Evaluation of the Impact of Negative Emotions on Sleep Quality of COVID-19 Patients by SPSS Under the Background of "Internet+" Big Data

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Abstract. This paper aims to explore the situation of anxiety, depression and other negative emotions and sleep quality in patients with novel coronavirus pneumonia under the background of "Internet+" big data, as well as the relationship between negative emotions and sleep quality. Collect information about 172 COVID-19 patients via the Internet using the APP Wenjuxing. SAS, SDS, PSQI conducted the survey. SPSS software was used for analysis, and the detection rate of anxiety, depression and sleep disorders was 15.7%, 22.6% and 68.02% in patients with COVID-19. Through t test and F test, it is found that gender, age, education, occupation, place of residence, annual income, whether there are underlying diseases are the main factors affecting negative emotions and sleep quality. Through Pearson analysis modeling, it is found that sleep quality is positively correlated with anxiety, depression and other negative emotions. The sleep quality of COVID-19 patients is poor, some patients have negative emotions such as anxiety and depression, and the more obvious the negative emotions, the worse the sleep quality. The Internet, short videos, scientific and educational films and other ways can be used for health education, online and offline combination of psychological counseling early intervention, psychological treatment if necessary, through improving the mental health of patients, improve the quality of sleep.

Keywords: COVID-19 patients · Negative emotions · Sleep quality · "Internet+" Big Data · SPSS

1 Introduction

In November 2019, a novel coronavirus disease (COVID-19) was first reported and then became widespread within Wuhan, the capital city of Hubei Province of China. The disease rapidly spread throughout China and elsewhere, becoming a global health emergency. The purpose of this study was to investigate the relationship between anxiety, depression and other negative emotions and sleep quality in patients with COVID-19, and to provide guidance for sleep improvement in patients with COVID-19 from a psychological perspective.

2 Information and Method

2.1 General Informations

From February 20 to March 6, 2020, investigations were conducted on light and common COVID-19 patients treated in isolation at 2 designated hospitals for COVID-19 in Shaoyang City and Chenzhou City and the counterpart support from Hunan Province's Dabie Mountain Regional Medical Center in Huanggang City, and use the questionnaire star to be guided by the front-line medical staff in the isolation ward, and fill it out on a voluntary basis.

A total of 180 patients with COVID-19 were investigated, 172 valid questionnaires were collected with a recovery rate of 95.56%. Among them, 84 (48.9%) were males and 86 (51.1%) were females. The youngest was 15 years old, and the oldest was 75 years old, with an average age of (43.41 ± 14.26) years old. The shortest treatment time was 1 day, the longest was 43 days, and the average isolation time was (17.20 ± 8.87) days.

2.2 Assessment Methods

Self-Written General Information Questionnaire. There were 10 items, including gender, age, residence, educational background, marital status, occupation, annual family income, existence of underlying diseases, time of isolation and treatment, etc.

Self-Rating Anxiety Scale (SAS). SAS was compiled by Zung [13], with a total of 20 items, reflecting patients' subjective feelings of Anxiety. According to the frequency of symptoms defined by the items, the Scale was divided into 4 levels. The positive items were rated as 1, 2, 3 and 4 points in turn. Reverse grading, in turn rated as 4, 3, 2, 1 points. The scores of 20 items are added together, namely the total rough score, which is converted into standard score. The standard score (the total score of 20 items multiplied by 1.25 to be an integer) has a cutoff of 50 points, with 50 to 59 for mild anxiety, 60 to 69 for moderate anxiety, and ≥70 for severe anxiety. The Cronbach' α coefficient of the questionnaire was 0.893.

Self-Rating Depression Scale (SDS). SDS was compiled by Zung [13], consists of 20 items, reflecting patients' subjective feelings of Depression. The scoring method is the same as SAS. The total score ≤49 is considered normal, and the total score 50–59 is considered mild Depression. A total score of 60–69 was classified as moderate depression, and a total score of ≥70 was classified as severe depression. The higher the score, the more severe the depression was. The Cronbach' α coefficient of the questionnaire was 0.912.

Pittsburgh Sleep Quality Index (PSQI). PSQI was compiled by Dr. Buysse, a psychiatrist from University of Pittsburgh, and translated into Chinese by Xianchen Liu et al. [5], consisted of 18 self-rated items consisting of 7 factors. It includes subjective sleep quality, sleep time, sleep duration, sleep efficiency, sleep disorders, hypnotic drugs and daytime dysfunction. Each factor is scored on a scale of 0~3, with reference to PSQI scoring description [1]. The cumulative score of each group is PSQI total score, which ranges from 0 to 21 points. It indicates that the worse the sleep quality is, the PSQI score

≥ 7 is considered as the existence of sleep disorder [7]. In this study, the Cronbach's α coefficient of this scale was 0.869.

2.3 Data Analysis

SPSS20.0 statistical software was used for statistical analysis, and measurement data were expressed as $(\overline{\chi} \pm S)$. Comparison between two groups was performed by t test, and comparison between multiple groups was performed by F test. Pearson correlation analysis was used to analyze the correlation between anxiety, depression and sleep quality, and the difference was statistically significant when $P < 0.05$.

3 Results

3.1 SAS, SDS and PSQI Scores of COVID-19 Patients

The total score of SAS, SDS and PSQI were 41.78 ± 8.90, 46.08 ± 8.36 and 8.32 ± 3.22 respectively. The details are shown in Table 1.

In SAS, 145 people were normal, accounting for 84.3%; There were 23 patients with mild anxiety, accounting for 13.4%; There were 4 patients with severe anxiety, accounting for 2.3%. The details are shown in Fig. 1.

In SDS, 133 people (77.3%) were normal. 26 patients with mild depression, accounting for 15.1%; 9 patients were moderately depressed, accounting for 5.2%; There were 4 patients with severe depression, accounting for 2.3%. The details are shown in Fig. 2.

The PSQI score of COVID-19 patients was (8.32 ± 3.22) points, significantly higher than the national norm [5] (3.88 ± 2.52) points $(P < 0.05)$, among which 117 patients had PSQI ≥ 7 points, accounting for 68.02%. The details are shown in Fig. 3.
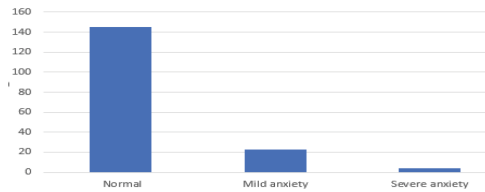

Fig. 1. The number distribution of anxiety degree of COVID-19 patients
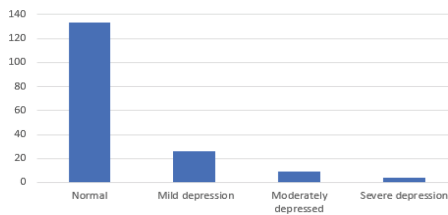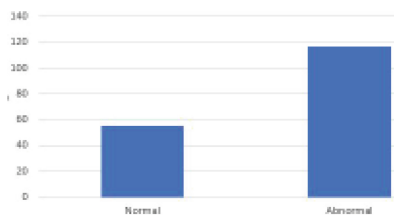

Fig. 2. Distribution of depression degree of COVID-19 patients

Fig. 3. Distribution of sleep status of COVID-19 patients

3.2 Comparison of SAS, SDS and PSQI Scores of Different Factors

The scores of SAS, SDS and PSQI of female patients were higher than those of male patients ($P < 0.05$). The total scores of SAS and SDS of ≥ 60 age group were higher than those of <20 and $40\sim$, and the PSQI scores of ≥ 60 age group were higher than those of other groups ($P < 0.05$). The scores of SAS, SDS and PSQI of patients living in rural areas were higher than those in urban areas ($P < 0.05$). The SAS and SDS scores of the primary school education group were higher than those of other education groups, and the PSQI scores of the primary school education group and lower school education group were higher than those of junior college education group ($P < 0.05$). The scores of SAS, SDS and PSQI of self-employed were higher than those of non-self-employed group ($P < 0.05$). The SAS, SDS and PSQI scores of the group with annual income $(10,000) \leq 5$ were higher than those of the other two groups ($P < 0.05$); FER score, SAS and SDS of patients with underlying disease were higher than those without underlying disease ($P < 0.05$). The details are shown in Table 1.

3.3 Correlation Analysis of Anxiety, Depression and Sleep Quality in COVID-19 Patients

Sleep quality is positively correlated with anxiety, depression and other negative emotions. The more obvious the negative mood of anxiety and depression, the worse the sleep quality. The details are shown in Table 2.

Table 1. Comparison of SAS, SDS and PSQI scores of different factors ($\overline{\chi} \pm S$)

Factors	n	SAS	SDS	PSQI
Total	172	41.78 ± 8.90	46.08 ± 8.36	8.32 ± 3.22
Gender				
Male	84	39.40 ± 7.26	44.35 ± 7.16	7.52 ± 3.15
Female	88	44.06 ± 9.73	47.73 ± 9.10	9.41 ± 3.31
t		-3.546	-2.701	-14.636
P		0.001	0.008	0.000

(*continued*)

Table 1. (*continued*)

Factors	n	SAS	SDS	PSQI
Age				
<20	12	38.13 ± 8.11^{b}	43.48 ± 6.88^{b}	7.67 ± 3.65^{b}
20~	54	42.96 ± 7.46	46.54 ± 7.72	8.17 ± 3.05^{b}
40~	84	40.21 ± 8.69^{b}	45.00 ± 8.20^{b}	8.32 ± 3.28^{b}
≥60	22	46.93 ± 11.04^{a}	50.49 ± 9.93^{a}	10.36 ± 3.79^{a}
F		4.599	3.055	2.852
P		0.004	0.030	0.039
Place of residence				
Rural	40	45.31 ± 9.26	48.76 ± 9.46	10.55 ± 3.78
City	132	40.72 ± 8.54	45.27 ± 7.86	7.86 ± 2.90
t		2.923	2.344	22.082
P		0.004	0.020	0.000
Educational background				
Elementary school and below	12	52.08 ± 15.53^{a}	55.10 ± 14.16^{a}	12.00 ± 3.62^{b}
Junior high school	78	41.12 ± 8.69^{b}	45.80 ± 8.40^{b}	8.85 ± 3.44^{b}
High school or Secondary school	48	42.14 ± 7.18^{b}	46.88 ± 5.84^{b}	7.88 ± 3.19
College and above	34	39.19 ± 5.79^{b}	42.40 ± 6.10^{b}	7.29 ± 2.28^{a}
F		7.198	7.885	7.385
P		0.000	0.000	0.000
Marital status				
Unmarried	22	43.18 ± 9.96	47.58 ± 8.30	8.09 ± 3.13
Married	132	41.65 ± 8.96	45.70 ± 8.69	8.56 ± 3.40
Other	18	41.11 ± 7.75	47.04 ± 5.61	8.44 ± 3.47
F		0.336	0.607	0.185
P		0.715	0.546	0.832
Profession				
Student	10	40.50 ± 7.43^{b}	45.43 ± 6.49^{b}	8.00 ± 3.83^{b}
Enterprise workers	46	38.53 ± 5.64^{b}	42.45 ± 5.56^{b}	7.01 ± 2.29^{b}
Small private business	30	49.92 ± 11.07^{a}	53.53 ± 10.20^{a}	10.87 ± 3.34^{a}
Farming or Unemployed	40	41.06 ± 8.01^{b}	45.71 ± 8.60^{b}	8.93 ± 3.78^{b}
Other	46	40.65 ± 8.14^{b}	45.31 ± 6.62^{b}	8.15 ± 2.95^{b}
F		9.770	10.000	10.681
P		0.000	0.000	0.000

Table 1. (*continued*)

Factors	n	SAS	SDS	PSQI
Annual income (1000 yuan)				
≤5	50	47.10 ± 10.24^a	50.36 ± 1.42^a	10.16 ± 3.84^a
6~	50	38.30 ± 7.27^b	43.60 ± 7.53^b	8.28 ± 3.19^b
>10	72	40.52 ± 7.19^b	44.84 ± 6.42^b	7.47 ± 2.95^b
F		15.824	10.616	10.681
P		0.000	0.000	0.000
Underlying disease				
Yes	34	46.18 ± 8.90	50.19 ± 8.67	9.12 ± 2.53
No	138	40.71 ± 8.59	45.07 ± 7.99	8.33 ± 3.52
t		3.303	3.292	1.493
P		0.001	0.000	0.223
Isolated treatment time(days)				
≤7	26	43.27 ± 8.58	46.70 ± 8.73	8.00 ± 4.04
>7	146	41.52 ± 8.96	45.97 ± 8.32	8.58 ± 3.29
t		0.921	0.408	0.647
P		0.358	0.684	0.422

Note: The superscript letters are different in the groups, and the difference between the groups is statistically significant

Table 2. Correlation analysis of SAS, SDS and PSQI in COVID-19 patients (R-value)

	SAS	SDS	PSQI
SAS	1		
SDS	0.674^{**}		
PSQI	0.697^{**}	0.642^{**}	1

** $P < 0.01$

4   Discussion

The survey found that: 15.7% of COVID-19 patients had anxiety symptoms, 22.6% had depression symptoms, PSQI score was significantly higher than the national norm ($P < 0.05$), and more than half of the patients with sleep disorders (68.02%), the COVID-19 patients' anxiety, depression and other negative emotions were significantly positively correlated with sleep quality, consistent with the survey results of Hong Jiang et al. [4]. This indicates that the overall sleep quality of patients with COVID-19 is poor, and the more obvious the anxiety and depression, the worse the sleep quality. In the face of the sudden epidemic, patients lack awareness of the emerging disease, and the disease has

a certain fatality rate. After the disease, fear, upset, anxiety and hypochondriasis lead to anxiety, depression and other negative emotions, which seriously affect the quality of sleep. Previous studies have also confirmed that there is a strong correlation between anxiety and depression and sleep quality [2, 8]. When individuals have anxiety and depression, sleep quality is likely to decline [14].

The psychological condition and sleep quality of male patients with COVID-19 are better than that of female patients, which is similar to the studies of some scholars [8, 15]. The possible reason is that men and women have different psychological cognition and coping strategies [6], and women are more susceptible to stress and negative emotions [12], and they are more prone to fear, anxiety, depression and other adverse emotional reactions, which affect the sleep quality. People over 60 years old are the elderly, and their physical functions decline rapidly. In the face of emergencies, elderly people are prone to adverse physical reactions such as increased blood sugar, increased blood pressure, increased heart rate and accelerated respiration, especially those with underlying diseases. When the infection is combined with the novel coronavirus pneumonia, the ideological burden is increased, more likely to appear anxiety, depression and other psychological and emotional reactions. In the case of stress, anxiety and depression, cortisol content in the body increases, while high cortisol level will damage immune function [11]. The two interact and influence each other, leading to serious insomnia in hospitalized elderly patients under environmental changes [9].

From the perspective of social factors, rural people with low education experience lack of self-esteem and confidence in the social environment, little knowledge of diseases, increased psychological and emotional needs, and prone to emotional instability, anxiety and depression [10]. Low-income, self-employed and other groups are relatively lacking in medical, employment, social and other aspects of protection. The coming of the epidemic will undoubtedly make things worse for them. There are more worries and concerns from all sides, and it is easy to aggravate anxiety, depression and other negative emotions, resulting in decreased sleep quality.

However, there is comorbidity between sleep disorders and negative emotions such as depression and anxiety [3], and a healthy mental state is also conducive to improving sleep quality. In view of this, through health education, we can make patients realize that this disease is preventable and controllable, and it is normal to have acute stress response in the face of public health emergencies, so as to improve cognition and reduce negative emotions such as fear, anxiety and depression. Moreover, through psychological counseling, psychological treatment and other ways to intervene early, in order to improve the mental health of patients, improve the quality of sleep. For patients with poor effect of psychological intervention, psychiatric consultation and drug treatment should be requested when necessary.

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