EFFECTIVENESS OF INFECTION MANAGEMENT CONTROL AMONG CHILDREN WITH FEBRILE NEUTROPENIA

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ABSTRACT

Febrile neutropenia mostly happens among children with cancer and can be prevented by infection management control. This study aimed to measure the parents' knowledge and behavior about infection management control implementation in children with febrile neutropenia. This study used a pre-experimental design with a pre-post without control group approach. The study sample consisted of 30 parents of children with cancer who were treated with febrile neutropenia. Pre-test measured parents' knowledge about infection control using Parents' Knowledge Instrument before the education session begins. Infection management control consisted of parents' education and behavior monitoring of infection control for five days in hospital. After that, the respondents did a post-test to see the effectiveness of the intervention. The infection management control was effective to reduce infection. This can be seen from the significant increase in parents' knowledge (p=0,001) and it was in line with the change of parents' infection management control behavior. Parents' infection management control in children with febrile neutropenia is effective in reducing the incidence of infection and the length of stay for children in the hospital, as well as improving the quality of life for children. Further research can be carried out with more effective methods so that infection management control can run optimally.

Keywords: children with cancer, febrile neutropenia, infection control, management

ABSTRAK

Febrile neutropenia kebanyakan terjadi pada anak-anak penderita kanker dan dapat dicegah dengan manajemen pengendalian infeksi. Penelitian ini bertujuan untuk mengukur pengetahuan dan perilaku orang tua tentang penerapan pengendalian manajemen infeksi pada anak dengan demam neutropenia. Penelitian ini menggunakan desain pre-experimental dengan pendekatan pre-post without control group. Sampel penelitian terdiri dari 30 orang tua anak penderita kanker yang diterapi dengan febrile neutropenia. Pre-test mengukur pengetahuan orang tua tentang pengendalian infeksi menggunakan Parents' Knowledge Instrument sebelum sesi edukasi dimulai. Pengendalian manajemen infeksi terdiri dari edukasi orang tua dan pemantauan perilaku pengendalian infeksi selama lima hari di rumah sakit. Setelah itu, responden melakukan post-test untuk melihat keefektifan intervensi. Pengendalian manajemen infeksi efektif untuk mengurangi infeksi. Hal ini terlihat dari peningkatan pengetahuan orang tua yang signifikan (p=0,001) dan sejalan dengan perubahan perilaku pengendalian infeksi orang tua. Pengendalian manajemen infeksi orang tua pada anak dengan demam neutropenia efektif dalam menurunkan kejadian infeksi dan lama rawat inap anak di rumah sakit, serta meningkatkan kualitas hidup anak. Penelitian selanjutnya dapat dilakukan dengan metode yang lebih efektif agar pengendalian manajemen infeksi dapat berjalan lebih optimal.

Kata kunci: anak dengan kanker, demam neutropenia, pengendalian infeksi, manajemen

INTRODUCTION

Prevalence of febrile neutropenia in children with cancer is increase in every year. In United States, there are about 60.000-100.000 cancer patient that hospitalized due to febrile neutropenia every year (Rasmy et al., 2016). That increases about 43 cases from 1000 cases of cancer. The prevalence of febrile neutropenia in Indonesia, especially in Jakarta is 65 children with cancer (Nursyirwan & Windiastuti, 2017).

Febrile neutropenia is a complication most often found in hospitals in immunosuppressed children with fever as a sign of infection (Loeffen et al., 2016; Khoirunnisa et al., 2020). Febrile neutropenia is an oncological emergency that requires immediate antibiotics to prevent potential complications of infection/sepsis and death (Pizzo et al., 2015; Rasmy et al., 2016). Fever in neutropenia occurs when the child's body temperature is more than 38^0 C (Rasmy et al., 2016). Other signs of the occurrence of febrile neutropenia are cough, sore throat, neck stiffness (Rasmy et al., 2016).

Febrile neutropenia can affect pediatric treatment procedures, delay chemotherapy, and can worsen the patient's condition. In addition, the death rate from neutropenic fever is around 6.6% (Wang et al., 2017). Good personal hygiene is one of the things that can be done as an effort to prevent febrile neutropenia. Prevention can also be done through providing education about activities that can increase the risk of infection during neutropenia (Rasmy et al., 2016).

Infection prevention can be done with infection management control. Infection management control consists of education to parents and observation of parents' behavior. Previous study said that there was a significant reduction in the infection prevention after being given education using booklets. That study showed an improvement in parents' knowledge relates to incidence of febrile neutropenia (Rasmy et al., 2016; Wang et al., 2017). But, there is not any studies discuss about behavior changes in infection control after given education to incident of febrile neutropenia. The aim of this study was to measure the parents' knowledge and behavior about infection management control implementation in children with febrile neutropenia.

METHOD

Research design

This study used a quasi-experimental design with a pre-post approach without control group. This study was conducted in the non-infectious pediatric ward (oncology) of a government hospital in Jakarta. The study was conducted from January 28 to April 6, 2019.

Participant characteristics

Population in this study was parents of children with all kind of cancer who were treated with febrile neutropenia. Samples were taken by using consecutive sampling technique. The inclusion criteria were parents of children with fever more than 38^0 C and ANC values less than 1000/mm^3. The exclusion criteria were parents of children who had worsening condition. Samples of this study used a formula calculation to test the two-proportion difference hypothesis (Dharma, 2015) so that the number of samples in this study was 30 children.

Procedures

Infection management control consisted of two steps that were education and behavior observation. Respondents received an explanation and signed the informed consent before administering the questionnaire. Next, respondents did a pre-test to measure parents' knowledge about infection control. After that, education was carried out on infection control which was divided into two sessions with each session lasting 25-30 minutes. Education was provided by involving parents. The

educational media was a booklet developed by the author, which contains signs and symptoms of infection and measures to prevent further infection. Then, the parents' behavior of infection control and children's clinical condition that treated with febrile neutropenia were observed for five days. This was based on children's length of stay in the ward. After five days of observation, parents were given a post test to evaluate the knowledge.

Measures and covariates
This study used Parents' Knowledge Instrument (r = 0,509 – 0,884; Cronbach's alpha = 0,948) and observation sheets for monitoring parents' behavior developed by the author.

Data analysis
Data analysis included univariate and bivariate analyzes. The bivariate analysis in this study included the paired T test. The data normality test in this study was the Saphiro Wilk test.

Ethical Clearence
This study ethical clearance was obtained from the Research Ethics Committee of the Faculty of Nursing, Universitas Indonesia (No. 20/UN2.F12.D/HKP.02.04/2019). The ethics in this study emphasizes several principles, including informed consent, participants are not required to include their full names or anonymity and explain confidentiality.

RESULTS AND DISCUSSION

Results

Characteristics of participans
Characteristics of parents of children with febrile neutropenia consisted of age, gender, and education. The mean value of age was 35,67 years old (table.1), with the most of the gender were male (60%) and education degree were high school graduate (54%) (table 2). Characteristics of children consisted of data about body temperature and ANC value. The mean of children's body temperature was $38,3^0$ C and the ANC value was 370,8/mm^3 (table 1).

Table 1
Distribution of Respondents by Parents' Age, Children's ANC Value, and Children's Body Temperature (n=30)

Characteristics	n	Mean ± SD	Min – Max	95% CI
Parent's age (In year)	30	35,67 ± 5,23	28-45	33,71-37,62
Children's ANC (/mm^3)	30	370,8 ± 172,84	70-848	306,26-435,34
Children's Body temperature (^{0}C)	30	38,32 ± 0,48	37,6-39,3	38,14-38,50

Table 2
Frequency Distribution of Respondents Based on Parents' Gender and Education Degree of Children Treated with Febrile Neutropenia (n=30)

Characteristic	Respondent	
	n	%
Parents' Gender		
Male	18	60
Female	12	40
Total	30	100
Parent's education		
Elementary school	0	0
Middle school	4	13
High school	16	54
University	10	33

Parents' Knowledge and Behavior After Education and Observation

Parents' knowledge before and after receiving infection management control education based on the results of statistical tests was that there is a significant difference in the level of knowledge with a mean difference of 1.2 (table 3).

Table 3

The Differences of Parents' Knowledge Before and After Receiving the Infection Management Control with Children Treated with Febrile Neutropenia (n=30)

Variable	n	Before		After		Mean difference	*p value*
		Mean	SD	Mean	SD		
Knowledge	30	6,8	1,38	7,96	1,43	1,2	0,001

Notes. *p < 0,05

The results of observation for five days, most of the children took a shower and did oral hygiene. Meanwhile, almost all children and parents have implemented hand hygiene as an infection control measure (table 4). This means that children exhibit good infection prevention in personal hygiene after the intervention.

Table 4

Observation result of Children's Personal Hygiene and Parents' Environment Control (n=30)

Indicator		Observation Day				
		1	2	3	4	5
Children's Personal Hygiene						
Take a shower	Yes	26	26	27	27	27
	No	4	4	3	3	3
Oral hygiene	Yes	12	14	17	19	21
	No	18	16	13	11	9
Hand hygiene	Yes	25	25	27	27	28
	No	5	5	3	3	2
Parents' Environment Control						
Use of mask	Yes	8	10	10	16	17
	No	22	20	20	14	13
Visitors restriction	Yes	14	12	19	22	24
	No	16	18	11	8	6
Accumulation of items	Yes	19	10	6	5	5
	No	11	20	24	25	25
Food storing	Yes	27	27	28	28	28
	No	3	3	2	2	2

Besides, other observation indicator was environment control. On the first day of follow-up, most of the parents and patients had not used masks in an effort to prevent infection. However, this number continued to decrease until the 5th day of observation. Most of parents did not do visitors restriction in the first day of observation and that number decreased in the 5th day of observation. Most of the parents also still piled their belongings in the ward on the first day of observation. This number had decreased in the 5th day. Almost all parents had been storing food in closed containers since the first day of monitoring (table 4). This means that parents exhibit good behavior in infection control after the intervention.

Discussion

Symptoms that arise as a result of chemotherapy can be overcome by providing education to parents using booklets. Previous study by Şahin & Ergüney (2016), said there was a significant reduction in the children's severity and discomfort of chemotherapy symptoms that arose after parents being given education using booklets. It can also be said that planned education using booklets is effective in increasing parental knowledge so that they can better anticipate dealing with symptoms that arise.

This study is in line with the previous study that said there was an increase in parents' knowledge after being given education using booklets on infection prevention management in children with febrile neutropenia (Maree et al., 2016).

Parents' knowledge improvement is affected by some factors, such as parents' age and education degree. This study showed the mean of parents' age of children with febrile neutropenia was 35 years old and the education degree was high school graduate. This is related to study that said parents who are in the range of age 30 – 40 years old are included in productive age so that they are easier to receive information and more mature in the process of thinking and processing information (Anderson et al., 2018). Thus, education degree also affects a person's understanding of information (Maree et al., 2016).

One of the efforts to increase the role of parents as caregivers is by providing education related to child care procedures. This is in line with the research which states that the information needs of parents as caregivers are related to children's diseases, how to deal with sudden medical diagnoses, how to adapt to treatment procedures, and how to communicate with sick children (Mediani et al., 2019).

Information that needs to be given to parents regarding the infection control in children with febrile neutropenia is related to children's personal hygiene and environment control. This study showed there is a change in children's behavior in personal hygiene as an infection control measure. This is supported by previous study that said infection could prevent by hand hygiene, take a shower every day, and oral hygiene (Hawley et al., 2011; Vedi et al., 2015; Wang et al., 2017). Personal hygiene in this study included take a shower, oral hygiene, and hand hygiene. According to previous study, it recommends to take a shower every day (Aguado et al., 2017). From the observation, it was found that on the first day, almost all children did not take a shower. This was stated by the parents that their children only wanted to take a shower in the bathroom, while some of them also experienced weakness or difficulty in mobilizing. So, they chose to not take a shower. Another thing happened to the aspect of oral hygiene. On the first day of observation, most of the children did not do oral hygiene. They stated that they were lazy to brush their teeth. They also stated that they were uncomfortable with mouthwash, so they were lazy to rinse their mouths. The effect of bad oral hygiene is mucositis. A study showed that mucositis that happen in children with cancer is able to worsen their quality of life (Hendrawati et al., 2019). The nurse recommends the child to rinse his mouth using normal saline fluids. According to Vedi et al [(12)], in the case of neutropenia, gargling with 0.9% normal saline fluid reduces the chance of bleeding and increases comfort (Vedi et al., 2015).

Hand hygiene is a simple action, but has a big impact in reducing the risk of spreading infection. Hand hygiene consists of two types, namely washing hands using alcohol and washing hands using soap with running water. Since the first day of observation, almost all children and parents have implemented hand hygiene. They already understand about the benefits of washing hands for healing their children. Hand hygiene education is not only given to families and patients, but also to visitors who come. Meanwhile, the nurses in the room have already performed hand hygiene after each and every contact with the patient. That is supported by a study stated that one of the standards for preventing infection in hospitals is hand hygiene (Aguado et al., 2017). Also, a study conducted by Bennett et al (Sickbert-Bennett et al., 2016) stated that a level of hand hygiene compliance is needed in preventing the spread of infection. The results obtained showed an association between increased hand washing compliance from 48% to 66% and overall a 40% reduction in nosocomial infection rates

In addition to discussing personal hygiene, infection management control also emphasizes environment control, especially the ward in hospital. The nurse teaches parents about keeping the room clean and tidy so that it doesn't cause new infections because the room is dirty. The environment control includes the use of masks, visitor restrictions, the accumulation of items in the ward, and the food storing. This is consistent with the previous study about environment control (Hendrawati et al., 2019; Şahin & Ergüney, 2016; Sickbert-Bennett et al., 2016). After five days of observation, there was an improvement in parents' behavior in terms of environment control. It gives a good impact in infection management control.

Parents as caregivers have an important role during the process of hospitalizing their children, especially in infection prevention to increase children's health status. The challenge in implementing infection management control is that parents are not accustomed to the implementing of infection control aspects, so that nurses and residents need to remind parents about awareness and responsibility of infection control management for their children.

LIMITATION OF THE STUDY

The limitation of this study is that it only used observation for monitoring methods. This has resulted in the implementation of infection management control not being able to run optimally, especially in the use of disposable masks and the accumulation of luggage in the children's ward.

CONCLUSIONS AND SUGGESTIONS

Our finding highlights febrile neutropenia can increase a child's risk of developing an infection. In this study, there was a significant difference in parents' knowledge about infection management control. Also, there was a change in parents' behavior after being given intervention. Parents' infection management control in children with febrile neutropenia is effective in reducing the incidence of infection. and the length of stay for children in the hospital, as well as improving the quality of life for children. Further research can be carried out with more effective monitoring methods so that infection management control can run optimally.

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Conflict of Interest Statement

The authors declare no conflict of interest.

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