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Original Article

The effects of lifestyle guidance and mental health care on improving the carbohydrate metabolism and enhancing the pregnancy rate in obese PCOS patients mental health care

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Abstract: Objective: This study aimed to analyze the influence of lifestyle guidance and mental health care on internal secretions, carbohydrate metabolism, and pregnancy in obese patients with polycystic ovary syndrome (PCOS). Methods: A total of 107 obese PCOS patients admitted to our hospital from January 2015 to August 2017 were selected as the study cohort for a retrospective analysis and were divided into two groups according to the different means of intervention. The cohort included 53 patients in the control group who received routine care and 54 patients in the observation group who received lifestyle guidance and mental health care on the basis of routine care, so as to compare their body mass indexes, internal secretions, carbohydrate metabolisms, insulin resistance, and ability to get pregnant in the two groups after the intervention. Results: (1) The body mass indexes of the observation group were lower than they were in the control group 3 months after the intervention ($P<0.05$). (2) The testosterone (T), luteinizing hormone (LH), and follicle stimulating hormone (FSH) levels in the observation group were lower than they were in the control group 3 months after the intervention ($P<0.05$). (3) The fasting blood glucose (FBG), fasting insulin (FINS), and homeostasis model assessment of insulin resistance (HOMA-IR) levels in the observation group were lower than they were in the control group 3 months after the intervention ($P<0.05$). (4) The pregnancy rate in the observation group was 18.52%, which was higher than the 1.89% in the control group ($P<0.05$). Conclusion: The intervention of lifestyle guidance and mental health care in obese PCOS patients can improve internal secretions and carbohydrate metabolism and can enhance the pregnancy rate.

Keywords: Obese polycystic ovary syndrome, lifestyle guidance, mental health care, internal secretions, carbohydrate metabolism

Introduction

Clinically, polycystic ovary syndrome (PCOS) is a reproductive endocrine disease with a high incidence, and its main sufferers are women of childbearing age. This disease is also one of the main causes of female infertility [1, 2].

In previous clinical studies, the pathogenesis of PCOS was studied from the perspectives of insulin resistance, hyperandrogenism, and genetics [3]. However, recent studies have found that PCOS is a multifactorial syndrome which may be caused by the combined effect of social psychological factors, environmental factors and genetic factors [4]. Studies have shown that PCOS patients, with a series of somatizations, are more likely to suffer from negative emotions, such as self-abasement, nervousness, anxiety and depression, etc., in comparison with healthy people [5, 6]. The emergence of various negative emotions aggravates PCOS patients' pathological and physiological conditions and may lead to hyperinsulinemia, insulin resistance, increased androgen levels, and endocrine disorder, etc. [7, 8]. Furthermore, the occurrence of PCOS is also closely related to an unbalanced dietary structure, overeating, a lack of exercise, and other unhealthy lifestyles [9]. Therefore, in order to improve the states of internal secretion and carbohydrate metabolism and enhance the pregnancy rate, it is not only necessary to str-

engthen the intervention of mental health care in patients and relieve all of their negative emotions, but it is also indispensable to strengthen the scientific and reasonable lifestyle guidance to patients, to guide them developing healthy living habits, thus effectively controlling their conditions [10].

In the past, clinical interventions for PCOS patients mainly focused on disease control, but ignored the influence of mental health factors on the disease. In the present study, the lifestyle guidance and mental health care are strengthened in PCOS patients based on the comprehensive consideration of the physiological and psychological factors, which was innovative to some extent.

Methods

A total of 107 obese PCOS patients admitted to our hospital from January 2015 to August 2017 were selected as the study cohort for a retrospective analysis and divided into two groups according to the different means of intervention. Patients in the control group (n=53), with an average age of 22-39, received routine care, while those in the observation group (n=54), with an average age of 23-38, received lifestyle guidance and mental health care on the basis of the routine care. (1) Inclusion criteria: An informed consent was obtained, and the patients had no severe organ dysfunction, such as of the heart, liver, kidneys, etc. This study was approved by the Ethics Committee of the First People's Hospital of Wenling. (2) Exclusion criteria: This study excluded patients with mental and cognitive disorders; those with hematological disorders; those with complications such as pituitary tumors, adenomyosis, uterine fibroids, or other organic diseases of the reproductive organs; those with thyroid diseases; those with diabetes or other endocrine diseases; those with cardiovascular diseases; and those with a history of alcohol or drug dependence.

The patients in the control group received routine care. The nurses persuaded the patients to give up smoking and drinking, provided them with general advice on diet and instructed them to eat the food low in calories and carbohydrates and high in dietary fiber and protein.

The patients in the observation group received lifestyle guidance and mental health care on the basis of the routine care.

Lifestyle guidance: (1) Diet control: Patients were instructed to maintain a low caloric diet. Namely, the caloric intake of ideal body weight was kept between 42KJ and 48KJ per kilogram. Meanwhile, the importance of a high protein diet and a low carbohydrate diet was emphasized to the patients. The daily energy intake of lipids, proteins, and carbohydrates should be kept at the proportion of 3:3:4 according to Table of Five Food Groups and Ten Classes and Food Exchange List. At the same time, the actual situation of each patient was considered to formulate a targeted dietary intervention plan. The patients were required to keep diet diaries and adjust their diets accordingly. (2) Exercise intervention: Patients were instructed to workout at least 5 times per week, including various treadmill exercises, bike riding, sit ups, jogging, brisk walking, etc. The exercise duration should be between 30 and 45 minutes each time. Generally, the best times to exercise are 1 hour after dinner or 1 hour after breakfast. The patients should gradually increase the amount of exercise, starting with a low amount of exercise, and then increase the amount of exercise appropriately according to their actual conditions. During the exercise, the patients were doing aerobic exercises when their heart rates reached 140 times/min. (3) Behavioral intervention: Self-abasement, nervousness, depression, and other negative mental states, as well as long-term computer use, staying up late, drinking, smoking, and other unhealthy living habits will affect physical fitness and cause metabolic and endocrine disorders. Some patients may eat and drink too much or give up on themselves, with their energy intake clearly higher than their energy consumption. So the patients will become obese, which further aggravates their conditions. Therefore, the nurses should actively instruct patients to develop healthy living habits, put them in a good mood, help them change their unhealthy living habits like staying up late, drinking, and smoking, etc., and make them recognize the hazards of various unhealthy living habits and take the initiative to change.

Mental care: Generally, the obese PCOS patients are obese due to the influence of disease, so they are more likely to develop feelings of inferiority. Besides, as they always worry about their health, they may have negative mental states, such as anxiety and nervous-

Table 1. Comparison of the general data in the observation and control groups [n (%)]/($\overline{X}$ ± s)

Data	Observation group (n=54)	Control group (n=53)	t/X^2	*P*
Age (years old)	28.69±1.25	28.72±1.19	0.127	0.899
Body mass (kg)	68.15±2.16	68.23±2.19	0.191	0.849
Marital status [n (%)]				
Married	38 (70.37)	36 (67.92)	0.075	0.784
Single	16 (29.63)	17 (32.08)		
Educational background [n (%)]				
Junior high school or below	5 (9.26)	6 (11.32)	0.063	0.998
Senior high school to junior college	36 (66.67)	35 (66.04)		
Undergraduate college or above	13 (24.07)	12 (22.64)		

ness. For this reason, the nurses should inform the patients that negative mental factors will adversely affect their treatment, explain the relevant disease information to the patients, correct their misconceptions about the disease, and help them build the confidence in the treatment. At the present stage, PCOS is not only a medical problem, but also a psycho-social problem. Symptoms including obesity, hypertrichosis, sterility, and infertility will increase the patients' mental stress in different degrees. So the nurses should determine why the patients are depressed, answer their and their families' questions politely and patiently, strengthen the psychological counseling in a targeted manner, give hope to patients, help them build the confidence in treatment, and make them understand that their PCOS will be controlled if they positively cooperate with the nurses in treatment and care.

The intervention duration lasted for 3 months.

Observation targets

(1) Body mass: The two groups' body mass indexes were compared before the intervention and at 3 months after the intervention. (2) Indicators of internal secretion: From the two groups' second to fifth days of menstruation, 5 ml blood was taken from the cubital vein and centrifuged to obtain the liquid supernatant, which was stored in a refrigerator at -20°C for inspection. An enzyme linked immunosorbent assay was used to measure the total serum testosterone (T), serum luteinizing hormone (LH), follicle stimulating hormone (FSH), and other indicators. (3) Indicators of carbohydrate metabolism and insulin resistance: The fasting blood glucose (FBG), fasting insulin (FINS), and the homeostasis model assessment of insulin resistance (HOMA-IR) of the two groups were measured before the intervention and at 3 months after the intervention. (4) Pregnancy: The number of women who had gotten pregnant was compared between the two groups at 3 months after the intervention.

Statistical methods

SPSS 22.0 was used for the statistical analysis. The measurement data were expressed as the means ± standard deviations. Independent-samples *t* tests were used for the data in conformity with a normal distribution; Mann-Whitney U tests were used for the data not in conformity with a normal distribution, and paired-samples *t* tests were used for the comparisons within groups before and after the intervention. The enumeration data were expressed as [n (%)] and compared using X^2 tests between the groups. $P<0.05$ was considered statistically significant.

Results

Comparison of the general data in the observation and control groups

There were no statistical differences in terms of age, body mass index, marital status, or educational background in the two groups, which were comparable ($P>0.05$) (**Table 1**).

Comparison of the body mass indexesin the observation and control groups

There were no statistical differences in the body mass indexes of the two groups before the intervention ($P>0.05$). The body mass indexes of the two groups were clearly reduced

Table 2. Comparison of the body mass indexes in the observation and control groups ($\overline{X}$ ± s)

Group	Body mass (kg)	
	Before intervention	3 months after intervention
Observation group (n=54)	68.15±2.16	59.98±1.08#,*
Control group (n=53)	68.23±2.19	63.12±1.26#
t	0.190	13.849
P	0.850	0.000

Note: #means *P*<0.05 in comparison with that before intervention; and *means *P*<0.05 in comparison with that of the control group.

Table 3. Comparison of internal secretion indicators in the observation and control groups ($\overline{X}$ ± s)

Group	T (ng/mL)		LH (IU/L)		FSH (IU/L)	
	Before intervention	3 months after intervention	Before intervention	3 months after intervention	Before intervention	3 months after intervention
Observation group (n=54)	2.82±0.25	0.89±0.12#,*	10.96±3.12	6.12±1.05#,*	3.39±0.98	1.68±0.25#,*
Control group (n=53)	2.89±0.22	1.59±0.26#	10.99±3.09	8.69±1.36#	3.42±0.95	2.59±0.36#
t	1.536	17.935	0.049	12.633	0.632	10.658
P	0.127	<0.001	0.960	0.000	0.965	0.000

Note: #means *P*<0.05 in comparison with that before intervention; and *means *P*<0.05 in comparison with that of the control group.

at 3 months after the intervention (*P*<0.05). The body mass indexes of the observation group were significantly lower than they were in the control group at 3 months after the intervention (*P*<0.05) (**Table 2**).

Comparison of the internal secretion indicators in the observation and control groups

There were no statistical differences among all the internal secretion indicators of the two groups before the intervention (*P*>0.05). The T, LH, and FSH levels of the two groups were clearly reduced significantly 3 months after the intervention (*P*<0.05). The T, LH, and FSH levels of the observation group were significantly lower than they were in the control group 3 months after the intervention (*P*<0.05) (**Table 3**).

Comparison of the indicators of carbohydrate metabolism and insulin resistance in the observation and control groups

The FBG was (5.63±0.61) mmol/L in the observation group and (5.89±0.59) mmol/L in the control group before the intervention, indicating there was no statistical difference in the FBG of the two groups before the intervention (*P*>0.05). The FBG was (4.32±0.28) mmol/L in the observation group and (5.03±0.31) mmol/L in the control group 3 months after the intervention, indicating the FBG of the two groups was clearly 3 months after the intervention (*P*<0.05) and the FBG of the observation group was significantly lower than it was in the control group 3 months after the intervention (*P*<0.05) (**Figure 1**).

The FINS was (20.63±1.28) mU/L in the observation group and (20.69±1.25) mU/L in the control group before the intervention, indicating there was no statistical difference in the FINS of the two groups before the intervention (*P*>0.05). The FINS was (12.02±0.13) mU/L in the observation group and (15.36±0.36) mU/L in the control group 3 months after the intervention, indicating the FINS of the two groups was clearly reduced 3 months after the intervention (*P*<0.05) and the FINS of the observation group was lower than it was in the control group 3 months after the intervention (*P*<0.05) (**Figure 2**).

The HOMA-IR was (3.56±0.63) in the observation group and (3.63±0.68) in the control group before the intervention, indicating there was no statistical difference in the HOMA-IR of the two groups before the intervention (*P*>0.05). The HOMA-IR was (1.16±0.15) in the observation group and (2.16±0.32) in the con-

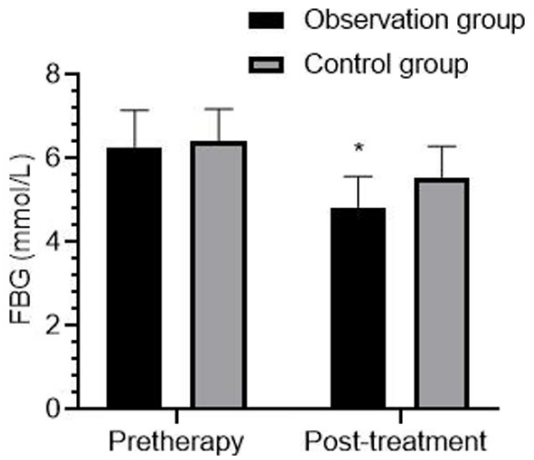

Figure 1. Comparison of the FBG of the two groups before and after the intervention. *P*>0.05 was obtained by comparing the FBG of the two groups before the intervention; and the FBG level of the observation group was lower than it was in the control group 3 months after the intervention (*P*<0.05). Note: * means *P*<0.05 compared to the control group.

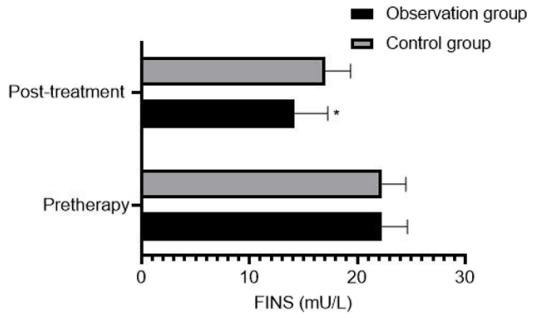

Figure 2. Comparison of the FINS of the two groups before and after the intervention. *P*>0.05 was obtained by comparing the FINS of the two groups before the intervention; and the FINS of the observation group was lower than it was in the control group 3 months after the intervention (*P*<0.05). Note: * means *P*<0.05 in comparison with the control group.

trol group 3 months after the intervention, indicating the HOMA-IR of the two groups was clearly reduced 3 months after the intervention (*P*<0.05), and the HOMA-IR of the observation group was lower than it was in the control group 3 months after the intervention (*P*<0.05) (**Figure 3**).

Comparison of the pregnancy rate in the observation and control groups

10 patients from the observation group were pregnant 3 months after the intervention, with a pregnancy rate of 18.52%, and 1 patient from the control group was pregnant 3 months after the intervention, for a pregnancy rate of 1.89%, indicating that the pregnancy rate in the observation group was higher than it was in the control group (*P*<0.05) (**Table 4** and **Figure 4**).

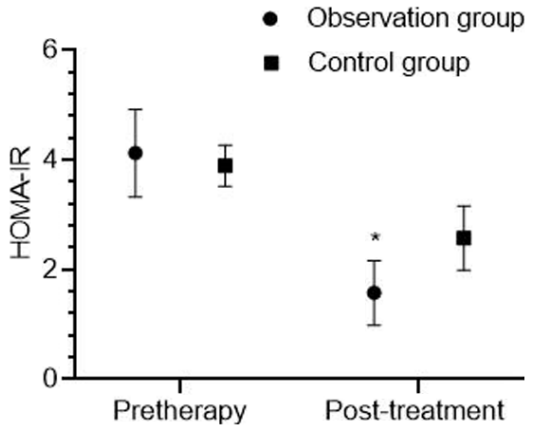

Figure 3. Comparison of the HOMA-IR of the two groups before and after the intervention. *P*>0.05 was obtained by comparing the HOMA-IR of the two groups before intervention; and the HOMA-IR of the observation group was lower than it was in the control group 3 months after the intervention (*P*<0.05). Note: * means *P*<0.05 in comparison with the control group.

Discussion

PCOS is a gynecological disease with a high incidence and a long duration in clinical practice. It often occurs repeatedly and can be difficult to cure, and it seriously affects patients' normal work and lives [11, 12]. More than half of PCOS patients suffer from obesity which not only causes insulin resistance and increases the compensatory insulin level, but it also affects follicle development and maturation and finally causes female infertility [13, 14].

In recent years, a large amount of clinical studies have shown that most PCOS patients generally lack of confidence and have anxiety, depression and other unhealthy emotions [15, 16]. Their negative emotional reactions can affect their neuroendocrine functions, cause abnormal gonadal hormone concentrations, and thus lead to female reproductive dysfunction, mainly manifesting as anovulation, difficulty in ovulation, infrequent menstruation, and amenorrhea, etc. [17, 18]. Moreover, the negative emotional reactions can also influence the release of norepinephrine and dopamine

Table 4. Comparison of the pregnancy rates in the observation and control groups [n (%)]

Group	Number of cases	Non-pregnancy rate
Observation group	54	10 (18.52)*
Control group	53	1 (1.89)
X^2		8.022
P		0.005

Note: *means *P*<0.05 in comparison with that of the control group.

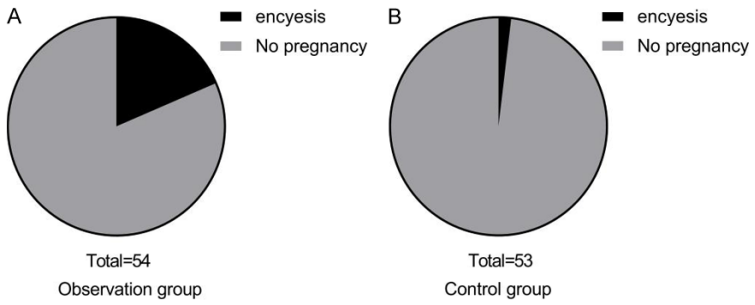

Figure 4. Comparison of the pregnancy rates of the two groups after the intervention. The pregnancy rate in the observation group was 18.52% at 3 months after intervention, which was higher than the 1.89% in the control group (*P*<0.05).

through the hypothalamus, therefore causing a changes in the cervical mucus, spasms of the fallopian tubes, or irregular menstruation, ultimately leading to infertility [19]. The clinical treatment of PCOS usually focuses on drug therapy and ignores the influence of mental factors on the disease's therapeutic effect [20].

Polycystic ovary syndrome and obesity are not only related to genetic factors, they are also closely correlated with the patients' unhealthy lifestyles [21, 22]. Spiritual hypertension and long-term stress promote the secretion of serum cortisol and inhibit the hypothalamic-pituitary-adrenal axis. overwork A lack of sleep will significantly increase the cortisol and blood glucose levels, leading to vagus and sympathetic nerve disorders [23, 24]. The drug therapy for PCOS can improve patients' clinical symptoms to a certain extent, but the effective target is so simple that it cannot improve the endocrine and metabolic disorders. Also, various clinical symptoms may occur repeatedly after the drug withdrawal [25, 26].

This study showed that the body mass index, body mass, T, LH, FSH, FBG, FINS, and HOMA-IR in the observation group were significantly lower than they were in the control group at 3 months after the intervention, and the pregnancy rate in the observation group was higher than it was in the control group 3 months after the intervention (*P*<0.05), implying that the intervention of lifestyle guidance and mental health care in obese PCOS patients can improve the states of internal secretion and carbohydrate metabolism and enhance the pregnancy rate. The reason may be that the scientific and reasonable lifestyle guidance to patients can help them build good lifestyles. For instance, the pathogenesis of PCOS can be eliminated from the source by ensuring good sleep quality, keeping a stable emotional state and strengthening physical exercise and regular diet, etc., which will improve the overall metabolic microenvironment and endocrine function. Fessler [27] and other scholars combined multiple scientific lifestyle interventions in obese PCOS patients, including exercise, nutrition and cognition, and found that the body mass index of obese PCOS patients was controlled effectively after intervention, and the metabolic state and reproductive function were also improved. Kellesarian [28] and other scholars considered the influence of exercise on obese PCOS patients and found that the exercise therapy can improve the insulin resistance and ovulation function of obese PCOS patients. These researchers' findings were very similar to the results of this study, which further proves the effectiveness of lifestyle guidance and mental health care in obese PCOS patients.

In conclusion, the intervention of lifestyle guidance and mental health care in obese PCOS patients is conducive to improving the states of internal secretions and carbohydrate metabolism and enhancing the pregnancy rate, a finding which is worthy of communicating to health care providers.

However, the results of this study were not representative enough due to the small cohort, so it is necessary to expand the sample size for more in depth studies in the future.

Disclosure of conflict of interest

None.

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