control group after care ($P = 0.000, 0.000$), which implied that lifestyle guidance and mental care could improve the anxious and depressive moods of patients, as shown in **Figure 4**.

Lifestyle guidance and mental care could enhance the pregnancy rate of patients

The pregnancy rate of the observation group was higher than that of control group at 8

Influence of lifestyle guidance and mental care on PCOS

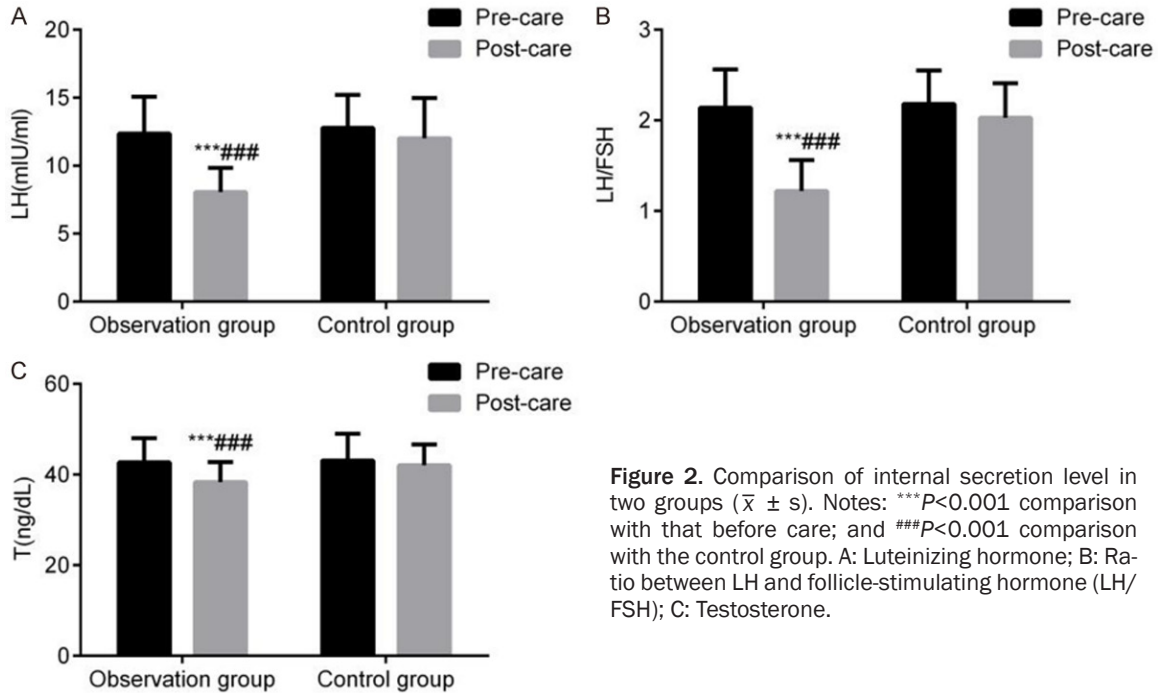


Figure 2. Comparison of internal secretion level in two groups ($\bar{x} \pm s$). Notes: *** $P < 0.001$ comparison with that before care; and ### $P < 0.001$ comparison with the control group. A: Luteinizing hormone; B: Ratio between LH and follicle-stimulating hormone (LH/FSH); C: Testosterone.

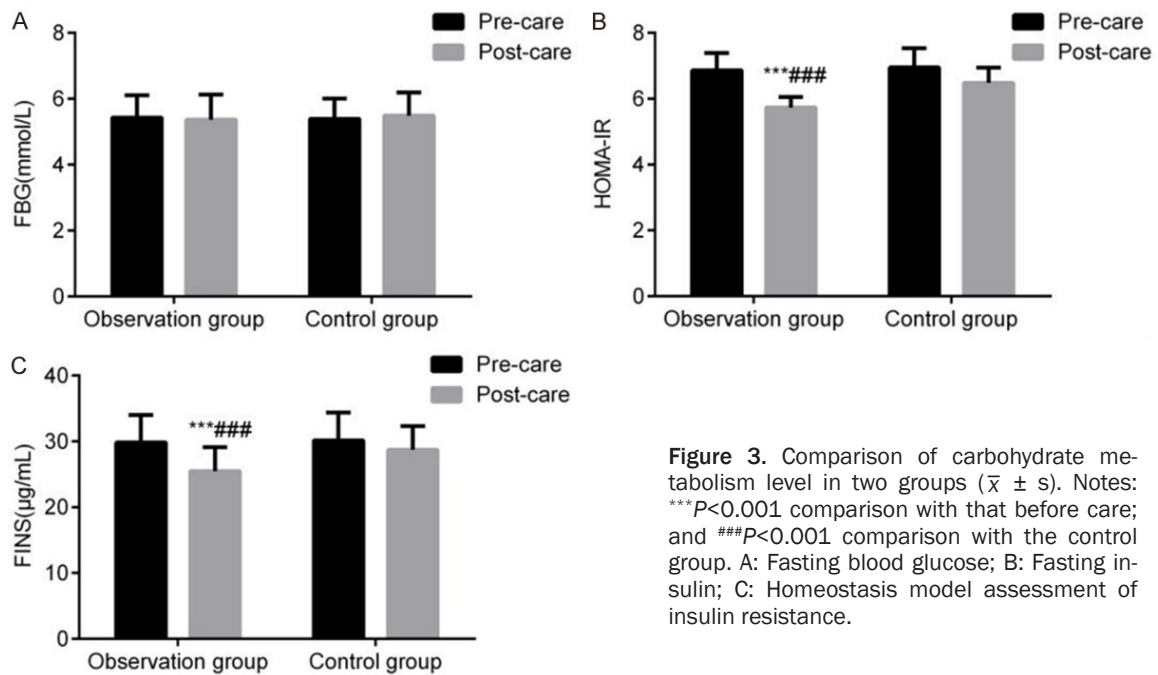


Figure 3. Comparison of carbohydrate metabolism level in two groups ($\bar{x} \pm s$). Notes: *** $P < 0.001$ comparison with that before care; and ### $P < 0.001$ comparison with the control group. A: Fasting blood glucose; B: Fasting insulin; C: Homeostasis model assessment of insulin resistance.

weeks, 12 weeks and 24 weeks after care ($P = 0.011, 0.035, 0.013$), as shown in **Table 2**.

Discussion

Obesity is a common symptom in PCOS patients. It was reported that the obesity rate of PCOS was about 30%-70% [10]. Obesity is an important reason for ovulation failure in PCOS

patients. The obese PCOS patients are more prone to endocrine disorders and carbohydrate metabolism disorders and have more difficulty ovulating and conceiving compared with non-obese PCOS patients. The success rate of assisted reproductive technology is also lower in obese PCOS patients [11, 12]. As reported, the incidence of PCOS with carbohydrate metabo-

Influence of lifestyle guidance and mental care on PCOS

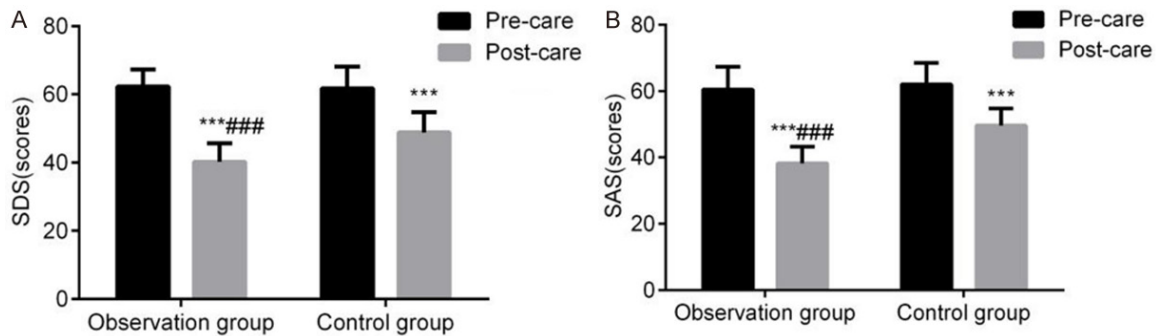


Figure 4. Comparison of mental states in two groups ($\bar{x} \pm s$). Notes: *** $P < 0.001$ comparison with that before care; and ### $P < 0.001$ comparison with the control group. A: SDS; B: SAS.

Table 2. Comparison of pregnancy situation in two groups [n (%)]

Group	<i>n</i>	8 weeks after care	12 weeks after care	24 weeks after care
Observation group	44	9 (20.45)	14 (31.82)	20 (45.45)
Control group	40	1 (2.50)	5 (12.50)	18 (45.00)
χ^2		4.842	4.467	3.667
<i>P</i>		0.011	0.035	0.019

lism disorder was as high as 70% [13]. Previous clinical research failed to clearly elucidate the pathogenesis of PCOS, which increased the difficulty of clinical treatment. Many research indicates that PCOS may be caused by heredity and other factors jointly and it is believed that the key factors of PCOS include obesity, reasonable diet, lack of exercise and family history, etc. [14-16]. Hence, lifestyle guidance can not only control weight and body mass index of patients, but also correct metabolic disorder, which is significant to promote ovulation and pregnancy. Moreover, the obese PCOS patients are more likely to suffer from obesity and infertility and develop unhealthy psychology, which will reduce their confidence and enthusiasm in treatment and thus affect the intervention effects. So, mental intervention in obese PCOS patients has also become a main issue in clinical practice.

This study showed that the weight and BMI of the observation group reduced and was lower than that of the control group after lifestyle guidance and mental care in obese PCOS patients, which was basically consistent with similar reports [17]. The mechanism to control weight and body mass index of patients by strengthening lifestyle guidance is shown below: lifestyle guidance can control the accept-

able daily intake of total dietary calories and promote the decomposition and discharge of hepatic glycogen. Under the action of gluconeogenesis, body fat and protein are used to achieve the effect of weight loss [18, 19]. It shall be noted that some obese PCOS patients cannot achieve the effect of weight loss or their weight may rebound rapidly after weight loss, which may be caused by physical differences and compliance of patients [20, 21]. Or it may be because the obese PCOS patients have multifactorial pathogenesis, so the means of strengthening lifestyle intervention only cannot achieve ideal effects [22].

This study showed that the internal secretion and metabolism indicators of LH, LH/FSH and T levels reduced after care in the observation group, which was basically consistent with previous literature reports [23]. The mechanism to improve internal secretion and metabolism and promote ovulation by strengthening lifestyle guidance is shown below: the accumulation of abdominal fat and visceral fat in obese PCOS patients can increase the release of inflammatory factors, adipocyte factors and other cell factors. These factors may not only increase the compensatory insulin level, but also affect the secretion of androgen and adrenal cortical hormone and lead to hyperandrogenism and cascade reactions, which will further cause endocrine disorder and abnormal expression of LH and LH/FSH and thus affect normal ovulation [24, 25]. Thus complicated endocrine disorders cannot be corrected by drugs, but lifestyle guidance can be strengthened to reduce weight and decrease visceral fat. When visceral fat decreases continuously, the effect of chronic low-grade inflammatory responses and adi-

pocyte factors on ovary and adrenal gland will be inhibited to reduce the secretion of androgens and avoid ovarian hyperthecosis caused by androgen excess and activity increase, which is conducive to ovulation [26, 27].

As shown in this study, carbohydrate metabolism indicators of HOMA-IR and FINS reduced in the observation group, which was consistent with similar reports [28]. The mechanism may be that lifestyle guidance is strengthened for weight loss to reduce the insulin resistance, enhance the insulin sensitivity and decrease insulin level. The hyperinsulinemia can increase the availability of testosterone and insulin-like growth factor to target tissues, stimulate the secretion of ovarian hormones and adrenal hormones and increase androgens [28]. Hence, the reduction of insulin levels can reduce the secretion of androgens, decrease the adverse influence of androgens on follicle development and maturation and thus promote ovulation. Furthermore, this study also indicated that pregnancy rate increased, and the mental states of anxiety and depression improved with the duration of care and all indicators of the observation group were much better than those of the control group. A series of lifestyle guidance was carried out to decrease the weight and body mass index, regulate LH, LH/FSH and T level, reduce HOMA-IR and FINS, promote ovulation and thus increase the pregnancy rate. At the same time, mental care can eliminate the mental states of anxiety and depression, restore confidence in treatment, enhance the degree of adaptability and compliance with intervention, encourage patients to persist in healthy lifestyles and thus improve the effect of weight loss and the pregnancy rate of patients.

In conclusion, lifestyle guidance and mental care can improve endocrine hormone levels, correct carbohydrate metabolism disorders, enhance the pregnancy rates and relieve the mental states of anxiety and depression in obese PCOS patients, so they are worth popularizing.

Disclosure of conflict of interest

None.

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