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Original Article

Correlative analysis of psychological factors and interventions for adults with primary nephrotic syndrome

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Abstract: Objective: The aim of this study was to examine correlative factors and intervention measures for psychological states of adults with primary nephrotic syndrome (PNS). Methods: Data of 320 patients with PNS was retrospectively analyzed concerning psychological states and correlative factors, using multiple linear regression analysis. A prospective randomized controlled trial with 130 patients with PNS was conducted. They were randomly assigned into the observation group and control group, with 65 cases in each group. The observation group received psychological intervention, while the control group did not. Symptoms check-list-90 (SCL-90), self-rating anxiety scale (SAS), and self-rating depression scale (SDS) scores were compared between the two groups, before and after the intervention period. Outcomes of the two groups were also compared. Results: SCL-90 scores were positively correlated with education levels, hospital stays, 24-hour urinary protein quantity, and infections. They were negatively correlated with monthly family income, source of hospital costs, and plasma albumin. Scores of all dimensions in SCL-90 were lower in the observation group than in the control group, after psychological intervention. After intervention, the number of patients with anxiety and depression in the observation group was less than that in the control group. SAS and SDS scores in the observation group were lower than those of the control group, with statistically significant differences ($P = 0.004$, $P = 0.001$). Effective rates for PNS were 80.0% in the observation group and 24.6% in the control group, with statistically significant differences between the two groups ($P < 0.05$). Conclusion: The psychological state of patients with PNS is affected by certain factors, to varying degrees, mainly including education levels, hospital stays, monthly family income, source of hospital costs, 24-hour urinary protein quantity, plasma albumin, and infections. Psychological intervention can effectively alleviate negative emotions, such as anxiety and depression, and improve the mental health of patients, showing positive significance for outcomes of PNS.

Keywords: Primary nephrotic syndrome, adult, psychological state, correlation, psychological intervention

Introduction

Primary nephrotic syndrome (PNS) is characterized by a series of pathological and physiological changes because of plentiful proteins lost in the plasma through urination due to increased permeability of the glomerular filtration membrane. This can be caused by a variety of reasons. Clinical changes include massive proteinuria (greater than 3.5 g/24 h), hypoalbuminemia (less than 30 g/L), edema, and hyperlipidemia [1-3]. Incidence of nephrotic syndrome in adults is increased by 3 new cases per 100,000 people, annually [4]. PNS will eventually develop into end-stage renal disease, without timely treatment [5]. Treatment for PNS is difficult due to a long period and easy recurrence. Therefore, patients usually have uncertainty about treatment and may develop psychological symptoms, such as irritability, inferiority, fear, and anxiety [6, 7]. This study investigated the psychological symptoms of adult patients with PNS, correlative factors of psychological symptoms, and effects of psychological intervention, according to symptoms check-list-90 (SCL-90), anxiety, depression, and PNS outcome scores.

Materials and methods

General data

The current study retrospectively analyzed data of 320 adult patients with PNS. They were admitted to Dezhou People's Hospital from Janu-

ary 2014 to January 2017. Patients included 240 males and 80 females, with a male to female ratio of 3:1. Age ranged from 16 to 76 years, with an average age of 33.6 ± 48.1 years. Factors affecting SCL-90 were analyzed using univariate analysis and multivariate linear regression analysis.

Another 130 adult patients with PNS, admitted to Dezhou People's Hospital from March 2017 to March 2018, were enrolled. Patients included 96 males and 34 females, with a male to female ratio of 2.8:1. Age ranged from 18 to 75 years, with an average age of 34.8 ± 47.1 years. All 130 patients met the diagnostic criteria for PNS. They were randomly assigned into the observation group and control group, with 65 cases in each group. The observation group received psychological intervention, while the control group received routine care without any psychological intervention. This study was approved by the Ethics Committee of Dezhou People's Hospital and written informed consent was obtained from all patients.

Criteria

Diagnostic criteria for PNS are as follows: 1) Large amount of proteinuria and concentrations of 24-hour proteinuria greater than 50 mg/kg; 2) Concentrations of plasma albumin less than 25 g/L; 3) Concentrations of plasma cholesterol greater than 5.7 mmol/L; 4) Various degrees of edema (main manifestations) [8].

Patients were eligible for the current retrospective analysis if they were: 1) Aged between 16-76 years old; 2) Diagnosed with PNS according to the diagnosis criteria above; 3) Showed no heart, brain, lung, hematopoietic system, and other serious diseases or mental disorders; and 4) Were informed and willing to participate in the study. Patients were excluded from the current retrospective analysis if they were: 1) Aged younger than 16 years old or older than 77 years old; 2) Had secondary nephrotic syndrome due to infection, drugs, toxins, allergens, tumors, diabetes, systemic lupus erythematosus, anaphylatic purpura nephritis, or renal amyloidosis; 3) With heart, brain, lung, hematopoietic system, and other serious diseases; and 4) History of mental disorders.

Patients were eligible for the prospective randomized controlled trial if they were: 1) Aged 18-75 years; 2) Diagnosed as PNS according to the diagnosis criteria above; 3) Had no heart, brain, lung, hematopoietic system, and other serious diseases or mental disorders; and 4) Were informed and willing to participate in the study. Patients were excluded from the prospective randomized controlled trial if they were: 1) Aged younger than 18 years or older than 75 years; 2) Had secondary nephrotic syndrome due to infection, drugs, toxins, allergens, tumors, diabetes, systemic lupus erythematosus, anaphylatic purpura nephritis, or renal amyloidosis; 3) Had heart, brain, lung, hematopoietic system, and other serious diseases; and 4) History of mental disorders.

Psychological intervention

In the control group, patients only received routine care. Blood pressure, heart rates, and pulse were monitored twice a day. For patients with edema, 24-hour urine volume was recorded. The clinical status of patients was observed. Doctors were contacted promptly if any complications occurred. Patients in this group did not receive any psychological intervention.

In the observation group, patients received the following psychological intervention in addition to routine care: 1) Health education and timely explanations of the purpose and significance of the treatment; 2) Explaining the purpose and methods of preventing infections, the roles and side effects of oral medication, and outcomes and prognosis of the disease; 3) Gradually explaining the disease in simple language, making sure that patients had a preliminary understanding of PNS and that a life desire, could overcome anxiety and tension. They were encouraged to face reality and avoid overwork; and 4) Educating patients concerning adequate sleep, maintaining emotional stability, controlling bad moods, learning to relax, reducing mental stress, and facing the disease and treatment with a positive and optimistic attitude.

Methods

The current retrospective study was conducted in 320 adult PNS patients. Each patient filled out the SCL-90 scale. Factors influencing the results were identified by univariate analysis and multivariate linear regression analysis.

The prospective randomized controlled clinical trial was conducted in 130 adult PNS patients, obtaining information including age, gender, education level, occupation, hospital stays, type of medical insurance, family income, source of hospital cost, 24-hour urinary protein quantity, plasma albumin level, and infections during hospitalization. Patients were measured for psychological symptoms in the first week of admission. They were given three months of psychological intervention and assessed for following scales within one week after intervention. They were analyzed for correlative factors of psychological symptoms, proposing corresponding psychological interventions.

SCL-90 is a scale for assessment of patient current clinical symptoms, including grief and psychopathological symptoms, with 90 items. SCL-90 consists of 9 dimensions, including somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. The scoring system contains five levels [9].

Self-rating anxiety scale (SAS) is a scale used to measure the degree of anxiety in patients. There are 20 items and the scoring system contains levels 1 to 4 [10].

Self-rating depression scale (SDS) is a scale measuring the severity of depression and changes of depression during treatment. SDS consists of 20 items and the scoring system contains 4 levels [11].

Outcomes of PNS were classified into three categories: 1) Markedly effective: 24-hour urinary protein quantity less than 5 mg/kg and plasma albumin greater than 25 g/L; 2) Effective: 24-hour urinary protein quantity no more than 50 mg/kg and decreased more than 50%, compared with before treatment; 3) Non-effective: 24-hour urinary protein quantity greater than 50 mg/kg or decreased less than 50%, compared with before treatment. Effective rate = rate of markedly effective + rate of effective.

Statistical analyses

Statistical analyses were performed using SPSS 17.0 software. Independent variables were first screened by univariate analysis. Multiple linear regression analysis was performed on statistically significant variables of SCL-90 scores (dependent variables), identifying influencing factors of psychological symptoms. Measurement data are expressed as mean ± standard deviation (mean ± sd). SCL-90 scores of patients, before and after intervention, were compared using paired t-tests. SCL-90, SAS, and SDS scores between groups were compared using independent sample t-tests. Count data are expressed as frequencies (n) and percentages (%). Count data was processed using χ^2 tests. Differences are statistically significant when $P < 0.05$.

Results

Univariate analysis of SCL-90

SCL-90 scores in adult PNS patients were processed with the use of univariate analysis. Independent variables included age, gender, education level, occupation, length of hospital stay, medical insurance, family income, source of hospital cost, 24-hour urinary protein quantity, plasma albumin, causes of nephrotic syndrome, coexisting disorder, course of disease, treatment history, and infections during hospitalization. Results showed that factors influencing SCL-90 scores were education level, length of hospital stay, monthly family income, source of hospital cost, 24-hour urinary protein quantity, plasma albumin, and infections (at a level of $P = 0.05$).

Multivariate linear regression analysis of SCL-90

The seven factors identified above were processed using multivariate linear regression analysis. Results are shown in **Table 1**. Assignments are shown in **Table 2**. SCL-90 scores of patients with PNS were positively correlated with patient education level, length of hospital stay, 24-hour urinary protein quantity, and infections, but negatively correlated with monthly family income, source of hospital cost, and plasma albumin.

Comparison of general data

In the prospective trial, 130 adult PNS patients were randomly assigned into the observation group. A total of 65 patients received psychological intervention. In the control group, 65 patients did not receive psychological interven-

Table 1. Multivariate linear regression analysis of SCL-90

Factor	Regression coefficient	Standard error	Wald value	P	OR	Standard regression coefficient
Education level	1.684	0.181	87.181	< 0.001	0.186	1.900
Hospital stay	0.786	0.435	32.476	< 0.001	0.147	0.585
Monthly family income	-0.066	0.021	9.552	0.001	1.033	-0.483
Source of hospital cost	-0.021	0.002	60.004	< 0.001	1.024	-2.132
24-hour urinary protein quantity	2.113	0.415	25.326	< 0.001	9.178	1.118
Plasma albumin	-0.015	0.014	29.014	< 0.001	0.975	-2.013
Infection	0.853	0.011	38.264	< 0.001	1.031	0.986

Note: OR for odds ratio; SCL-90 for symptom check-list-90.

Table 2. Assignments

Education level	Middle school or below = 0	High school or above = 1	
Hospital stay	≤ 20 days = 0	> 20 days = 1	
Monthly family income	< 800 yuan = 0	800-2500 yuan = 1	> 2500 yuan = 2
Source of hospital cost	Self-paying = 0	free medical service = 1	Medical insurance = 2
24-hour urinary protein quantity	< 3.5 g/24 h = 0	≥ 3.5 g/24 h = 1	
Plasma albumin	< 25 g/L = 0	≥ 25 g/L = 1	
Infection	No = 0	Yes = 1	

tion. General data of the two groups of patients were compared, with results shown in **Table 3**. There were more male patients (73.85%) than female patients (26.15%). There were more patients with education levels of middle school or below (61.54%) than patients with levels of high school or above (38.46%). There were more patients with medical insurance (68.46%) than patients that did not have insurance (31.54%). There was a high proportion (60.77%) of patients with 24-hour urinary protein quantity less than 80 mg/kg and the cause of nephrotic syndrome in all patients was primary (100%). The proportion of patients with course of disease of 2 years or more was higher (65.38%) than those with a course of less than 2 years. Proportions of patients with or without coexisting disorders were similar. The proportion of patients without treatment history (79.23%) was higher than that of patients with treatment history (20.77%).

Comparison of SCL-90 scores before and after intervention

Nine dimensions of SCL-90 scores, including somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism, were compared between two groups, before and after intervention. Results are shown in **Tables 4** and **5**. The total score of SCL-90 in the observation group was higher than that in the control group before psychological intervention. Differences were statistically significant (P = 0.002). After psychological intervention, the total score of SCL-90 in the observation group was significantly lower than that of the control group, with statistically significant differences (P = 0.001). Scores of all dimensions were similar between the two groups, before intervention, with no significant differences (all P > 0.05). After psychological intervention, scores of all dimensions in the observation group were lower than those in the control group. Differences were statistically significant in terms of interpersonal sensitivity (P = 0.042), depression (P = 0.038), anxiety (P = 0.001), hostility (P = 0.031), and phobic anxiety (P < 0.001). The remaining ones were not statistically significant. Differences in scores, before and after intervention, were statistically significant in the observation group (all P < 0.05), but not significant in the control group (all P > 0.05).

Comparison of SAS scores

Anxiety states of patients with PNS, after intervention, are shown in **Figure 1** and **Table 6**. As

Table 3. General data

Item	Observation group (n = 65)	Control group (n = 65)	t/χ^2	P
Age (year)	35.3 ± 16.6	34.1 ± 11.3	9.125	0.407
Gender			2.549	0.110
Male	44	52		
Female	21	13		
Education level			0.130	0.718
Middle school or below	39	41		
High school or above	26	24		
Occupation			0.123	0.725
Working	33	35		
Not working	32	30		
Hospital stay (day)	18 ± 6	28 ± 8	7.236	0.211
Medical insurance			0.036	0.850
Yes	45	44		
No	20	21		
Monthly family income			1.266	0.531
<800 yuan	20	23		
800-2500 yuan	21	24		
> 2500 yuan	24	18		
Source of hospital cost			0.383	0.826
Self-paying	19	16		
Free medical service	6	7		
Medical insurance	40	42		
24-hour urinary protein			0.290	0.590
50 mg/kg-80 mg/kg	41	38		
> 80 mg/kg	24	27		
Plasma albumin			0.031	0.860
1-10 g/L	36	35		
10-25 g/L	29	30		
Causes of nephrotic syndrome				
Primary	65	65		
Secondary	0	0		
Course of disease			0.850	0.357
< 2 years	25	20		
≥ 2 years	40	45		
Coexisting disorder			0.278	0.598
With coexisting disorder	32	29		
Without coexisting disorder	33	36		
Treatment history			0.421	0.517
Yes	15	12		
No	50	53		

shown, 36 patients in the observation group had no anxiety and 29 patients had anxiety (heavy, moderate, or mild). In the control group, only 5 patients had no anxiety, while 60 patients had anxiety. Of these, 12 patients had severe anxiety, 29 patients had moderate anxiety, and 19 patients had mild anxiety. It can be seen from the table that SAS scores, before intervention, were similar in the two groups, without statistically significant differences (P = 0.061). SAS scores of the observation group were significantly decreased, after intervention, com-

Table 4. Comparison of SCL-90 scores before intervention (mean ± sd)

Item	Observation group (n = 65)	Control group (n = 65)	t	P
Somatization	2.03 ± 0.73	2.01 ± 0.42	0.223	0.125
Obsession-compulsion	1.92 ± 0.35	1.95 ± 0.67	0.196	0.065
Interpersonal sensitivity	2.13 ± 0.52	2.24 ± 0.63	0.532	0.241
Depression	2.31 ± 0.25	2.45 ± 0.36	1.043	0.083
Anxiety	2.52 ± 0.39	2.41 ± 0.57	0.885	0.059
Hostility	1.84 ± 0.55	1.92 ± 0.79	0.405	0.053
Phobic anxiety	2.35 ± 0.63	2.20 ± 0.42	1.062	0.278
Paranoid ideation	1.77 ± 0.49	1.82 ± 0.65	0.325	0.073
Psychoticism	2.51 ± 0.67	2.35 ± 0.47	1.002	0.217
Total score	189.35 ± 26.31	187.56 ± 25.18	1.335	0.002

Note: SCL-90 for symptom check-list-90.

Table 5. Comparison of SCL-90 scores after intervention (mean ± sd)

Item	Observation group (n = 65)	Control group (n = 65)	t	P
Somatization	1.43 ± 0.56[a]	1.46 ± 0.56[b]	0.075	0.761
Obsession-compulsion	1.92 ± 0.58[a]	1.96 ± 0.61[b]	0.179	0.164
Interpersonal sensitivity	1.91 ± 0.62[a]	2.33 ± 0.62[b]	2.066	0.042
Depression	2.01 ± 0.56[a]	2.34 ± 0.46[b]	2.134	0.038
Anxiety	1.82 ± 0.59[a]	2.34 ± 0.57[b]	3.665	0.001
Hostility	1.34 ± 0.65[a]	1.82 ± 0.78[b]	2.365	0.031
Phobic anxiety	1.35 ± 0.53[a]	1.78 ± 0.65[b]	2.662	< 0.001
Paranoid ideation	1.57 ± 0.59[a]	1.81 ± 0.63[b]	0.775	0.435
Psychoticism	2.10 ± 0.72[a]	2.31 ± 0.63[b]	1.222	0.062
Total score	156.31 ± 21.05[a]	178.33 ± 19.47[b]	1.27	0.001

Note: Comparison of the observation group before and after intervention, [a]P < 0.05; comparison of the control group before and after intervention, [b]P > 0.05. SCL-90 for symptom check-list-90.

pared with before intervention (P = 0.013). However, there were no significant changes in the control group (P = 0.250). Differences between the two groups were statistically significant after intervention (P = 0.004).

Comparison of SDS scores

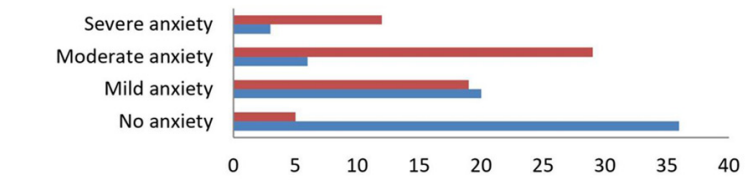
Depression states of patients with PNS, after intervention, are shown in **Figure 2** and **Table 7**. As shown, 33 patients (50.77%) in the observation group had no depression. In the control group, only 4 patients (6.15%) had no depression. SDS scores, before intervention, were similar in the observation group and control group, without statistically significant differences (P = 0.069). SDS scores of the observation group were significantly decreased, after intervention, compared with before intervention (P = 0.005). However, there were no significant changes in the control group (P = 0.612). Differences between the two groups were statistically significant after intervention (P = 0.001).

Comparison of outcomes

Clinical outcomes of the two groups were compared after intervention. See **Table 8**. Total effective rates for PNS in the observation group (80.0%) were significantly higher than those in the control group (24.6%), after psychological intervention. Differences were statistically significant (P < 0.001).

Discussion

Adult PNS is a ch-ronic disease characterized by massive proteinuria and edema [12]. Relapse and extension easily occur during treatment. Thus, PNS is difficult to treat with repeated states of illness, resulting in a great impact on patient physical and mental health, including negative emotions of pessimism and anxi-



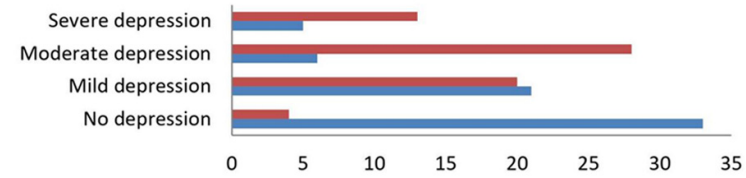
	No anxiety	Mild anxiety	Moderate anxiety	Severe anxiety
Control Group (n)	5	19	29	12
Observation Group (n)	36	20	6	3

Figure 1. SAS scores after intervention. SAS: self-rating anxiety scale.

Table 6. Comparison of SAS scores after intervention (mean ± sd)

	Observation group (n = 65)	Control group (n = 65)	t	P
Before intervention	56.14 ± 10.32[a]	58.31 ± 11.46[b]	0.075	0.061
After intervention	39.35 ± 9.68[a]	55.26 ± 10.43[b]	0.158	0.004

Note: Comparison of the observation group before and after intervention, [a]P = 0.013; comparison of the control group before and after intervention, [b]P = 0.250. SAS: self-rating anxiety scale.



	No depression	Mild depression	Moderate depression	Severe depression
Control Group (n)	4	20	28	13
Observation Group (n)	33	21	6	5

Figure 2. SDS scores after intervention. SDS: self-rating depression scale.

Table 7. Comparison of SDS scores after intervention (mean ± sd)

	Observation group (n = 65)	Control group (n = 65)	t	P
Before intervention	65.31 ± 15.14[a]	64.25 ± 14.35[b]	0.105	0.069
After intervention	49.47 ± 11.34[a]	60.17 ± 13.46[b]	0.210	0.001

Note: Comparison of the observation group before and after intervention, [a]P = 0.005; comparison of the control group before and after intervention, [b]P = 0.612. SDS: self-rating depression scale.

ety [13, 14]. In addition, complications, such as infections, are prone to occur during treatment [15, 16]. Long-term use of hormones may cause anxiety or even depression [17, 18], subsequently causing humoral-neuromodulation disorders, decreases in immunity, and eventually chronic renal insufficiency [19, 20]. In recent years, some studies on the psychological states of patients with PNS have been conducted, but the number of related studies is relativly small. Main research subjects of these studies were children [21-24]. Psychological intervention gives targeted care to patient psychological states. This helps patients to receive treatment smoothly and have better outcomes, with fewer adverse reactions [25].

In the current study, univariate analysis indicated that patient education level, length of hospital stay, monthly family income, source of hospital cost, 24-hour urinary protein quantity, plasma albumin, and infections were correlative factors affecting psychological symptoms and SCL-90 scores. Multivariate linear regression analysis showed that SCL-90 scores in patients with PNS were positively correlated with patient education level, length of hospital stays, 24-hour urinary protein quantity and infection, but negatively correlated with monthly family income, source of hospital cost, and plasma albumin. The long course of disease and hospital stays can bring physical and mental burden to patients. Higher patient education levels bring greater mental stress. Higher monthly family income brings lower mental stress, as patients could afford more medical expenses. Additionally, source of hospital costs was also closely related to mental stress. Present findings are contrary to results reporting that anxiety or depression had no effects on patients. This was in a study of psychosocial effects on children with nephrotic syndrome [6], indicating that the main influencing factors of pediatric nephrotic syndrome are internal factors that affect the body [26].

In the present study, adult PNS showed a trend of attacking younger people. Male patients (73.85%) were more than female patients

Table 8. Comparison of outcomes after intervention

Group	Cases	Markedly effective	Effective	Noneffective	Effective rate (%)
Observation group	65	22	30	13	80.0
Control group	65	4	12	49	24.6
X^2					41.079
P					< 0.001

(26.15%), consistent with the results of a relevant study [27]. Total scores and scores of the nine dimensions, including somatization, obsession-compulsion, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism, after psychological intervention, were decr-eased in the observation group, compared with before intervention. They were lower in observation group than in the control group. Furthermore, after intervention, the number of patients without anxiety and depression was significantly increased in the observation group. SAS scores and SDS scores were significantly lower than those before intervention in the observation group, indicating that psychological intervention can alleviate psychological symptoms of adult patients with PNS. These results are in accord with the opinion of related scholars, suggesting that psychological intervention can alleviate depression or anxiety of patients [28, 29].

In summary, adult patients with PNS generally have different levels of psychological problems. Educational level, length of hospital stays, monthly family income, source of hospital cost, 24-hour urinary protein quantity, plasma albumin, and infections are factors affecting psychological states of patients. Psychological intervention can alleviate mental stress, relieve psychological symptoms, such as anxiety and depression, significantly improve psychological states, and improve effective rates for PNS. These effects are difficult to achieve with medication alone. However, this study only focused on univariate analysis and multivariate linear regression analysis of SCL-90 scores to illustrate correlative factors of psychological symptoms in adults with PNS. This study did not analyze correlation of SAS and SDS scores. Thus, present findings are general and should be extended in future studies.

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Disclosure of conflict of interest

None.

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