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Review Article

Effects of comprehensive nursing on anxiety and depression of acute leukemia patients and risk factors of infection

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Abstract: This study aimed to investigate the effects of comprehensive nursing on anxiety and depression of acute leukemia (AL) patients and infection-related risk factors. Altogether 113 AL patients in our hospital were enrolled; of which 62 patients were nursed comprehensively as the research group and thg others were nursed routinely as the control group. The psychological state, activities of daily living (ADL), chemotherapy, hospitalization time, and infection-related risk factors were compared and analyzed between the two groups. After treatment, compared with the control group, the research group had lower SAS and SDS scores and higher ADL score, and showed lower incidences of Gram-negative and Gram-positive bacteria. Antibiotic use, hospitalization time, invasive operation, and hormone use were infection-related risk factors for AL patients. Comprehensive nursing can effectively relieve the negative psychology of AL patients and accelerate their rehabilitation, and Gram-negative bacteria are the main pathogen causing bloodstream infection in AL patients.

Keywords: Comprehensive nursing, acute leukemia, anxiety, depression, risk factors of infection

Introduction

Leukemia is a malignancy of the blood and one of the top ten malignant tumors in China [1]. Acute leukemia is a malignant clonal disease of hematopoietic stem cells, which is accompanied by a large scale proliferation of abnormal primitive cells and immature cells (leukemic cells) occurring in the bone marrow [2]. Those cells accumulate in the marrow, suppress normal hematopoiesis, and extensively infiltrate extramedullary organs such as the liver, spleen, and lymph nodes [3]. At present, the incidence of leukemia is increasing worldwide [4], and acute leukemia accounts for a large proportion of leukemia [5]. According to statistics, the incidence of leukemia accounts for about 5% of the total incidence of malignant tumors [6], which poses a serious threat to the health of humans. Acute leukemia is characterized by acute onset, severe symptoms, and poor prognosis. If it is not treated in time, the patient usually dies within several months [7]. At present, acute leukemia is mainly treated through regular chemotherapy in clinical practice [8]. After long-term chemotherapy, the leukemia will be relieved and the patient may survive for a long time [9]. However, due to the characteristics of acute leukemia itself, acute leukemia patients will suffer from various adverse reactions such as infection, hemorrhaging, high temperatures, activity intolerance, psychological anxiety, and depression during chemotherapy [10, 11]. This brings serious obstacles to treatment, and is a highly concerning problem for medical workers and thus has become a research hotspot for scholars.

Some studies have pointed out that nursing intervention is beneficial to the rehabilitation of cancer patients after chemotherapy, including lung cancer patients and liver cancer patients [12, 13]. It implies that nursing methods play a key role in the rehabilitation of cancer patients. Comprehensive nursing is a new nursing intervention model [14], which not only focuses on the nursing of patients' diseases, but also emphasizes corresponding intervention measures on patients' psychology, physiology, diet, exercise, surrounding environment, and others

aspects of health to meet numerous needs of patients in recovery [15]. At present, it has been proved to have extremely high application value in many tumor diseases [16]. In the face of acute leukemia with an increasing annual incidence and adverse psychological and physiological reactions in clinical treatment, we speculated that comprehensive nursing is beneficial to the alleviation of psychological anxiety, depression, and infection of acute leukemia patients and could improve the cure rate. In order to verify our conjecture, we analyzed the effects of comprehensive nursing interventions on anxiety, depression, infection, and risk factors of infection in acute leukemia patients, with the goal of providing effective references and guidance for future clinical treatment of acute leukemia patients.

Materials and methods

General materials

Altogether 113 patients with acute leukemia admitted to our hospital from May 2016 to May 2018 were enrolled as research participant; of which 62 patients were given comprehensive nursing during hospitalization as the research group, and the rest were given routine nursing during hospitalization as the control group (Con group). This experiment was carried out with permission from the Ethics Committee of our hospital, and all research subjects signed informed consent forms.

Inclusion and exclusion criteria

The inclusion criteria of the study: Patients confirmed with acute leukemia in our hospital through pathological diagnosis, patients who did not receive chemotherapy and radiotherapy before surgery or puncture, patients treated in our hospital after diagnosis, patients with complete case data, patients willing to cooperate with the arrangements made by the medical staff in our hospital, and those who signed an informed consent form or whose family members signed informed consent forms.

The exclusion criteria of the study: Patients comorbid with multiple chronic diseases, patients with other malignant tumors, other cardio-cerebrovascular diseases, organ dysfunction, or malignant tumors, patients allergic to drugs or unable to take care of themselves, and those transferred to our hospital.

Methods

Patients in the Con group were nursed under the routine nursing modes; mainly including medication guidance and basic clinical nursing. Each of them was taught about health knowledge and diseases, and their diseases were monitored. In contrast, patients in the research group were nursed comprehensively in addition to the routine nursing; which mainly included psychological nursing. The nursing staff was asked to pay attention to the tone of speech, give timely care and comfort to patients, and help patients relieve negative emotions. The nursing staff were also arranged to appease adverse reactions of the patients after chemotherapy in a timely manner, such as gastrointestinal discomfort, vomiting, and nausea, and take measures to alleviate them. In terms of life, the nursing staff was instructed to guide the patients to strictly follow a reasonable diet, to give guidance to the patients' family members, and to help the patients maintain an optimistic attitude. In addition, the nursing staff was arranged to assist and guide patients to complete simple rehabilitation training, and hold regular nursing meetings about how to improve the recovery of acute leukemia patients and analyze the problems encountered for solutions in the daily nursing process. The nursing staff was instructed to regularly remind the patients of following up by telephone after their discharge.

Outcome measures

Main outcome measures: The scores of self-rating anxiety scale (SAS) and self-rating depression scale (SDS) of patients in the research group and the Con group, the infection of the patients after treatment, risk factors for the infection, and prognosis of the patients.

Secondary outcome measures: The activities of daily living (ADL) of patients in the two groups were assessed using the ADL scale, and the chemotherapy time and hospitalization time of the two groups were compared.

Statistical analysis

In this study, data were statistically analyzed using the SPSS 220, and illustrated as figures using Graphpad 7. Enumeration data are expressed as rate, and comparison within groups was carried out using the chi-square test.

Table 1. General data

	The research group (n=62)	The Con group (n=51)	t or χ^2	*P*-value
Age (Y)	42.3±6.6	43.2±7.5	0.678	0.499
BMI (KG/cm^2)	23.52±3.05	24.46±4.72	1.278	0.204
Sex			3.251	0.197
Male	27 (43.55)	29 (56.86)		
Female	35 (56.45)	22 (43.14)		
Residential environment			1.759	0.415
Urban area	49 (79.03)	43 (84.31)		
Rural area	13 (20.97)	8 (15.69)		
Education level			1.509	0.470
< Senior high school	31 (50.00)	28 (54.90)		
≥ Senior high school	31 (50.00)	23 (45.10)		
Smoking history			1.252	0.535
Yes	26 (41.94)	22 (43.14)		
No	36 (58.06)	29 (56.86)		
Alcohol abuse history			1.276	0.528
Yes	28 (45.16)	26 (47.06)		
No	34 (54.84)	44 (52.94)		
Family medical history			1.290	0.525
Yes	17 (27.42)	15 (29.41)		
No	46 (72.58)	36 (70.59)		
Nationality			1.416	0.493
Han nationality	54 (87.10)	43 (84.31)		
Minority nationality	8 (12.90)	8 (15.69)		

Measurement data are expressed as the mean ± standard deviation, and inter-group comparison was carried out using the t-test. P<0.05 indicates a significant difference.

Results

There was no difference in general data between the two groups

There was no remarkable difference in age, body mass index (BMI), gender, living environment, education level, smoking history, alcohol abuse history, family medical history, and nationality between the two groups (all P>0.05). **Table 1**.

The psychological state of the research group was better than that of the control group

Before treatment, there was no remarkable difference in SAS and SDS scores between the two groups (both P>0.05). While after treatment, the SAS and SDS scores of the research group were both significantly lower than those of the Con group (both *P*<0.05), and both groups had significantly decreased SAS and SDS scores (both *P*<0.05) **Figure 1**.

The ADL score of the research group was higher than that of the control group

Before treatment, there was no remarkable difference in ADL score between the two groups (P>0.05). While after treatment, both groups had a significantly higher ADL score, and the ADL score of the research group was significantly higher than that of the Con group (P<0.05) **Figure 2**.

Chemotherapy time and hospitalization time between the research group and the control group

There was no remarkable difference in chemotherapy time between the research group and the Con group ((12.69±3.17) d vs. (13.16±3.23) d, P>0.05), and the research group experienced much shorter hospitalization time than the Con group ((18.64±2.21) d vs. (22.36±2.67) d, P<0.05) **Figure 3**.

The incidence of Gram-negative bacteria and Gram-positive bacteria in the research group was lower than that in the control group

The research group showed an incidence of Gram-negative bacteria of 33.33% and an incidence of Gram-positive bacteria of 11.11%, with 27 infected patients, and the Con group had 35 infected patients. Therefore, the incidence of Gram-positive bacteria was significantly higher than that of Gram-positive bacteria. The incidences of both Gram-negative bacteria and Gram-positive bacteria in the research group were significantly lower than those in the Con group (both P<0.05) **Table 2**.

There was no significant difference in survival rate between the research group and the control group

Patients in the two groups were followed up for 3 years through hospital review, and all the 113 patients were successfully followed up.

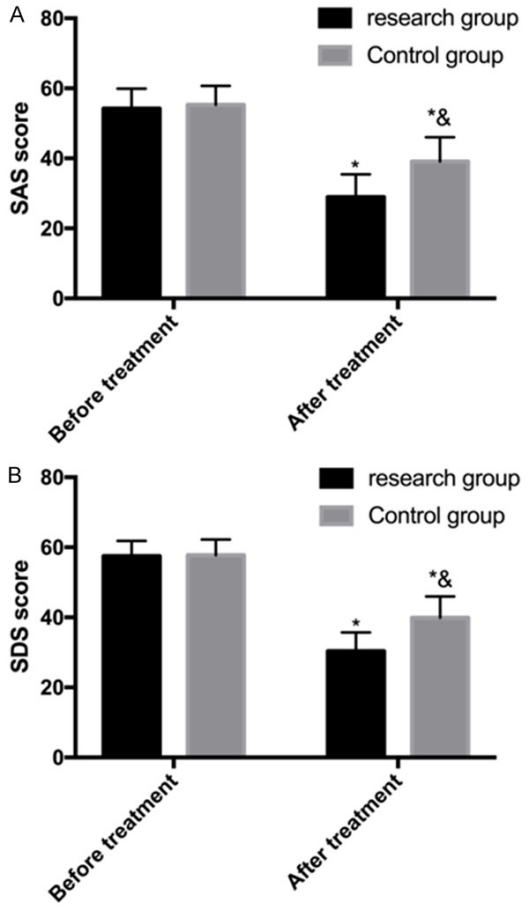

Figure 1. Comparison of psychological states between the two groups. A. Comparison of SAS score between the two groups. B. Comparison of SDS score between the two groups. * indicates comparison with the situation before treatment P<0.05, & indicates comparison with the research group, P<0.05.

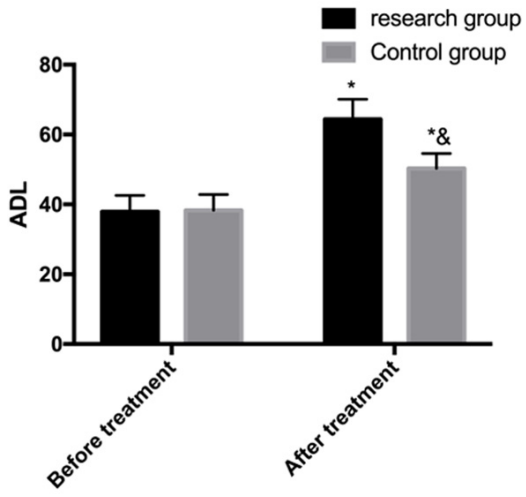

Figure 2. Comparison of ADL score between the two groups. * indicates comparison with the situation before treatment *P*<0.05, & indicates comparison with the research group, *P*<0.05.

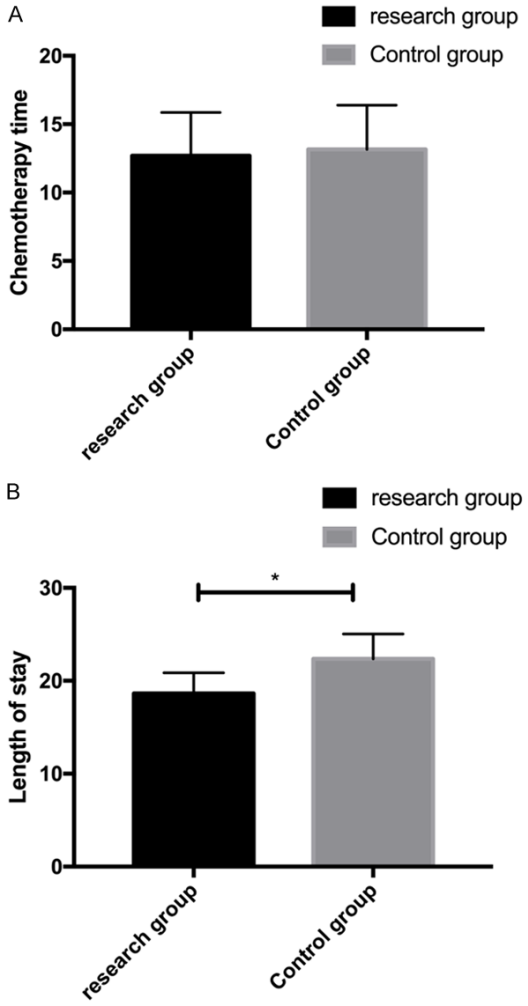

Figure 3. Chemotherapy time and hospitalization time of patients. A. Chemotherapy time of patients in the two groups. B. Hospitalization time of patients in the two groups. * means *P*<0.05.

The success rate of follow-up was 100.0%. It was found that there was no significant difference in the 3-year survival rate between the research group and the Con group (74.19% vs. 70.59%, P>0.05) **Figure 4**.

Risk factors of infection

There were significant differences between the two groups in antibiotic use, hormone use, hospitalization time, invasive operation, and infection rate

Of the 113 patients, 62 patients were infected, showing an incidence rate of 54.87%. There were remarkable differences between the two groups in antibiotic use, hormone use, hospitalization time, invasive operations, and infection rate (all P<0.05), but there was no remarkable

Table 2. Statistics on the incidence of Gram-negative bacteria and Gram-positive bacteria

Germs	The research group (infected patients: n=27)	The Con group (infected patients: n=35)	X^2	*P*-value
Gram-negative bacteria				
Escherichia coli	4 (14.81)	10 (28.57)		
Pseudomonas aeruginosa	3 (8.11)	6 (17.14)		
Klebsiella pneumoniae	2 (7.41)	5 (14.29)		
Pathogen incidence (%)	33.33	60.00	4.340	0.037
Gram-positive bacteria				
Coagulase negative staphylococcus	1 (3.70)	4 (11.43)		
Streptococcus	1 (3.70)	2 (5.71)		
Enterococcus faecium	1 (3.70)	1 (2.86)		
Pathogen incidence (%)	11.11	20.00	0.890	345

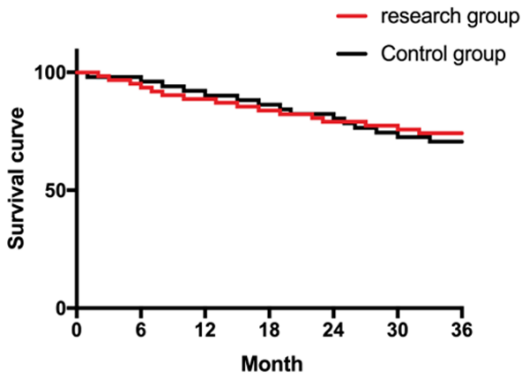

Figure 4. Prognostic survival curve.

difference between them in age and sex (both P>0.05) **Table 3**.

Antibiotic use, hospitalization time, invasive operation, and hormone use were independent risk factors for infection in patients with acute leukemia

Indexes in **Table 3** with differences were assigned (see **Table 4** for assignment), and logistic regression analysis was carried out to them. It came out that antibiotic use, hospitalization time, invasive operation, and hormone use were independent risk factors for infection in patients with acute leukemia (all P<0.05) **Table 5**.

Discussion

Acute leukemia is a common illness of the hematopoietic system. Because of immune deficiency in the disease itself and the influence of chemotherapy, patients are prone to suffer from a variety of adverse reactions [17]. If acute leukemia is not treated specially, the patient would face an extremely high risk of death [18]. At present, acute leukemia is mainly treated through chemotherapy in clinical practice, and how to improve the rehabilitation of patients during chemotherapy is both the focus and challenge in clinical research. According to previous studies, it is found that nursing intervention has significantly improved the alleviation of various diseases [19]. However, there is still a lack of research guidance on nursing of acute leukemia. Therefore, this experiment analyzed the effects of comprehensive nursing on the alleviation of acute leukemia, with the goal of providing reference opinions for future clinical diagnosis and treatment of such patients.

The results of this experiment showed that the SAS and SDS scores of patients in the research group nursed under the comprehensive nursing mode were significantly lower than those of patients in the Con group nursed under the routine nursing mode; suggesting that comprehensive nursing could effectively improve the psychological quality of patients. This is consistent with study results on the effects of comprehensive nursing by some other researchers, which can support the results of this experiment. We speculated that it may be due to the fact that under comprehensive nursing, nursing staff are more careful and patient in communication with patients. During comprehensive nursing, nursing staff are required to pay attention to the tone of speech and give timely care and comfort to patients, which can effectively reduce the negative psychology such as fear and resistance during hospitalization. Moreover, some studies have pointed out that the improvement of emotional function has a significant

Table 3. Univariate analysis on factors affecting patients' infection

Factor	The infection group (n=62)	The non-infection group (n=51)	X^2	*P*-value
Antibiotic use			19.190	<0.001
Yes	30 (48.39)	45 (88.24)		
No	32 (51.61)	6 (11.76)		
Hospitalization time			6.467	0.011
>20	38 (61.29)	19 (37.25)		
≤20	24 (38.71)	32 (62.75)		
Invasive operation			4.277	0.039
Yes	40 (64.52)	23 (45.10)		
No	22 (35.48)	28 (54.90)		
Age			1.434	0.488
>60	23 (37.10)	21 (41.18)		
≤60	39 (62.90)	30 (58.82)		
Hormone use			9.526	0.009
Yes	41 (66.13)	20 (39.22)		
No	21 (33.87)	31 (60.78)		
Sex			1.667	0.434
Male	29 (46.77)	27 (52.94)		
Female	33 (53.23)	24 (47.06)		

Table 4. Assignment

Factor	Assignment
Antibiotic use	No=0, yes=1
Hospitalization time	>20=0, ≤20=1
Invasive operation	No=0, yes=1
Hormone use	No=0, yes=1

positive impact on the rehabilitation of patients [20]. Therefore, we compared the ADL score, chemotherapy time, and hospitalization time of the two groups, finding that the ADL score of the research group was significantly higher than that of the Con group. The chemotherapy time and hospitalization time for the research group were both significantly shorter than the Con group, which implied that the rehabilitation of the research group was better than that of the Con group. Thist is also consistent with our above conjecture. In addition, we guessed that the difference in rehabilitation between the two groups of patients was caused by the dietary support provided in comprehensive nursing and emotional appeasement of family members, and regular nursing meetings could improve the work efficiency of nursing staff. Reducing the mistakes made by nurses due to lack of experience when they encounter some unexpected situations in nursing acute leukemia patients is not only beneficial to the patients, but also a potential reason for improving the rehabilitation effects.

We further compared bloodstream infections in the two groups during chemotherapy, finding that the number of patients with bloodstream infections in the research group was significantly lower than that in the Con group, suggesting that comprehensive nursing intervention can effectively improve the safety of chemotherapy for acute leukemia. Moreover, by observing the pathogenic bacteria of patients with bloodstream infections, we found that the most common pathogenic bacteria of acute leukemia patients with bloodstream infections were gram-negative bacteria, mainly Escherichia coli. Therefore, this analysis is required to strengthen the intervention treatment against bloodstream infection in treating acute leukemia patients. The difference of infection between the two groups may be related to diet and hygiene habits, and one of the pathogenic substances of Escherichia coli is plasma coagulase [21]. It cannot be excluded that the difference was caused by the influence of chemotherapeutic drugs on the blood. We will conduct a more in-depth analysis on it in the future. Furthermore, through multivariate analysis, we found that antibiotic use, hospitalization time, invasive operation, and hormone use were independent risk factors affecting bloodstream infections of acute leukemia patients. Therefore, it is necessary to reduce the use of antibiotics and hormones in strict accordance with clinical requirements, and reduce the number of invasive operations on patients, as well as pay close attention to the rehabilitation of patients, and strive to shorten the hospitalization time of patients in nursing acute leukemia patients.

The purpose of this experiment was to explore the application value of comprehensive nursing for acute leukemia, but there are deficiencies due to limited experimental conditions. At present, there are many nursing modes in clinical

Table 5. Logistic regression analysis

	S.E.	B	Wald χ^2	*P*-value	OR	95% CI
Antibiotic use	0.876	2.761	5.763	0.003	2.131	1.093-2.983
Hospital stay	1.763	2.032	6.872	0.000	3.031	2.342-4.123
Invasive operation	0.983	2.983	5.983	0.000	2.763	1.872-3.562
Hormone use	1.983	3.873	5.312	0.013	2.871	1.763-3.652

practice, but this study only uses routine nursing as a control, so it is necessary to include more nursing modes to expand our comprehensiveness for acute leukemia patients. Moreover, because of the short follow-up period, we have failed to evaluate the long-term prognosis of the patients. We will conduct more in-depth experimental analysis as soon as possible to obtain better experimental results.

Conclusion

Comprehensive nursing can effectively relieve the negative psychology of acute leukemia patients and accelerate their rehabilitation. Gram-negative bacteria are the main pathogens causing bloodstream infections in acute leukemia patients, and strictly regulating the use of antibiotics and hormones, reducing invasive operations, and shortening the rehabilitation process of patients are effective intervention schemes to avoid infection.

Disclosure of conflict of interest

None.

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