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Original Article

Study on risk factors for depression in female infertile patients and evaluation of efficacy of psychological nursing intervention

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Abstract: Objective: To analyze the risk factors for depression in infertile patients on a basis of female infertile outpatients and to evaluate the efficacy of psychological interventions on depression and quality of life. Methods: The study was comprised of the following two parts: in the first part, a total of 185 patients treated from January 2015 to December 2015 were recruited as research objects and a case-control study was adopted to analyze the risk factors for depression in female infertile patients; the second part was a randomized controlled study of 160 female infertile patients treated from January 2016 to December 2016, who were categorized into regular nursing group and psychological nursing group. To compare the differences in score improvements of Self-rating Depression Scale (SDS) and The Fertility Quality of Life (FertiQoL) between the two groups at the initial visit and three months after the intervention, comprehensive psychological interventions of health education and cognitive behavioral therapy were conducted in the psychological nursing group on the basis of routine care. Results: On a univariate analysis, age, educational level, family income, the duration of infertility, causes of infertility, costs and frequencies of treatments were all possible risk factors for depression in female infertile patients. Taking the above factors into the logistic regression analysis, the study found that the longer duration of infertility, female factor infertility, the higher costs and frequencies of treatments were all independent risk factors for depression in female infertile patients and the adjusted odds ratios were 1.77 (95% confidence interval (CI): 1.18-2.29), 2.26 (95% CI: 1.43-3.24), 1.89 (95% CI: 1.21-2.44) and 2.19 (95% CI: 1.53-3.23), respectively. The score improvements of SDS and FertiQoL before and after intervention in psychological intervention group were outstandingly higher than those in the control group (all $P<0.05$). Conclusion: The longer duration of infertility, female factor infertility, the higher costs and frequencies of treatments will increase the risks of depression in female infertile patients. In comparison with routine care, psychological intervention can effectively alleviate the depression and improve the quality of life in patients.

Keywords: Infertility, depression, risk factor, psychological intervention, quality of life

Introduction

Infertility is a disorder in patients who have a normal sex life without contraception after marriage and cohabit for two years without a pregnancy. In 2010, the global prevalence of primary infertility and secondary infertility in women was 1.9% and 10.5%, respectively [1]. In China, with the influences of environmental pollution, accelerated pace of life, increased work pressure and dietary changes, the infertility rate showed a trend of increasing year by year. According to a systematic review, the rate of infertility among newlyweds for one year and two years was 12.5% and 6.6% respectively in our country, which has become a crucial social and public health problem [2]. In addition to personal psychological distress, infertile patients also face pressures from family, society and many other aspects, especially female patients who are prone to depression, anxiety and other negative emotions. Among all the distresses, the most prominent one is depression, resulting in seriously affecting the quality of life of patients, even exacerbating the condition and prognosis of infertility [3, 4]. Previous studies have suggested that various social, environmental and psychological factors, such as pri-

mary infertility, the duration of treatment, male attitude and educational level, may increase the risks of depression in female patients with infertility [5-7]. Investigating the risk factors for depression in female infertile patients contributes to providing the scientific basis for making interventions to alleviate depression in patients with infertility.

Several studies have found that psychological interventions can reduce depression, anxiety and other negative emotions in patients with infertility, and improve quality of life; but due to the differences of the study designs and evaluating indexes, the results of the studies are not exactly the same [6, 8-12]. A Meta-analysis study showed that prominent differences in the effects of psychological interventions on Hamilton Rating Scale for Depression among infertile patients; however, in the analysis of indicators in Self-rating Depression Scale (SDS), there was no markedly difference between psychological nursing intervention and other nursing methods in the effects on depression in patients with infertility [13]. Based on female infertile outpatients, this study analyzed the risk factors for depression in infertile patients and evaluated the efficacy of psychological interventions on depression and quality of life in order to elucidate the efficacy of interventions, which will provide a scientific basis for improving the nursing efficacy in female infertile patients.

Materials and methods

Study subject

This study was approved by the Ethics Committee of Shenzhen People's Hospital, Ji'nan University. Female patients with infertility treated in the Reproductive Medicine Center of Shenzhen People's Hospital, Ji'nan University from January 2015 to December 2016 were enrolled as study subjects. Inclusion criteria: (1) Patients were definitively diagnosed with infertility and fulfilled the World Health Organization diagnostic criteria for infertility, which included one year of husband and wife cohabitation without contraception but not pregnant. (2) Patients aged from 20 to 45 years old were recruited. (3) Patients without psychiatric diseases or disorders of consciousness were selected. (4) Informed consents were obtained. Exclusion criteria: (1) Patients complicated by other severe diseases. (2) Patients had cognitive or mental malfunctions.

Research design

Study on risk factors for depression in female infertile patients: The study was divided into the following two parts. A total of 185 patients treated from January 2015 to December 2015 were enrolled in this study and their demographic and infertility-related clinical information were collected. Patients were assigned into the case group and the control group according to the occurrence of depression during the study and a case-control study was adopted to analyze the risk factors for depression in female patients with infertility.

Efficacy of psychological intervention on depression and quality of life in female infertile patients: A total of 160 female infertile patients treated from January 2016 to December 2016 were randomly assigned by a random number table, including the control group and the intervention group with 80 cases in both groups. The control group received conventional treatments and routine cares, and diets, lifestyle habits, medications and cares of the patients' conditions were given at every visit to a physician. Besides routine cares, psychological interventions were conducted in the intervention group by the caregivers, who had participated in the relevant psychological intervention trainings, including: (1) Through the conversation with the patient at the time of the health care visit, major problems of the patient were aware of and a comprehensive assessment of the patient's condition and emotion was made. According to the literature reported before and the risk factors determined in the early stage, the high-risk individuals for depression were identified, which contributed to carrying out psychological interventions appropriately; (2) Health education: At the initial outpatient visit, patients would receive education manuals on reproduction edited by own department. Since then, health education campaigns were carried out on a regular basis. In addition, related knowledge would be taught and the problems encountered by the patients in the diagnosis and treatment would be answered by nurses and doctors in senior positions from the department; (3) Interventions of cognitive behavior: in consideration of all the patients were outpa-

Table 1. Univariate analysis of quantitative data in case group and control group

Characteristics	Control group (n=98)	Case group (n=87)	X^2	*P* value
Age (years)				
<25	7 (7.1)	9 (10.3)		
25-29	50 (51.0)	28 (32.2)		
≥30	41 (41.9)	50 (57.5)	6.715	0.035
Level of education				
Grade school education or below	6 (6.1)	15 (17.2)	9.790	0.020
Junior high education	12 (12.2)	11 (12.6)		
High school or secondary vocational school education	54 (55.1)	31 (35.6)		
Junior college or above	26 (26.6)	30 (34.6)		
Place of residence				
Rural region	59 (60.2)	50 (57.5)	0.142	0.706
Urban region	39 (39.8)	37 (42.5)		
Monthly income in family (yuan)				
<3000	16 (16.3)	29 (33.3)	7.291	0.026
3000-5000	44 (44.9)	30 (34.5)		
>5000	38 (38.8)	28 (32.2)		
Job				
Yes	19 (19.39)	20 (22.99)	0.359	0.549
No	79 (90.61)	67 (77.01)		
Home setting				
Only husband and wife	62 (63.3)	41 (47.1)	4.864	0.027
Live with parents	35 (36.7)	46 (52.9)		
Duration of infertility				
<4 years	50 (51.0)	29 (33.3)	5.893	0.015
≥4 years	48 (49.0)	58 (66.7)		
Pregnancy history				
No	44 (44.9)	48 (55.2)	1.946	0.163
Yes	54 (55.1)	39 (44.8)		
Cause of infertility				
Male factor	63 (65.0)	35 (40.2)	11.260	0.001
Female factor	34 (35.0)	52 (59.8)		
Costs of treatments for infertility (yuan)				
<40000	51 (52.0)	29 (33.3)	6.572	0.010
≥40000	47 (48.0)	58 (66.7)		
The number of treatments (times)				
<3	58 (59.2)	31 (35.6)	10.240	0.001
≥3	40 (40.8)	56 (64.4)		

tients, the study mainly focused on individual cognitive interventions. At the time of outpatient follow-up, methods of relaxation training were taught. Additionally, the one-to-one communication helped patients to identify and correct cognitive errors, so as to reconstruct cognitive structures; tailored according to each patient, individual psychological counseling was performed on patients with negative emotions and high-risk individuals.

Evaluating indexes

Depression score: All patients were evaluated for depression by SDS at the first outpatient service [14]; an SDS score of greater than fifty

Table 2. Multivariate analysis of risk factors for depression in female patients with infertility

Characteristics	Adjusted OR	95% CI	*P* value
Duration of infertility			
<4 years	Reference		
≥4 years	1.77	1.18-2.29	0.035
Cause of infertility			
Male factor	Reference		
Female factor	2.26	1.43-3.24	0.012
Costs of treatments for infertility (yuan)			
<40000	Reference		
≥40000	1.89	1.21-2.44	0.032
The number of treatments (times)			
<3	Reference		
≥3	2.19	1.53-3.23	0.014

Note: OR, odds ratio; CI, confidence interval.

indicated the presence of depression. Furthermore, two groups of patients who participated in the psychological intervention assessments were reevaluated at the follow-up after three months of interventions.

Quality of life score: Fertility quality of life was investigated in two groups of patients by The Fertility Quality of Life (FertiQoL) at the first outpatient service and the follow-up after three months of interventions [15]. This scale was made up of two core modules: the core FertiQoL and the therapeutic FertiQoL. The core FertiQoL consisted of four dimensions, including emotions, conjugal relations, social relations, physical and mental states, while the therapeutic FertiQoL contained two dimensions, including medical environment and tolerability of the treatment. The scale was a five grades evaluation with a 0-4-grade scoring system and a total score of 100 points. The higher the score was, the better quality of life would be.

Statistical analysis

All statistical analyses were performed with SPSS19.0 software. The categorical variables were represented by the constituent ratio and the significance of the differences was tested by the two-sided chi-square test while the continuous variables were expressed as mean ± standard deviation ($\bar{x}$ ± sd) and the Student's t-test was used for comparisons between independent samples from two groups. In the first part of the study, univariate and multivariate logistic regressions were adopted to analyze the risk factors for postoperative agitation; in multivariate analysis, likelihood ratio test was based on maximum local likelihood and forward stepwise selection was conducted in independent variables. In the second part of the study, the improvements of depression scores and quality of life scores before and after intervention in both groups were examined by paired t-test. The differences in improving scores above between the two groups were compared with unpaired Student's t-test. The statistical significance level was 0.05 for bilateral alpha.

Results

Univariate analysis of depression in female patients with infertility

Out of the 185 patients treated from January 2015 to December 2015, 87 patients with SDS scores of more than fifty at initial outpatient visit constituted the case group while the remaining 98 patients formed the control group. The incidence of depression was 47.0%. The baseline and clinical features of both groups are shown in **Table 1**. The proportion of patients aged 30 years or older in the case group was 57.5%, which was apparently higher than that in the control group with a proportion of 41.8% (P=0.035). In comparison with the control group, the level of education and the proportion of living with parents in the case group were outstandingly higher while the income was relatively low (P=0.020, P=0.027 and P=0.026). In terms of infertility characteristics, the duration of infertility was longer in the case group and the proportion of female factor infertility, costs and frequencies of treatments in the case group were markedly higher than those in the control group (all P<0.05). There was no notable difference between the two groups in place of residence, working and history of pregnancy (all P>0.05).

Table 3. Comparison of general characteristics between psychological intervention group and regular nursing group

Characteristics	Comprehensive care group (n=80)	Regular nursing group (n=80)	X^2	*P* value
Age (years)				
<25	4 (5.0)	8 (10.0)	1.443	0.486
25-29	34 (42.5)	32 (40.0)		
≥30	42 (52.5)	40 (50.0)		
Level of education				
Grade school education or below	9 (11.3)	6 (7.5)	2.405	0.493
Junior high education	8 (10.0)	12 (15.0)		
High school or secondary vocational school education	32 (40.0)	37 (46.3)		
Junior college or above	31 (38.7)	25 (31.2)		
Monthly income in family (yuan)				
<3000	7 (8.8)	11 (13.8)	2.025	0.363
3000-5000	34 (42.5)	38 (47.5)		
>5000	39 (48.7)	31 (38.7)		
Home setting				
Only husband and wife	28 (35.0)	37 (46.3)	2.100	0.147
Live with parents	52 (65.0)	43 (53.7)		
Duration of infertility				
<4 years	39 (48.8)	32 (40.0)	1.241	0.265
≥4 years	41 (51.2)	48 (60.0)		
Cause of infertility				
Male factor	36 (45.0)	47 (58.8)	3.029	0.082
Female factor	44 (55.0)	33 (41.2)		
Costs of treatments for infertility (yuan)				
<40000	37 (46.3)	46 (57.5)	2.028	0.154
≥40000	43 (53.7)	34 (42.5)		
The number of treatments (times)				
<3	39 (48.8)	45 (56.3)	0.902	0.342
≥3	41 (51.2)	35 (43.7)		

Multivariate analysis of depression in female patients with infertility

The results of **Table 1** also indicated that age, education level, family income, the duration of infertility, causes of infertility, costs and frequencies of treatments were all possible risk factors for depression in female infertile patients. The factors mentioned above were included in the logistic regression analysis, which suggested that the longer duration of infertility, female factor infertility, higher costs and frequencies of treatments were all independent risk factors for depression in female infertile patients, and the adjusted odds ratios were 1.77 (95% confidence interval (CI): 1.18-2.29), 2.26 (95% CI: 1.43-3.24), 1.89 (95% CI: 1.21-2.44) and 2.19 (95% CI: 1.53-3.23). See **Table 2**.

General characteristics of patients receiving routine intervention or psychological intervention

None of the patients in two groups withdrew during the study. A total of 160 female infertile patients treated from January 2016 to December 2016 were categorized into two groups according to the intervention methods. Comparisons of baseline characteristics in these two groups are shown in **Table 3**. There was no remarkable difference between the two groups in the demographic characteristics or clinical features of infertility (all P>0.05).

Table 4. Comparison of improvements in depression between psychological intervention group and regular nursing group

Items	Comprehensive care group (n=80)	Regular nursing group (n=80)	t value	*P* value
SDS				
Before intervention	56.5±9.7	58.1±10.9	0.981	0.328
After intervention	52.2±8.6	55.5±9.4		
Difference	4.3±3.9	2.6±2.7	3.206	0.002
t value	9.862	8.019		
P value	<0.001	<0.001		

Note: SDS, Self-rating Depression Scale.

Comparison of improvements of depression in two groups of patients before and after intervention

Before the intervention, there was no obvious difference in depression scores between the two groups. After three months of interventions, depression was noticeably improved in both groups (both P<0.001), while the improvements of depression in the psychological nursing group were outstandingly greater than those in the routine intervention group (P=0.002). See **Table 4**.

Comparison of improvements of quality of life in two groups of patients before and after intervention

There was no noted difference in quality of life scores between the two groups of patients before interventions (all P>0.05). After interventions for three months, the scores of all items in the psychological intervention group were prominently improved (all P<0.001), while the scores in the routine group (all P<0.05) were markedly improved except for the marital relationship score (P=0.077). The results of between-groups comparisons after interventions demonstrated, except that there was no pronounced difference between the two groups in the improvements of environmental scores (P=0.567), psychological intervention group was evidently better than the regular nursing group in the scores of emotional response, physical and mental function, marital relationship, social relationship and tolerability (all P<0.05). See **Table 5**.

Discussion

In recent years, due to the influences of environmental, social, lifestyle and other factors, the incidence of infertility is increasing continuously. Infertility makes patients under tremendous mental stress; especially in our country, the concept of "the continuation of the family line" still exists, which makes infertility patients, particularly female patients, prone to negative emotions such as depression and anxiety. In this study, the prevalence of depression in women with infertility was 47%, similar to the results of other domestic studies [16, 17]; but some results in other studies were higher or lower than those in this study [18, 19]. The differences may be related to cultural traditions, the number and sources of patients, and evaluating indexes, etc. Overall, the incidence of depression in female infertile patients is prominently higher than that in general population in China [20]. Correspondingly, depression in female patients with infertility exacerbates the deterioration of the quality of life as well [21].

In current reports, the risk factors for depression in female patients with infertility are not an exact match. In this study, the longer duration of infertility, female factor infertility, higher costs and frequencies of treatments are all independent risk factors for depression in female infertile patients, which yields similar results as other studies but is not exactly the same [5]. As in this study, there was no distinctive correlation between age and depression in female infertile patients whereas another study concluded that the older the age was, the higher the risk of depression would be [22]. But a domestic study suggested that age was a protective factor for female patients with infertility [23]. In another study, education levels and place of residence were markedly associated with depression in female infertile patients, whereas no evidence of the same result was found in this study, which was similar to the result of another study [16, 24]. As a consequence, further researches will be warranted in the future to identify and validate the risk factors for depression in female patients with infertility.

Currently, many psychological interventions have been explored in the control of depression

Table 5. Comparison of improvements in quality of life between psychological intervention group and regular nursing group

Quality of life	Comprehensive care group (n=80)	Regular nursing group (n=80)	t value	*P* value
Emotional response				
Before intervention	59.5±7.9	58.3±7.4	0.992	0.323
After intervention	62.4±8.1	59.8±7.7		
Difference	2.9±4.5	1.5±4.1	2.057	0.041
t value	5.764	3.272		
P value	<0.001	0.002		
Physical and mental function				
Before intervention	55.6±6.4	57.1±6.9	1.426	0.160
After intervention	58.8±9.4	58.9±9.1		
Difference	3.2±4.4	1.8±4.3	2.035	0.043
t value	6.505	3.744		
P value	<0.001	<0.001		
Marital relation				
Before intervention	62.2±8.8	59.6±8.5	1.901	0.060
After intervention	64.0±8.4	60.2±7.9		
Difference	1.8±3.2	0.6±3.0	2.445	0.012
t value	5.031	1.789		
P value	<0.001	0.077		
Social relation				
Before intervention	57.2±8.8	58.6±8.5	1.023	0.308
After intervention	59.5±8.4	59.6±9.1		
Difference	2.3±3.9	1.0±3.8	2.135	0.034
t value	5.275	2.354		
P value	<0.001	0.021		
Environment				
Before intervention	61.7±7.6	60.1±6.9	1.394	0.165
After intervention	65.2±7.9	63.2±8.3		
Difference	3.5±4.1	3.1±4.7	0.574	0.567
t value	7.635	5.899		
P value	<0.001	<0.001		
Tolerability				
Before intervention	55.8±9.2	54.1±8.8	1.194	0.234
After intervention	57.7±10.5	54.9±9.2		
Difference	1.9±3.3	0.8±3.1	2.173	0.031
t value	5.150	2.308		
P value	<0.001	0.024		

in female infertility, such as behavior, cognition, supportive psychotherapy, etc. These results demonstrate that psychological interventions on infertile patients can alleviate the negative emotions such as depression and improve quality of life in the course of treatment [25-27]. In this study, based on the results of previous case-control studies and reports from other studies, targeted psychological interventions were conducted in the psychological intervention group. The results illustrated that the depression and the quality of life in the psychological intervention group and the regular nursing group at three months after interventions were noticeably improved compared with those at the initial visit, and the improvements in the comprehensive psychological intervention group were remarkably better than those in the control group, which was similar to the results of other studies [25, 28]. Nevertheless, effects of psychological interventions on the improvements of depression and quality of life in female infertile patients remain controversial. In a recent systematic review of 21 studies involving the assessment of depression state, we found that with no statistical significance, the effect of psychological intervention was 0.29 (95% CI: -0.07-0.65) after the possible publication bias was adjusted [29]. Therefore, the efficacy of psychological interventions on depression and quality of life in female patients with infertility warrants further investigation.

Several limitations about our study should be addressed. For instance, not all reported factors were taken into account in the case-control study. Although randomization was adopted in the intervention study, the blind design was not carried out, which could not avoid the influences of some biases. In the future research, it is of great significance to evaluate the efficacy

of psychological interventions on depression and quality of life in female infertile patients by definitive evaluating indexes and a large sample size of randomized intervention controlled trial design, so as to provide an overwhelming evidence for psychological interventions in the control of negative emotions in female patients with infertility.

Collectively, based on the analysis of the risk factors for depression in female infertile patients, this study confirms that psychological intervention can prominently reduce the degree of depression and improve the quality of life in the treatment of female patients with infertility.

Disclosure of conflict of interest

None.

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