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Original Article

Detailed nursing intervention on neonatal septicemia can improve the clinical symptoms of children and reduce the inflammatory reaction

Jing Wang[1], Peifen Li[1], Peijie Zhang[2], Qing Du[1]

[1]*Department of Paediatrics, Ningbo Yinzhou District Second Hospital, Ningbo 315100, Zhejiang Province, China;* [2]*Wound Ostomy Clinic, Ningbo Yinzhou District Second Hospital, Ningbo 315100, Zhejiang Province, China*

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Abstract: Objective: To explore the application effect of detailed nursing intervention in neonatal septicemia. Methods: Altogether 60 neonates of neonatal septicemia admitted to our hospital from November 2019 to October 2020 were selected as the research participants, and all the children have received routine treatment, among which 30 neonates received routine nursing intervention as the regular group, and the remaining 30 received detailed nursing intervention as the detail group. The clinical effects, improvement of clinical symptoms, length of stay, and guardian satisfaction were compared, and the levels of serum inflammatory factors (TNF-α, IL-6 and IL-17) and immune function indicators (CD4+, CD8+) before and after nursing intervention were detected. Results: The total effective rate in the detail group was higher than that in the regular group ($P < 0.05$). Compared with the regular group, the temperature stabilization time, blood culture turning negative time, improvement time of milk rejection and hospital stay in the detail group were significantly shortened ($P < 0.05$). The guardian satisfaction score in the detail group was higher than that in the regular group ($P < 0.05$). After nursing, the levels of TNF-α, IL-6 and IL-17 decreased in both groups, and the levels of these three in the detail group were lower than those in the regular group ($P < 0.05$). After nursing, CD4+/CD8+ of children in both groups increased, and CD4+/CD8+ in the detail group and regular group were higher than those in the regular group ($P < 0.05$). Conclusion: The adoption of detailed nursing modes in the treatment of neonatal septicemia can further improve the treatment effect, shorten the hospital stay and the improvement time of clinical symptoms, reduce the incidence of complications, improve the nursing satisfaction of guardians, reduce the inflammation of the body and improve the immune function of the body.

Keywords: Detail nursing, neonatal septicemia, inflammation, immunologic function

Introduction

Neonatal septicemia is a systemic infection caused by pathogenic bacteria entering the blood that grows, reproduces and produces toxins [1]. According to reports, septicemia is the second leading cause of neonatal death, which has caused more than 1 million neonatal deaths annually [2]. In recent years, although there has been some progress in neonatal intensive care, there is still a need to improve neonatal septicemia outcomes [3]. As the clinical symptoms of neonatal septicemia are not obvious and the disease progresses rapidly, the children face the threat of death if corresponding treatment is not taken in time [4]. Previous studies have shown that strengthening nursing care for neonatal septicemia can effectively improve the clinical treatment effects [5]. Therefore, active nursing intervention is also the key to improve the curative effect in children.

With the progression of society, the development of medicine, the renewal of nursing concepts and the continuous innovation of nursing modes, traditional nursing modes have failed to satisfy people's demand for good medical care [6]. Under this background, a variety of new nursing modes have been explored, such as high-quality nursing, integrated nursing, comprehensive nursing and detailed nursing, which were unanimously recognized by patients and medical staff [7-10]. Among them, detail

nursing is a kind of nursing mode that is centered on patients, which emphasizes paying attention to every detail that may appear in the nursing process, and actively discovering and solving problems. We believe that detailed nursing can closely monitor the subtle changes of children's conditions, so as to find any abnormal conditions as early as possible and give corresponding treatment. However, at present, there are few reports about the application effect of detailed nursing in neonatal septicemia.

In this study, 60 neonates with septicemia treated in our hospital from July 2018 to August 2019 were selected as research participants, and the application effect of detailed nursing in neonatal septicemia care was explored in groups, aiming at finding a high-quality nursing mode for neonatal septicemia children.

Materials and methods

Research participants

Altogether 60 neonates with septicemia who were admitted to Ningbo Yinzhou District Second Hospital from November 2019 to October 2020 were selected as the research participants, and all the children received routine treatment, among which 30 neonates were given regular nursing intervention as the regular group, and the remaining 30 neonates were given detailed nursing intervention as the detail group. Inclusion criteria: neonates diagnosed with septicemia and pathogen culture showed positive results; the guardians of the subjects were completely clear about the research contents and signed the informed consent form in our hospital. Exclusion criteria: neonates who used antibiotics before the study; neonates who were allergic to the drugs applied in this study; neonates with congenital diseases or other serious diseases. This research has been approved by the Medical Ethics Committee of our hospital.

Methods

All children were given routine treatment for neonatal septicemia, including focused care for eliminating infection, symptomatic treatment of complications, active application of antibiotics, correction of acidosis and electrolyte disturbance.

On this basis, the regular group received routine nursing. The nursing staff kept the ward environment suitable, paying close attention to children's vital signs, monitoring the children's body temperature, reporting abnormalities immediately, and ensuring nutrition supply.

The detail group received detailed nursing on the basis of regular group, and every nursing measure was improved. Specific measures were as follows: ① Cleaning: prevention of bacteria from invading through the skin, navel and oral cavity was strengthened; the umbilical cord shedding and bleeding were closely observed; the secretion properties were analyzed; the skin characteristics of the perineum, submandibular and armpits were closely observed; the body surface of children was cleaned in time and talcum powder was applied; antibiotics and normal saline were applied externally for treating ulceration and inflammation. ② Strengthening breast feeding in nutritional support: for children with weak sucking and serious illness, nasal feeding with a gastric tube and intravenous supplement were given; for children with poor swallowing reflex and cough function, it is necessary to actively prevent choking on milk and suffocation; for children with maternal infection, direct breastfeeding was avoided. ③ Medication nursing: early treatment and continuous treatment were emphasized. After being diagnosed with neonatal septicemia, patients were given penicillin, and sensitive antibiotics were replaced after the drug sensitivity results were revealed; the adverse reactions and allergic reactions during medication were closely observed; regular laboratory testing was applied; continuous medication was applied after clinical symptom relief. ④ Nursing care of complication prevention: Nursing staff strictly carried out aseptic operations, paid attention to hand hygiene. Attention was paid to the possibility of pneumonia, meningitis and osteomyelitis. When symptoms such as dyspnea and cough occurred, antibiotics were used quickly to prevent pneumonia. When symptoms such as convulsion, high fever and purple complexion occurred, cerebrospinal fluid was extracted in time to check meningitis. When symptoms such as superficial breathing and excessive heart rate occurred, the heart was paid attention to. ⑤ Strengthen health education for family members: a health propaganda manual was used, so that family mem-

Table 1. Comparison of general data between the two groups of children

Group	Regular group (n=30)	Detail group (n=30)	χ^2/t	P
Gender			0.272	0.602
Male	16 (53.33)	18 (60.00)		
Female	14 (46.67)	12 (40.00)		
Age (d)	13.63±2.84	13.26±3.12	0.480	0.633
Weight (kg)	3.21±0.56	3.17±0.71	0.242	0.809
Gestational age (weeks)	38.56±3.16	38.98±3.28	0.615	0.505
Premature			0.635	0.426
Yes	10 (33.33)	13 (43.33)		
No	20 (66.67)	17 (56.67)		
Birth mode			0.287	0.592
Eutocia	12 (40.00)	10 (33.33)		
Cesarean section	18 (60.00)	20 (66.67)		
Infection route			1.359	0.715
Skin infection	8 (26.67)	6 (20.00)		
Omphalitis	7 (23.33)	5 (16.67)		
Pneumonia	10 (33.33)	11 (36.67)		
Enteritis	5 (16.67)	8 (26.67)		

bers could master certain nursing knowledge and cooperate with medical staff for treatment and nursing.

Outcome measures

Through blood culture and clinical symptom examination, the clinical curative effect was assessed. Cure: clinical symptoms disappeared within 14 days, and blood culture was negative; Markedly effective: the blood culture was negative within 14 days, but the clinical symptoms did not completely return to normal; Ineffective: the clinical symptoms remained unchanged or deteriorated within 14 days. Effective rate = (cured number+markedly effective number)/total cases ×100%.

The recovery time of symptoms such as milk refusal, abnormal body temperature and negative blood culture after treatment were observed, and the hospital stay of the children was recorded; the complications of the two groups were recorded, including rash, nausea, vomiting, diarrhea and phlebitis.

A self-made satisfaction questionnaire was used to investigate the nursing satisfaction of the children's guardians. The questionnaire included four dimensions, namely, care for children, care for family members, operation quality of nursing staff and communication with family members. Each dimension had a total score of 25 points and had 5 questions. Each question scored 1-5 points, with a total score of 100 points. The higher score indicates the higher satisfaction.

One day before treatment and 14 days after treatment, 2 mL venous blood was collected from the two groups of children, sent to the laboratory for centrifugation at 1500 g for 10 min, and the supernatant was taken for later use. The levels of TNF-α, IL-6 and IL-17 in samples were detected by ELISA, and the operation process was carried out according to the instructions of the kit (Shanghai Guang Rui Biological Technology Co., Ltd). The levels of CD4+ and CD8+ in serum were detected by flow cytometry, and the ratio of CD4+ to CD8+ was calculated.

Statistical methods

SPSS 21.0 was used for statistical analysis, and GraphPad Prism 7 was used to illustrate the data. Chi-square test was used to compare the counting data between the two groups, t test was used to compare the measurement data between the two groups, and paired t test was used for comparison before and after nursing in the same group. When $P < 0.05$, the difference was statistically significant.

Results

Comparison of general data between two groups of children

Comparing the general data of the two groups, we found that there was no significant difference between the two groups in sex, age, weight, gestational age, premature birth, birth mode and infection route ($P > 0.05$), as shown in **Table 1**.

Comparison of clinical efficacy

Both groups of children successfully completed the treatment. Evaluation of the clinical treat-

Table 2. Comparison of clinical efficacy

Group	Regular group (n=30)	Detail group (n=30)	χ^2	P
Cure	16 (53.33)	22 (73.33)	-	-
Markedly effective	7 (23.33)	7 (23.33)	-	-
Ineffective	7 (23.33)	1 (3.33)	-	-
Total effective rate	23 (76.67)	29 (96.67)	5.192	0.023

ment efficacy in the two groups showed that 16 cases were cured, 7 cases were markedly effective and 7 cases were ineffective in the regular group, with a total effective rate of 76.67%. In the detail group, 22 cases were cured, 7 cases were markedly effective and 1 case was ineffective, with a total effective rate of 96.67%. The total effective rate in the detail group was higher than that in the regular group ($P < 0.05$), as shown in **Table 2**.

Comparison of recovery of clinical symptoms and length of hospital stay

According to the recovery of clinical symptoms and length of stay in the two groups, it was found that the temperature stabilization time, blood culture turning negative time, milk rejection improvement time and length of stay in the detail group were significantly shorter than those in the regular group ($P < 0.05$), as shown in **Table 3**.

Comparison of complications

The complications in the two groups were recorded. It was found that there were 2 cases of rash, 4 cases of vomiting, 3 cases of diarrhea and 2 cases of phlebitis in the regular group, and the total incidence of complications was 36.67%. In the detail group, there were 1 case of rash, 2 cases of vomiting, 1 case of diarrhea and 0 cases of phlebitis, and the total incidence of complications was 13.33%. The total incidence of complications in the detail group was lower than that in the regular group ($P < 0.05$), as shown in **Table 4**.

Comparison of guardian's satisfaction with nursing

After the guardians evaluated the nursing satisfaction with the children's care betwen the two groups, it was found that the guardians of children in the detail group scored the care as being higher than those in the regular group in terms of child care, family care, operation quality and communication ($P < 0.05$). As shown in **Table 5**.

Comparison of inflammatory factors

Before nursing, there was no significant difference in TNF-α, IL-6 and IL-17 levels between the two groups ($P > 0.05$). After nursing, the levels of TNF-α, IL-6 and IL-17 decreased in both groups, and those in the detail group were lower than those in regular group ($P < 0.05$), as shown in **Figure 1**.

Comparison of immune function indicators

Before nursing, there was no significant difference in CD4+, CD8+ and CD4+/CD8+ between the two groups ($P > 0.05$). After nursing, CD8+ of children in both groups decreased, CD4+ and CD4+/CD8+ increased, and CD4+ and CD4+/CD8+ of children in the detail group were higher than those in the regular group, while CD8+ was lower than that in the regular group ($P < 0.05$). As shown in **Figure 2**.

Discussion

The results of this study showed that detailed nursing can further improve the treatment effect, shorten the hospital stay and the time to improvement of clinical symptoms, reduce the incidence of complications, improve the nursing satisfaction of guardians, reduce the inflammation of the body and improve the immune function of the body.

Neonatal septicemia is the main cause of infant mortality and morbidity in the neonatal intensive care unit, and it often leads to various complications, which not only increases the social medical burden, but also has a serious negative impact on children's physical and mental growth [11, 12]. At present, the delay in identification and treatment of neonatal septicemia is considered as the main cause of its high mortality [13]. Therefore, in the nursing process of neonatal septicemia patients, it is necessary to closely observe the subtle changes of children's conditions, so as to find anny abnormal conditions as early as possible, give timely treatment, so as to ensure the safety of children's lives. Detail nursing, as a nursing mode that emphasizes the care details, may provide better nursing quality for neonatal septicemia. This study compared the application

Table 3. Comparison of recovery of clinical symptoms and length of stay of children

Group	Regular group (n=30)	Detail group (n=30)	t	P
Temperature stabilization time (d)	5.78±1.27	4.53±1.39	3.636	< 0.001
Turning negative time of blood culture (h)	2.67±0.81	2.06±0.75	3.027	0.004
Improvement time of milk rejection (d)	6.81±1.88	4.32±1.67	5.424	< 0.001
Average length of stay (d)	12.71±3.59	9.15±2.98	4.179	< 0.001

Table 4. Comparison of complications

Group	Regular group (n=30)	Detail group (n=30)	χ^2	P
Rash	2 (6.67)	1 (3.33)	0.351	0.554
Vomiting	4 (13.33)	2 (6.67)	0.741	0.389
Diarrhea	3 (10.00)	1 (3.33)	1.071	0.301
Phlebitis	2 (6.67)	0 (0.00)	2.069	0.150
Total number of people affected	11 (36.67)	4 (13.33)	4.356	0.037

Table 5. Comparison of guardian's satisfaction with nursing

Group	Regular group (n=30)	Detail group (n=30)	t	P
Child care	85.93±15.24	97.24±16.35	2.772	0.008
Family care	82.15±17.11	96.78±15.56	3.465	0.001
Operational quality	86.24±18.14	96.25±17.67	2.165	0.035
Information communication	85.78±14.59	94.25±15.15	2.206	0.031

effect of regular nursing and detail nursing in neonatal septicemia care. The results showed that compared with the regular group, the detail group not only had higher total effective rate, but also significantly shortened temperature stabilization time, blood culture turning negative time, milk rejection improvement time and hospital stay. In addition, the total incidence of complications in the detail group was lower than that in the regular group, indicating that the detailed nursing mode can further improve the treatment effect and promote the recovery of children. This is closely related to the nursing care of medication, complications, cleaning and other details. Previous studies have found that most families with neonates that have septicemia are accompanied by uneasiness and anxiety. Therefore, the nursing staff can popularize the knowledge of neonatal septicemia for the families of children, gain their understanding and reduce their psychological pressure [14]. After evaluating the nursing satisfaction of the guardians of children in the two groups, it was found that the guardians in the detail group had better opinions about the care their neonates received than those in the regular group in terms of child care, family care, operation quality and communication. This showed that a detailed nursing mode is better accepted by the families of children, which is conducive to the follow-up heath and care of the neonates and their family.

As the autoimmune system of most newborns is not mature, bacteria can easily enter the blood, grow and multiply in the blood, release a large number of toxins, and stimulate a variety of immune cells to release excessive inflammatory mediators, resulting in systemic inflammatory reactions and lead to the progression of sepsis [15, 16]. Therefore, it is important to reduce the inflammatory reaction and improve the immunity of children for the treatment of neonatal septicemia. TNF-α, IL-6 and IL-17 are all proinflammatory factors and are abnormally elevated in children with neonatal septicemia, which is closely related to the disease development in children [17, 18]. In this study, the levels of TNF-α, IL-6 and IL-17 in the serum of both groups of children after nursing intervention were detected, and it was found that those in the detail group were lower than those in regular group. The changes of T lymphocyte subsets is an important marker reflecting the disorder of immune function, and the imbalance between CD4+ and CD8+ indicates abnormal immune function [19]. The results of this study showed that after nursing intervention, CD4+ and CD4+/CD8+ of children in the detail group were higher than those in the regular group, while CD8+ was lower than that in the regular group. These results showed that detailed nursing can effectively reduce inflammation in the children's body and improve

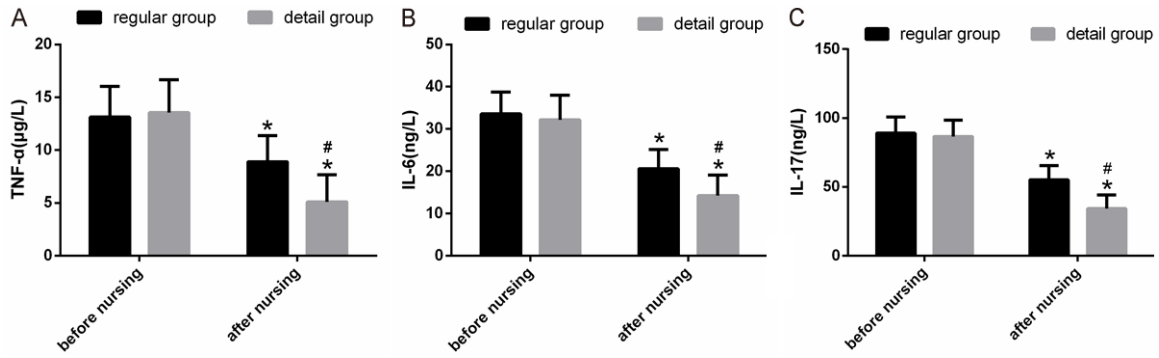

Figure 1. Comparison of TNF-α, IL-6 and IL-17 levels between two groups of children before and after nursing. A: After treatment, the serum TNF-α level of children in both groups decreased, and the level of TNF-α in the detail group was lower than that in the regular group. B: After treatment, the serum IL-6 level of children in both groups decreased, and the level of IL-6 in the detail group was lower than that in the regular group. C: After treatment, the serum IL-17 level of children in both groups decreased, and the level of IL-17 in the detail group was lower than that in the regular group. Note: * indicates compared with before nursing, $P < 0.05$; # indicates compared with the regular group, $P < 0.05$.

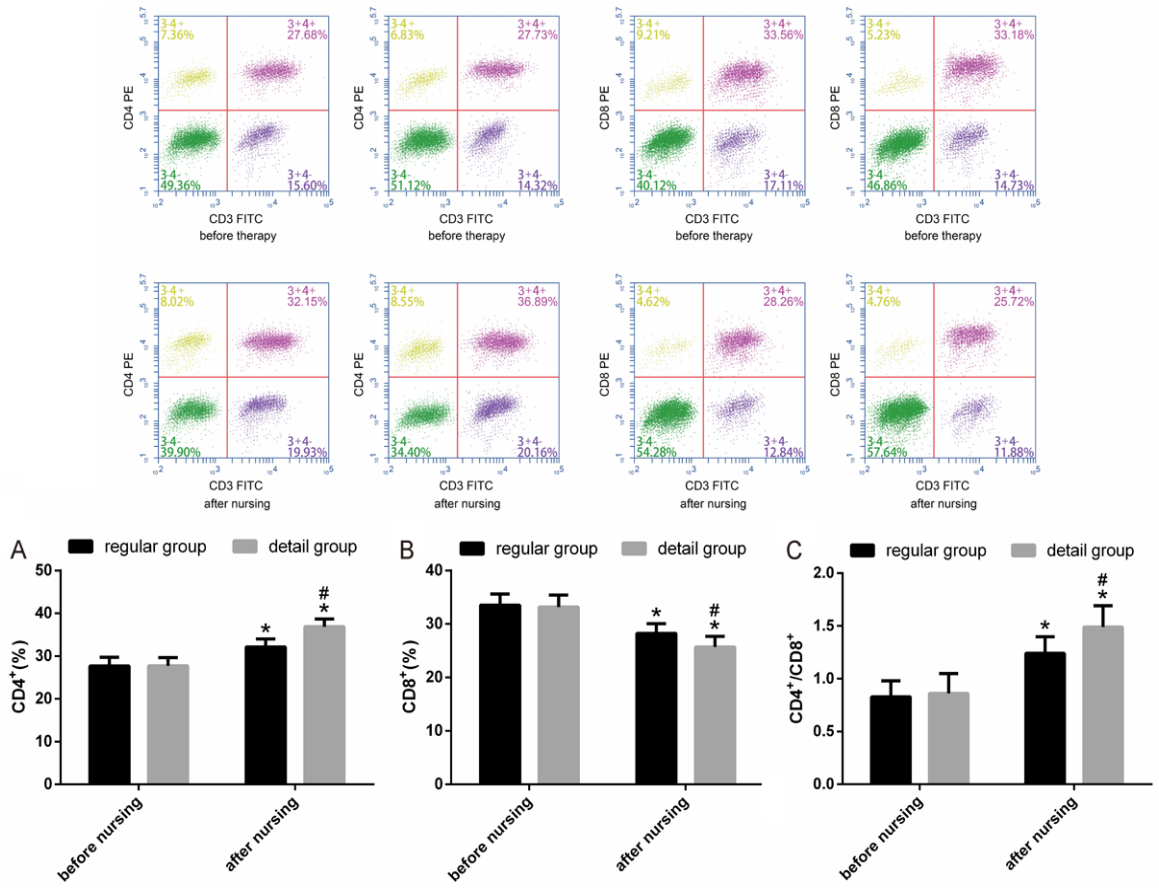

Figure 2. Comparison of CD4+, CD8+ and CD4+/CD8+ levels of children before and after nursing. A: The CD4+ level of children in both groups increased after treatment, and the CD4+ level in the detail group was higher than that in the regular group. B: CD8+ levels of children in both groups decreased after treatment, and CD8+ levels in the detail group were lower than those in the regular group. C: After treatment, CD4+/CD8+ in both groups increased, and CD4+/CD8+ in the detail group was higher than that in the regular group. Note: * indicates compared with before nursing, $P < 0.05$; # indicates compared with the regular group, $P < 0.05$.

their immune function. The reasons may be as follows. First, we closely monitored the subtle changes of children's conditions, and immediately detected and took corresponding measures if there was any abnormal condition, so as to better control the condition. Second, breast milk is the most ideal natural food for infants, which plays an irreplaceable role in the healthy growth and development of infants. Moreover, breast milk contains a large number of irreplaceable immune components and immunocompetent cells, which can effectively enhance the resistance of infants [20, 21], and breast feeding was strengthened in detail nursing, which improved the immune function of children.

There are some shortcomings in this study. First, there are some differences in the work experience of nurses, which may lead to a certain impact on the quality of nursing. Secondly, the economic burden brought by the two nursing methods in this paper is not analyzed from the economic point of view. In addition, the number of research participants that were recruited in this study is small, and more research participants are needed in the follow-up.

The adoption of a detailed nursing mode in the treatment of neonatal septicemia can further improve the treatment effects, shorten the hospital stay and reduce the improvement time of clinical symptoms, reduce the incidence of complications, improve the nursing satisfaction of guardians, reduce inflammation in the body and improve the immune function of the body.

Disclosure of conflict of interest

None.

Address correspondence to: Qing Du, Department of Paediatrics, Ningbo Yinzhou District Second Hospital, Qianhe North Road, Yinzhou District, Ningbo 315100, Zhejiang Province, China. Tel: +86-0574-55662350; E-mail: duqing20091010@126.com

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