Jurnal Ners

Volume 19 Issue 1, February 2024, p. 31-38
http://dx.doi.org/10.20473/jn.v19i1.50681

ORIGINAL ARTICLE OPEN ACCESS

# Cultural care behaviors of multidisciplinary health workers in preventing neutropenic fever in children with leukemia after chemotherapy: an ethnonursing study

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Responsible Editor: Ilya Krisnana

Received: 19 October 2023○ Revised: 5 January 2024 ○ Accepted: 13 January 2024

## ABSTRACT

**Introduction:** Neutropenic fever is commonly found in children with leukemia after chemotherapy. Fever occurs when children's immunity decreases after chemotherapy, and they are prone to infection. This study aims to describe the cultural care behaviors of multidisciplinary health workers in preventing neutropenic fever among hospitalized children with leukemia after chemotherapy.

**Methods:** An ethnonursing study was conducted at a cancer referral hospital in Central Java, Indonesia. Data were collected through observation in two Pediatric ward and chemotherapy unit for three months and FGDs and in-depth interviews with health workers who provided care services to leukemia patients post-chemotherapy. Data were collected from 14 informants: six nurses, four doctors, two clinical pharmacists, and two nutritionists. This study employed four phases of Leininger analysis for qualitative data to develop its thematic structures.

**Results:** The analysis of the entire data has revealed five themes: (1) performing antiseptic and aseptic techniques consistently, (2) nurse and dietician collaboration in handling eating difficulties post-chemotherapy, (3) collaborative interactions interdisciplinary in handling medication, (4) patient placement in an isolation room adjusted to patients' conditions, and (5) nurse's challenge to educate patients and their families.

**Conclusions:** Health workers from multiple disciplines play essential roles in preventing neutropenic fever by involving patients, parents, and other family members. It is necessary for the nurses to collaborate with other healthcare professionals and educate patients, and families to participate in the care interventions for these patients in minimizing the occurrence of infection among leukemia patients.

**Keywords:** behavior, health workers, preventing neutropenic fevers

## Introduction

Neutropenic fever is one of the complications of chemotherapy in children with cancer and frequently becomes the leading cause of morbidity and mortality (Patel and West, 2017; Davis and Wilson, 2020). Neutropenic fever is more commonly found in blood cancers than in solid cancers. Moreover, neutropenic fever is primarily found in acute lymphocytic leukemia and acute myeloblastic leukemia at 54.2% (Nursyirwan and Windiastuti, 2018).

After chemotherapy, children with leukemia usually encounter various side-effects, including leukopenia and fever, caused by adverse drug reactions (ADRs) (Adade *et al.*, 2022). As neutrophils are one of the components of white blood cells or leukocytes, neutropenia can occur when someone has a low leukocyte count. Such a

condition causes immunocompromising or decreased body immunity and makes children susceptible to fever (Rastogi *et al.*, 2021). Neutropenia is the most common side effect of myelosuppressive drugs and puts patients at risk of neutropenic fever due to infection (Tralongo *et al.*, 2020). Febrile neutropenia is most often caused by an infection in the bloodstream. Cancer patients with this fever are particularly susceptible to infectious complications, such as sepsis, which may lead to death (Davis and Wilson, 2020). To avoid deaths, appropriate multiple interventions for neutropenic fever must be delivered by multidisciplinary professionals before and after fever occurrence (Cennamo *et al.*, 2021).

Neutropenic fever is a body temperature reaching ≥ 38°C and a decrease in the value of the Absolute Neutrophil Count (ANC) reaching ≤ 500 cells/mm3 (Lucas, Olin and Coleman, 2018). Neutropenic fever is most often caused by an infection in the bloodstream. Cancer patients with neutropenic fever are particularly susceptible to infectious complications. Various effects that emerge after pediatric patients get chemotherapy include anemia, infection, leukopenia, and fever; this condition is known as adverse drug reactions (ADRs) (Adade *et al.*, 2022). To anticipate infection or complications, the multidisciplinary medical team will administer antibiotics to pediatric patients following chemotherapy. This effectively reduces the risk of infection (Davis and Wilson, 2020). Health workers, especially nurses, must strictly administer antibiotics on schedule and ensure that this administration in patients is in accordance with dosage and time using aseptic standards to prevent neutropenic fever. Administration of antibiotics is a preventive measure against neutropenic fever and are administered when neutrophils are < 500 cell/MCL or before the onset of fever is considered viable and safe (Melchionda *et al.*, 2013; Zengin *et al.*, 2017).

The Centers for Disease Control and Prevention recommends several aspects to prevent infection or neutropenic fever in children with cancer, which must involve multidisciplinary collaboration (Control, 2019). However, previous research has not comprehensively examined the collaborative works of health professionals related to nursing care in preventing neutropenic fever. Meanwhile, the number of neutropenic fevers in Central Java is still high. Among 101 patients with cancer who suffered from neutropenic fever after chemotherapy in Central Java, specifically in the Central General Hospital, 35 (34.7%) were pediatric patients (Pratiwi *et al.*, 2022). Thus, this study aims to describe the cultural care behaviors of multidisciplinary health workers in preventing neutropenic fever among hospitalized children with leukemia after chemotherapy. Such a condition was investigated using an ethnonursing approach to reveal the cultural care in preventing neutropenic fever in children with leukemia after chemotherapy through multidiscipline perspectives. Behavior is culture, and it is more appropriate to carry out research using ethnonursing because it will explore the actual natural condition of nurses and other health workers who work together with the nurses. This study was expected to understand the existing nursing collaboration culture in providing care to leukemia patients and its barriers to preventing neutropenic fever. Thus, the findings can underlie the establishment of a multidisciplinary team (MDT) model of care for post-chemotherapy among pediatric patients.

## Materials and Methods

### Design and Settings

A mini ethnonursing study was conducted to identify health workers' behavior in preventing neutropenic fever in children with leukemia after chemotherapy in a hospital. This study employed Leininger's theory of transcultural nursing or culture (McFarland and Wehbe-Alamah, 2019; Wehbe-Alamah and McFarland, 2020) as a guide frame. Qualitative study of multidiscipline health workers involved in leukemia therapy was conducted to gain facts regarding these workers' care behaviors and to understand the potential and real phenomenon of nursing which needs to work collaboratively with other professionals in achieving goals. The aim of ethnonursing, as indicated in this study design, is to capture the expressions and meaning of patient care from similar and different perspectives (Leininger and Mc Farland, 2006).

This study was conducted for three months in two Pediatric ward and one outpatient chemotherapy unit. The data were collected through observation, FGDs, in-depth interviews, and document studies on medical records of leukemia patients and hospital protocols for leukemia and infection control. Data saturation was reached with 14 informants. The informants in this study were health workers, including nurses, doctors, clinical pharmacists, and nutritionists.

### Ethical considerations

This study was approved by the Ethics Committee of the Central General Hospital of Central Java, Indonesia (No.1466/EC/KEPK-RSDK/2023). All observed and interviewed informants had given written consent prior to participating in this study.

## Data collection

To obtain credible and rich data, three areas of the hospital, two Pediatric ward and one pediatric chemotherapy unit were chosen as the study location. Data were collected by the researcher with the assistance of two head nurses in the wards. Data were collected by observing participants during services, interviewing them, conducting FGDs, and conducting documentation studies. Both emic and etic data were studied to maintain objectivity and record relevant patterns (McFarland and Wehbe-Alamah, 2019; Wehbe-Alamah and McFarland, 2020) Informants comprised nurses, doctors, clinical pharmacists, and nutritionists. Before retrieving data, all informants had received an explanation of the research purposes. After receiving this explanation, they voluntarily participated in the study by giving consent. Data retrieval employed a semi-structured interview guide (See Figure 1).

### *Informant observations and interviews*

Observations were made to obtain an authentic description of neutropenic fever prevention in pediatric patients with leukemia after chemotherapy. This study observed health workers' behavior and habits during services in the wards. The researchers observed health workers' behavior and habits in providing interventions and education for patients and their families. The researchers collaborated with nurses, doctors, clinical pharmacists, and nutritionists to conduct observations without involvement in the services. The researchers and health workers visited patients and observed the health workers' activities focusing on neutropenic fever prevention. Observations were carried out by following the service schedule of the nurses and doctors who were going to examine and treat the patients. Meanwhile, observations on dietitians and clinical pharmacists were conducted along with their duty time as informed by the nurse on duty. The researchers followed health workers during their visits to the patients and observed the health workers' activities. In the first and second weeks, the researchers used nursing uniforms to hold observations. Then, in the third and fourth weeks, we continued with interviews during observation for other informants. Finally, the observed health workers were interviewed. This study also analyzed documents related to the objective of this study. This study adjusted observation phases to those in an ethnonursing method, participation, and Leininger's reflection as observation protocols (Wehbe-Alamah and McFarland, 2020).

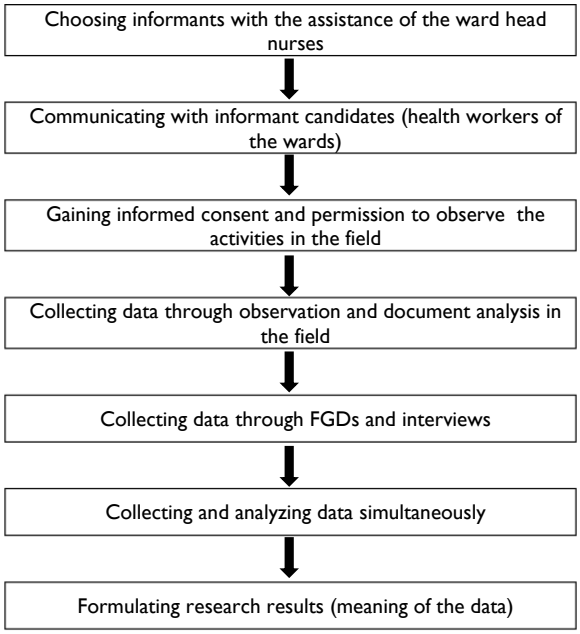


Figure 1 *Data collection process*

## Recruitment of the informants

The purposive sampling technique was employed to recruit informants to achieve data saturation. Informants were selected by adjusting to the research question as a guide and following their informants during the observation. The informants were recruited using the inclusion criterion of health workers who care for and treat children with leukemia after chemotherapy. During the observation in the wards, four health workers participated in this study; they were nurses, doctors, clinical pharmacists, and nutritionists. Meanwhile, the exclusion criteria were: (1) health workers who were on leave or sick during the research time and (2) health workers who resigned from participating in this research. The researchers protected the informants' privacy during the observation, FGDs, and interviews.

## Data analysis

Observation data were in the form of field notes and photographs. Meanwhile, the results of interviews and FGDs were recorded and transcribed. Afterward, the researchers analyzed the data to obtain a thematic view. This study employed four phases of Leininger analysis for qualitative data to gain the thematic structures of this study (Wehbe-Alamah and McFarland, 2020). First, the researchers consecutively focused on emic data, ethical data, and research objectives. Data from observations, field notes, photographs, interviews, and FGDs were copied. Second, the researchers described a process to encode all data. Then, the codes were classified according to the investigation domains, and each code's meaning in the context was analyzed. Third,

the researchers ranked repeatedly reviewed data to find recurring patterns, similarities, and different meanings in contexts. In this phase, the data saturation was confirmed. The data were analyzed to show meaning patterns of the findings, considering further credibility and confirmation of the results. In this phase, the meaning of the text was described as categories. In the final phase, the data were unified and interpreted, and the formulation of new findings of this study was determined as a pattern of preventing neutropenic fever in children with leukemia after chemotherapy. The researchers analyzed the data repeatedly; each step was conducted repeatedly by confirming the data with the informants. Then, each step was reviewed, and the data were confirmed with informants at all stages.

## Results

This study involved 14 participants aged 26 to 48 years old. The informants were mostly female and dominated by professional nurses and medical doctors with bachelor's degree backgrounds (See Table 1).

The observation, FGD, interviews, and document studies have revealed five themes: (1) performing antiseptic and aseptic techniques consistently, (2) nurse and dietician collaboration in handling eating difficulties post-chemotherapy, (3) collaborative interactions interdisciplinary in handling medication, (4) patient placement in an isolation room adjusted to patients' conditions, and (5) nurse's challenge to educate patients and their families The summary of the themes and sub-themes of the findings can be seen in Table 2.

*Theme 1: Performing antiseptic and aseptic techniques*

The observation results showed that the mother and child service wards were equipped with a sink for hand washing near the entrance door, near the bathroom, and in the patient's room. A bottle of liquid disinfectant for washing hands was also available next to the patient room's door. Before entering the patient's room, some of the health workers washed their hands in the sink or applied alcohol-based liquids. However, some others did not always apply this hand washing before and after entering the patient's room. In addition, they wore gloves during the treatment according to hospital procedure protocol. They also frequently reminded patients, families, and parents to pay attention to personal hygiene and hand washing. The observation has revealed that alcohol-based liquid disinfectant was regularly refilled because health workers, families, and visitors frequently apply it.

Almost all of the informants described that personal hygiene, especially hand washing, is a priority intervention for health workers to prevent infection and teach the patients and their families. Two of the nurse informants said:

*"Our treatment should follow the SPO. We should prevent pediatric patients from being infected so that we wash our hands and use disinfectant."* (P1)

*"We wear PPE and wash our hands when visiting the patient. We collaborate with housekeeping staff to clean the patients' rooms. We educate the staff on how to clean the room. We also educate patients' families about patient rooms' cleanliness."* (P5)

Meanwhile, one of the general practitioner (GP) informants emphasized the importance of conducting procedures with sterile techniques. He said: "*We always*

Table 1 Characteristics of the informants

| Code | Age | Sex | Level of Education | Occupation |
|---|---|---|---|---|
| P1 | 48 | Female | Undergraduate | Charge Nurse |
| P2 | 33 | Female | Undergraduate | Charge Nurse |
| P3 | 31 | Female | Undergraduate | Dietician |
| P4 | 35 | Female | Undergraduate | Charge Nurse |
| P5 | 34 | Female | Undergraduate | Charge Nurse |
| P6 | 41 | Female | Undergraduate | Charge Nurse |
| P7 | 28 | Female | Diploma | Charge Nurse |
| P8 | 56 | Female | Undergraduate | Dietician |
| P9 | 32 | Male | Postgraduate | Clinical Pharmacist |
| P10 | 33 | Female | Undergraduate | General Practitioner |
| P11 | 52 | Female | Postgraduate | Clinical Pharmacist |
| P12 | 32 | Female | Undergraduate | General Practitioner |
| P13 | 29 | Female | Undergraduate | General Practitioner |
| P14 | 48 | Female | Postgraduate | Specialist: Pediatrician with Hematologist expertise |

Table 2. Finding Themes and Sub-Themes

| No | Themes | Sub-Themes |
|---|---|---|
| 1 | Performing antiseptic and aseptic techniques consistently. | Personal hygiene<br>Healthy Living Behavior<br>Sterilization and disinfection |
| 2 | Nurse and dietician collaboration in handling eating difficulties post-chemotherapy. | Optimizing nutritional intake<br>Education on optimizing nutritional intake |
| 3 | Collaborative interactions interdisciplinary in handling medication. | Child's condition after chemotherapy<br>Intervention according to standard operational procedure |
| 4 | Patient placement in an isolation room adjusted to patients' conditions. | Criteria for isolated patients<br>Cohorting |
| 5 | Nurses' challenge is to educate patients and their families. | Education on healthy living behavior<br>Education minimizes the risk of infection from outside<br>Education on infection prevention at home<br>Educational media<br>Educational evaluation |

*perform the aseptic technique and administer medicine sterilely*." (P10)

*Theme 2: Nurse and dietician collaboration in handling eating difficulties post-chemotherapy*

This study's observations found that some patients had mouth ulcers, nausea, and vomiting as the effects of chemotherapy and this caused eating difficulty. To manage this problem, the nutritionists assessed and offered types of foods that pediatric patients could eat. They informed the pediatric patients' parents of these types of foods. Therefore, their diet was replaced with milk because they refused to eat porridge or bread. The nutritional staff served a significant portion of meals three times a day. It also indicates that some pediatric patients with eating difficulties cannot eat one meal in one serving, so the meals, including fruit, were left. The interviews revealed that leftover food was supposed to be saved in the food storage so patients could eat it later. However, no food storage was available in the room, and the leftovers could be the sources of infection when eaten again by pediatric patients. The FGDs stated that nurses and nutritionists collaborated to discuss patients' nutritional needs, provide high-nutritional meals, and educate the patients and their families. This strategy aims to provide adequate daily nursing care and nutritional care. The dietician informants stated:

*"After providing the pediatric patients with food, I ask their parents how much food the child can eat and what types of food the child eats. Then, I also ask them about symptoms of nausea and vomiting. Afterward, I will count the percentage of the food and decide if the amount can be added. I will increase the amount of food given. If the pediatric patients can only eat 30% of the provided food, instead of 50% as I target, I will remodify the diet and consider what types of food the child eats more, solid or liquid. For example, if they eat more liquid food, I will add the volume of the food or change into a higher calorie milk with the same volume."* (P3)

Furthermore, a nurse informant said:

*"For example, when leftover fruit, such as bananas or apples, is not discarded into the bin, family members sometimes eat it because they consider it unfortunate with the fruit. They just eat half of the fruit and leave it in the ward. If the other half of the fruit is eaten by pediatric patients with malignant diseases and chemotherapy, it will cause infections. Therefore, we educate the family to eat up the food and not leave over the food. If they cannot eat the food, they should throw it in the bin." (P1)*

The medical records also showed that nutritionists educate patients about food or nutrition given to hospitalized patients. Implementation notes showed that nurses also provided education about balanced nutritional intake to increase patients' body immunity and prevent infection risk and informed the dietician and pediatrician about patients' eating problems.

*Theme 3: Collaborative interactions interdisciplinary in handling medication*

The observations indicated that a pharmacist comes with the medicine as prescribed for a number of patients. Medicine handover was held in a room by pharmacy staff and more than one nurse to check the medicine. An example of health workers' collaboration is as follows: a clinical doctor prescribes medicine for a patient, and then a clinical pharmacist assesses, dispenses, and counsels the prescription to monitor the side effects of the prescribed medicine. This assessment involves nurses because they interact with patients more. One of the pharmacist informants explained:

*"We help doctors to review whether chemotherapy documents have already complied with established standards or protocols. If the documents are ready, pharmacists will prepare cytostatic. Afterward, the medicine is ready, the patient undergoes chemotherapy and he returns to the ward. Then, if the patient has chemotherapy repeatedly, he usually understands what he will feel every chemotherapy, even though the feeling is not the same. We help patients to conduct an initial assessment. For example, we ask, "How was the chemo yesterday?*

*"Patients usually say that they vomit after chemotherapy and suddenly have a fever. Even if the problem exists, it is fine so far. That is all that we are doing. We observe and monitor until the patient is discharged. However, some parents ask nurses to prepare medicine in case their child has a fever at home. We talk to the doctor and ask him to prescribe some medicine because the patient has a certain tendency.*

*"So I would definitely ask patients not to be bored because his medicine is a lot and not taste good. I also remind them if they did not take this medicine, their condition will get worse."* (P9)

*Theme 4: Patient placement in an isolation room adjusted to patients' conditions*

The observation revealed that the maternal and child care wards only have one isolation room with a HEPA filter and one isolation room without a HEPA filter. The capacity of the two rooms is two patients each. Pediatric patients with leukemia after chemotherapy are often placed in these two rooms due to the risk of infection caused by decreased white blood cells, known as neutropenia and pancytopenia; however, many times

the rooms were full while the demand for the rooms was higher. A high number of children conducting chemotherapy made the wards adhere to a cohort system. The informants described that this system aims to minimize the occurrence of infection due to limited existing facilities. The charge nurse discussed with the pediatrician about the patients to be prioritized in the isolation room and how prompt treatment should be delivered for these patients. One of the nurse informants said:

*"This patient can be treated in positive pressure and must be isolated from other patients who have infections. Therefore, quick treatment aims to reduce further severity or infection transmission."* (P7)

*Theme 5: Nurse's challenge to educate patients and their families*

Observation results indicate that each discipline provides health education to the patients by themselves, while documentation about specific information provided to the patients is not mentioned in the record. Thus, similar information was repeatedly delivered to the patients by different health workers. In addition, nurse informants explained their difficulties in managing patient's disobedience in following visiting rules to prevent nosocomial infection to the patients. This statement is supported by the observation data that some hospitalized children are accompanied by both parents. Once, an isolation room was occupied by six people, namely two patients with two companions each. Even though the hospital regulations showed in the electronic medical record stated that patients could only be accompanied by one family member and the family could not sleep on the bed, the nurses described that they were unable to enforce these hospital regulations to the patient's family as they did not want to have a conflict with the patient and his family. The results of the analysis of hospital administrative documents showed that there are no differences in regulations for visiting and accompanying pediatric patients. One of the charge nurse informants affirmed that:

*"Many family members should not stay here in the ward. Therefore, they will not block housekeeping staff from cleaning the ward in the morning and evening. An isolation room has a room for companions, while others do not. Therefore, when a family member sleeps under the patient's bed, we will wake him up, especially during the handover. We will ask him to wake up and roll up the mat. Sometimes, some family members do not follow our instructions, so we must call security staff. In some cases, a pediatric patient from a village is accompanied by many family members, such as a mother, father, grandmother, and uncle. That is our challenge, especially when dealing with chemotherapy patients. We will educate the family members that the patient's companion staying in the ward should not change. Therefore, when the companion in the ward needs food, another family member outside the ward can help him find food. Unfortunately, it is difficult for us to educate them about this issue. Sometimes, we also rebuke a family member from another city who directly visits the patient in the ward wearing a jacket. We will ask him to put the jacket outside the ward. That is our effort. Then, we ask him to wash his hands before entering the patient's room."* (P1)

The hospital services standard of infection prevention states that one only family could accompany one patient. However, because pediatric patients often experience hospitalization effects, such as anxiety and fear, the nurse permitted that a pediatric patient could be accompanied by both parents. In fact, this violates the provisions of infection control.

## Discussions

In this discussion, cultural care related to neutropenic fever prevention carried out by multidisciplinary health workers at the hospital will be explained and compared to the previous studies according to Leininger's educational factors enabler. Generally, this ethnonursing study found that professional nurses should effectively work with other professionals, such as physicians, nutritionists, and pharmacists, and involve patients and their families in the fulfillment of patients' basic needs and health education to prevent neutropenic fever due to chemotherapy; however, according to the results of the observation, interviews, and FGDs, the MDT collaboration has not been established optimally.

This study found that hand washing was mandatory for health workers, patients, their families, and visitors, and information always reminds medical staff to wash their hands every time patients are admitted to hospitalization, including when carrying out duty or intervening in patients. However, some medical staff did not comply with this rule. From the observation and interview, some medical staff do not comply with this rule. In some cases, health workers do not wash their hands or use hand rub before touching patients. Consistent with previous studies, practicing hand washing has several obstacles, such as inconsistent supplies of hand washing materials, lack of training, adverse reactions after being reminded to wash hands, and lack of motivation (González *et al.*, 2016). Although

health workers' infection prevention and control behaviors are key factors in infection prevention and management, many parties still have low adherence to prevention behavior, so the focus is usually on corrective interventions (Greene and Wilson, 2022). Lifestyle, personality, and organizational culture play a key role in hand-washing behavior (Ghaffari *et al.*, 2020).

According to this study's findings, many children with leukemia experienced post-chemotherapy side effects. They experienced anemia, nausea, and vomiting because of mucositis, which led to eating difficulties and low dietary intake. The roles of nurses and dieticians is important to maintain the oral intake and nutritional balance of the patients. These health workers collaborated in identifying problems and providing education and support for the patients and their families. Education about diet to meet nutritional needs during illness is crucial, especially for pediatric patients with leukemia after chemotherapy, as their immunity decreases (Adade *et al.*, 2022). Past research indicates that children with cancer presented undernutrition. In general, undernutrition rates were found in low- or low-middle-income countries. Malnutrition will affect the quality of life and the overall survival of the patient (Diakatou and Vassilakou, 2020). Proper nutritional assessment and nutritional intervention are necessary to maintain growth and development and improve the quality of life of children with cancer (Viani *et al.*, 2020).

This current study found that each health worker understood their part in patients' care services adequately. The nurse works are links with other professional work, and no single profession can prevent the occurrence of neutropenia; however, this study also indicates that most work is just a daily routine, while multidisciplinary consultation discussions or meetings for special or cases were rarely performed. Various effects that emerge after pediatric patients get chemotherapy include anemia, infection, leukopenia, and fever should be anticipated to prevent infection or complications by the medical team (Adade *et al.*, 2022). Furthermore, the medical team is supposed to give antibiotics after the pediatric patients have chemotherapy as administration of antibiotics effectively reduces the risk of neutropenic fever (Owattanapanich and Chayakulkeeree, 2019). However, this ethonursing study found that this antibiotic would not be prescribed for the patients if the infection has not to occur. A recent integrative review by Dunnack and Montano revealed that multiple health professional who works together towards standardize implementation for neutropenic fever will improve the patient's outcomes, including reducing antibiotic duration, deaths, cost, and length of stay (Dunnack and Montano, 2021).

In this study, health workers are found to perform several health promotion sessions to the patients and their families to improve their knowledge and behaviors toward preventing neutropenic fever. Several patients and families' behaviors, such as washing hands, wearing clothes that protect them from being contaminated by infectious fluids, not coming to visit patients if having respiratory tract infection symptoms, and hospital efforts to build private rooms with closed windows and install air filters that can filter the air efficiently are an important aspect in controlling the nosocomial infection (Bryant, Walton and Albrecht, 2014). Patients with neutropenia should be facilitated to occupy the isolation rooms to prevent them from infection (Naghdi, Forouzi and Dehghan, 2021), which is not fully supported in the hospital of this current study. One-time education is not enough and must be repeated and implemented for patients, parents, families, and visitors. Education is mainly about personal hygiene, hand washing, and hygiene. This education is crucial because some visitors often go in and out of patient rooms without washing their hands and bring various items from outside that can increase the risk of transmission.

## Conclusion

Prevention of neutropenic fever depends on the collaboration habits of the nurse team. Sufficient and prompt multidisciplinary teamwork between health workers and optimal support of patients and their families can effectively prevent the neutropenia side effects. Health workers must collaborate to maintain antiseptic and aseptic techniques and a high standard of health education and treatment for the patients, while patients and their families should implement aspects taught by health workers. Prevention of neutropenic fever requires the cooperation of multidisciplinary health workers, patients, and their families since medicaments and health workers' preventive behaviors cannot necessarily reduce the risk of infection.

## Funding

This research was funded by Direktorat Riset, Teknologi dan Pengabdian Kepada Masyarakat, Direktorat Jenderal Pendidikan Tinggi, Riset dan Teknologi Kementerian Pendidikan, Kebudayaan, Riset dan Teknologi Nomor: NKB-1092/UN2.RST/HKP.05.00/2023.

## Acknowledgments

This research was supported by Direktorat Riset, Teknologi dan Pengabdian Kepada Masyarakat, Direktorat Jenderal Pendidikan Tinggi, Riset dan Teknologi Kementerian Pendidikan, Kebudayaan, Riset and Teknologi and Universitas Indonesia.

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**How to cite this article:** Naviati, E., Afiyanti, Y., Allenidekania, A., and Novieastari, E. (2024) 'Cultural Care Behaviors of Multidisciplinary Health Workers in Preventing Neutropenic Fever in Children with Leukemia after Chemotherapy: An Ethnonursing Study', *Jurnal Ners*, 19(1), pp. 31-38. doi: http://dx.doi.org/10.20473/jn.v19i1.50681