Original Article

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Quick Response Code:

Website: www.jehp.net

DOI: 10.4103/jehp.jehp_241_22

A sequential exploratory study to develop and validate neutropenic nursing care bundle for neutropenic patients admitted in a tertiary care hospital, Uttarakhand

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Received: 13-02-2022
Accepted: 03-06-2022
Published: 25-08-2022

Abstract:

BACKGROUND: Patients diagnosed with cancer and who undergo cancer treatment are at potential risk of bone marrow suppression leading to prolonged hospitalization, delay in treatment, and chemotherapy dose reductions, which ultimately results in significant morbidity and mortality. This sequential exploratory study using a mixed-method approach was aimed to develop and validate a neutropenic nursing care (NNC) bundle for neutropenic patients admitted in a tertiary care hospital, Uttarakhand.

MATERIAL AND METHODS: This sequential exploratory study design with an instrument developmental model was used to develop the NNC bundle. It consisted of two phases: Qualitative phase and quantitative phase. In the qualitative phase, focused group discussion with eight oncology nurses was performed to derive themes related to neutropenic nursing care using conventional content analysis. An extensive literature review was also performed on these themes to explore the current pieces of evidence for item pool generation. In the quantitative phase, a preliminary draft bundle was developed, and two Delphi rounds (I and II) were carried out among the five experts for the content validation of the NNC bundle and a final bundle was developed.

RESULTS: Major domains identified for the bundle were hand hygiene, care of central and peripheral lines, routine oral care, antiseptic bath, peri-anal care, diet, and environmental hygiene. The content validity index (CVI) of the bundle was found to be >80% for all the items with I-CVI >0.8 and S-CVI = 0.99 after conducting two rounds of Delphi.

CONCLUSION: The present study has provided a set of valid written neutropenic nursing interventions to prevent complications in neutropenic patients. The NNC bundle should be subjected to other levels of evaluation that measure the bundle's practicability and suitability for the intended field.

Keywords:

Cancer, febrile neutropenia, infection prevention, nursing interventions

Introduction

Cancer is globally conceded as the second major cause of morbidity and mortality following cardiovascular diseases.[1] GLOBOCAN 2020 reported that the worldwide cancer burden has surged to 19.3 million cases and 10 million cancer deaths in 2020. Worldwide, the 5-year prevalence is extrapolated to be over 50 million.[2] India is also experiencing a rise in cancer incidence burden of over 1.39 million new cases (GLOBOCAN 2020).[1]

Broadly, tumors are classified into two major categories, that is, solid tumors

How to cite this article: Dahiya N, Rani R, Nath UK. A sequential exploratory study to develop and validate neutropenic nursing care bundle for neutropenic patients admitted in a tertiary care hospital, Uttarakhand. J Edu Health Promot 2022;11:267.

and hematological tumors. A solid tumor (sarcomas, carcinomas, and lymphomas) is an abnormal mass of tissue that usually does not contain cysts or liquid areas. It may be benign (not cancer) or malignant (cancer). On the other hand, hematological malignancies (leukemia, lymphoma, multiple myeloma) are cancers of blood cells and lymph organs.[3] These malignancies affect people all over the world. Acute lymphoid leukemia is the most common malignancy in children with a mean age of 5.61 ± 2.82,[4,5] and leukemia ranked 14th in the incidence rate and is the 11th most common cause for death (GLOBOCAN 2020).[2]

Patients diagnosed with cancer and who undergo cancer treatment including chemotherapy, hematopoietic stem cell transplantation, bone marrow transplantation, and so on are at potential risk of myelosuppression, and they land up with dropping neutrophil counts which act as the body's first line of innate defence from microorganisms and inflammation. It may lead to life-threatening infections leading to sepsis and death.[6]

Immunosuppressive/cytotoxic chemotherapies target the rapidly dividing cells of the body and produce dose-dependent toxicity on cell production, protein synthesis, bone marrow, and cell survival, and their mechanism of drug-inducing immunological reaction results in cell destruction and hence leads to neutropenia.[7,8]

As per the National Comprehensive Cancer Network (NCCN) Guideline, a condition where neutrophil counts of less than or equal to 500 neutrophils/μL or less than or equal to 1,000 neutrophils/μL and predicted to decline to less than or equal to 500 neutrophils/μL within 48 hours of presentation is known as neutropenia, and if it associated with fever, it is known as febrile neutropenia.[6] According to the European Society for Medical Oncology (ESMO), febrile neutropenia is defined by an oral temperature greater than 38.5°C for two consecutive readings within 2 hours and an absolute neutrophil count (ANC) below 0.5×10^9/L.[9] Hematological malignancies account for 80% of febrile neutropenia, whereas solid malignancies account for 10–50%.[9]

Neutrophil counts generally start to drop about a week (7–14 days) following each round of chemotherapy. This is considered as nadir, and at this point, patients are most likely to develop an infection.[10] The risk of infection increases if neutropenia persists for >7 days with lower absolute neutrophil counts.[11] A scale of four grades for classification of neutropenia has been developed by the National Cancer Institute based on the absolute neutrophil count (ANC): Grade 1, ANC ≥1.5 to $<2 \times 10^9$/L; grade 2, ANC ≥ 1.0 to $< 1.5 \times 10^9$/L; grade 3, ANC ≥0.5 to $<1 \times 10^9$/L; grade 4, ANC $<0.5 \times 10^9$/L.[12]

The most common signs and symptoms presented by neutropenic patients are fever, irritability, hot or cold shivers, sweating, and so on.[13] The inflammatory response is compromised in these patients as the body's first defence mechanism gets impaired; thus, there might be little to no symptoms found. Sometimes, fever may be the only complaint reported by the patients.[13] Febrile neutropenia leads to multiple complications such as septic shock, pneumonia requiring invasive or non-invasive ventilation, renal failure, neutropenic enterocolitis, encephalopathy, congestive heart failure, and bleeding manifestations (mucosal bleeds).[14]

To avoid a prolonged hospital stay, re-admission, interruption of the patient's recovery plan, and a high mortality rate, it is critical to prevent these life-threatening complications by early detection of febrile neutropenia and prompt management. Oncology nurses remain in close contact with patients and are expected to provide individualized care to neutropenic patients using evidence-based insight and practice to enhance patients' quality of life and thereby reduce the financial burden of treatment on families and healthcare systems by avoiding these life-threatening neutropenic complications. It has been found that to improve the psychological needs of the family members with patients, nurses should provide more precise information about the patient's treatment procedure to family members.[15] For nurses, observing patients' rights is also one of the most important components of providing humanistic and ethical care.[16] Self-efficacy among nurses can be enhanced by educating them to improve the patient training for maintaining their health, disease prevention, and health promotion.[17]

The majority of studies show a significant gap between nurses' knowledge and practice, which may result in infection prevention failure in neutropenic cancer patients.[18-20] Therefore, a sequential exploratory study was planned to develop a neutropenic nursing care (NNC) bundle, which allows nurses to follow the care interventions for every patient, every time.

Materials and Methods

Approvals

Ethical approval was obtained from the Institutional Ethical Committee of the All India Institute of Medical Sciences (AIIMS), Rishikesh, with approval No. (AIIMS/IEC/20/22;08/02/2020). Written informed consent (English) was obtained from all the participants of the focused group discussion (FGD) and all the experts for Delphi rounds.

Study design and setting

A mixed-method approach using sequential exploratory design (Qualitative–quantitative) with an instrument developmental model. [Figure 1] was used to develop the NNC bundle at AIIMS, Rishikesh. The qualitative phase was conducted first, followed by the quantitative phase. The qualitative phase mainly focused on a detailed exploration of a little researched phenomenon. FGD was performed with oncology nurses to get an overview of existing knowledge and practices, and the literature was reviewed to generate the item pool**.** In the quantitative phase, the item pool was tested for its validity through two rounds of the Delphi method [Figure 2].

Data collection procedure

Data collection was performed in following phases and steps [Table 1]. The duration of data collection phase 1 was from November 2020 to January 2021, and for phase 2, it was from February 2021 to March 2021.

Phase 1: Qualitative data collection phase

The qualitative phase mainly focused on a detailed exploration of a little researched phenomenon through focused group discussion and review of best evidence concerning NNC.

Focused group discussion

FGD was performed using six self-structured questions, which were developed by an extensive review of the literature and experts' suggestions. FGD was conducted among eight participants from the oncology nursing care unit, AIIMS, Rishikesh, by a team consisting of a moderator and two note takers after taking consent from participants. The inclusion criteria for the participants included nurses working in the Medical Oncology/Hematology ward and caring for neutropenic patients, having a work experience of a minimum of 6 months in the Medical Oncology/Hematology ward. However, nurses who were not present at the time of discussion and nurses who were not willing to participate in the study were excluded.

The entire discussion was carried out in the English language. At the beginning of the session, the participants were made comfortable for the discussion with ice-breaking questions such as '*What infection prevention measures you follow in the ward to protect yourselves and your patients?*' The nurses who sat in a semi-circle were asked the following questions during the FGD: "What does *neutropenia* mean to you?" "What does neutropenic care mean to you?" "Did you face difficulties related to neutropenia diagnosis and its treatment?" "What is your attitude toward neutropenic management done in hospital?" "What are neutropenic nursing care components for its prevention and its management?" "What education do you give to the family members and patients related to neutropenia?" With the permission of the participants, all the discussions were recorded through note-taking, photographs, and audiotapes. The FGD lasted for 45 min. The self-structured questionnaire was validated by seven experts in the field of oncology, and a try-out was performed to check the feasibility and interpretability of the questionnaire.

Analysis

A summary of the FGD was written down immediately after discussion by the focus group team. The researcher transcribed the recorded discussion word for word and then checked its accuracy and similarity to recorded tapes. By using conventional content analysis, six themes were extracted, and these were *Frequent hand hygiene by nurses, daily oral care, personal hygiene including sitz bath and daily bathing, central and peripheral line care, food hygiene, and environmental hygiene.* After discussion with the guide and co-guide, these themes were further searched through evidence-based research.

Literature review

The literature review aimed to systematically locate, appraise, and synthesize interventions on NNC.

Search strategy

We searched electronic databases including *PubMed/MEDLINE, EMBASE, Up to date, Mendeley, Clinical Key*

Table 1: Phases and steps under study

Phases	Steps
Qualitative data collection phase	Focused group discussion
	Literature Review
Quantitative validation phase	Preliminary preparation of NNC bundle draft and criteria rating scale
	Validation of the first draft and subsequent drafts of the NNC bundle through Delphi rounds

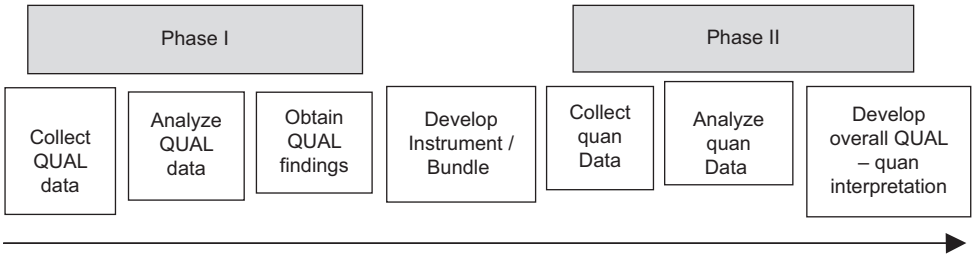

Figure 1: Visual diagram of the mixed-method instrument development study (exploratory design)

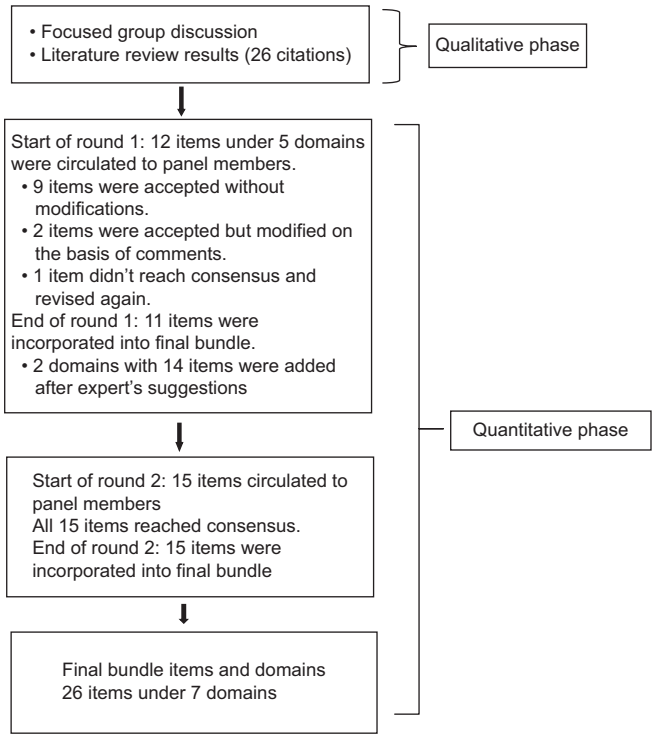

Figure 2: Study design: sequential exploratory mixed-method approach

and Cochrane. Other resources such as Google Scholar and Google search were also searched. Reference lists of studies found to be relevant for review, and related studies were examined for sources of further relevant data.

Free text terms and mesh terms such as *"infection", "infection control", "neutropenia", "febrile neutropenia", "cancer", "stem cell transplant", "immunocompromised host", "nursing interventions for infection control in neutropenic cancer patients", "oral care", "chlorhexidine mouthwash", "central venous catheter care", "antiseptic bath", "chlorhexidine bath", "protective environment", "neutropenic diet"*, and so on were used. Use of Boolean operators such as AND, OR, and NOT was performed to filter the literature. Two independent reviewers screened all the published studies based on defined inclusion and exclusion criteria. The full text of all the articles meeting eligibility criteria was considered eligible and retrieved.

Study selection

Studies dealing with neutropenia secondary to cancer and cancer-related treatment and nursing care in neutropenic cancer patients, studies published in the last 10 years (Feb 2011–May 2020), and studies published in the English language and full texts of relevant studies were included. However, studies that are not reported on interventions to prevent infection of febrile neutropenia, not included the patients with cancer and abstracts, proceedings, case reports, letters, editorials, opinions, and review papers were excluded.

Data extraction for generation of the item pool

Based on the best findings, an exhaustive list of the nursing interventions for the prevention of infection in neutropenic cancer patients was extracted and used to develop Microsoft Excel (2007) spreadsheets. Levels of evidence were adapted and ranged from systemic reviews (level 1) to descriptive studies (level 6). The guide and co-guide reviewed the Excel spreadsheet and subsequently discussed discrepancies and finalize research data for the development of a draft consensus document.

Phase 2: Quantitative validation phase

Preliminary preparation of NNC bundle draft and criteria rating scale

After finalizing the research data, the first draft was generated. This draft material was organized under *five domains including 12 items. These domains were Hand hygiene, care of central venous catheters and peripheral lines, oral care, antiseptic bath, and perianal care.*

A criteria rating scale was prepared for the Delphi round in consultation with a guide and co-guide and an in-depth review of the literature. The criteria rating scale included one major criterion for which experts were asked to give their ratings as 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant. Against criteria, a column of remarks was also made to place any special comment(s). The criteria rating scale included areas such as the relevance of items and domains appropriate to the objectives of the study.

Validation of the first draft and subsequent drafts of the NNC bundle through Delphi rounds

A panel of five members, both professional and experiential members of Medical Hematology, Medical Oncology, Microbiology, and Nursing, were selected, and Delphi rounds were conducted.

Delphi round 1

The draft document containing the bundle having *five domains and 12 items* was circulated manually to all five-panel members along with a criteria rating scale accompanied by a clear explanation of the objectives of the study and specific instructions for member participation.

Each expert was asked to vote for each item. Experts were also allowed to provide comments and suggest additional items that may not have been included when developing the initial list of items. Eighty per cent was chosen as an appropriate cutoff based on work by polit 2007 to achieve content validity. Statements not meeting 80% agreement were modified according to feedback provided by the expert panel and re-distributed to the panellists for round 2.

Delphi round 2

The list of items that did not meet consensus from round 1 was carefully scrutinized and revised. After incorporating the suggested comments, the second draft bundle containing *seven domains and 26 items* was again circulated to the experts.

In the second Delphi round, no new suggestions were given by Delphi members on the content matter. All the Delphi members agreed on the content matter of the bundle. It was suggested to make the bundle more practical and usable by nurses. Final responses were analyzed as described for round 1, and items meeting expert agreement were retained for the final NNC bundle.

Statistical analysis

Qualitative data analysis was performed using Maxqda software to extract the themes.[21] A conventional content analysis approach was utilized. For the quantitative phase, analysis was performed manually by calculating the CVI of items.

Content validity index

Items with highly relevant and quite relevant agreement scores by the experts were coded as 1, and items having somewhat relevant and not relevant agreement scores were coded as 0. Item level content validity (I-CVI) and scale level content validity (S-CVI) of the preliminary draft which was having *12 items under five domains* during the first Delphi round and the subsequent draft having *26 items under seven domains* during the second round of Delphi were calculated based on relevance rating of experts. Values of I-CVI higher than 0.8 and S-CVI higher than 0.9 were considered to be having good content validity, signifying that the bundle was having a good content validity.

Results

Phase 1: Qualitative phase

Focused group discussion

The basic demographics are shown in Table 2. The mean age of nurses was 28 years; most of the participants, that is, seven (87%), were male. The mean total working experience was found to be 4 years, and the mean years of experience in oncology was 3 years.

Table 2: Demographic characteristics of nurses included in focused group discussion

Socio-demographic Variables	*n*=8 f (%)
Age (mean)	28
Gender	
Male	7 (87)
Female	1 (13)
Total working experience (yrs.) (mean)	4
Years of experience in Oncology (yrs.) (mean)	3

After conducting an FGD with eight nurses, major six themes related to NNC in cancer patients were identified, and these were *Frequent Hand hygiene by Nurses, Daily Oral care, Personal hygiene including Sitz Bath and daily bathing, Central and peripheral line care, Food hygiene, and Environmental hygiene.* After discussion with the guide and co-guide, these themes were further searched through evidence-based research for exploration of current evidence.

Review of literature and data extraction

Approximately 500 studies were explored, but after reading the titles and abstract, most of the studies were rejected based on inclusion and exclusion criteria. Finally, 26 studies meeting eligibility criteria reached saturation, which comprised six systematic reviews, three systematic reviews with meta-analysis, five RCTs, four clinical practice guidelines and recommendations, two quasi-experimental studies, four cohorts and case-control studies, one methodological study, and one descriptive-analytical design study were included in item pool generation for the NNC bundle. The studies were critically appraised by two independent reviewers, and data were extracted and tabulated.

Phase 2: Quantitative phase

Development of the first draft of the NNC bundle

Items were selected from the content and pooled together, and a preliminary draft was prepared for the first round of Delphi. The first draft contained 12 items under five domains. These domains were *hand hygiene, care of central venous catheters and peripheral lines, routine oral care, antiseptic bath, and peri-anal care*. The draft was circulated to experts with a content validity criterion checklist to validate the items as per the relevance of objectives of the study.

Major findings from Delphi round I.

Most of the judges' responses reached an I-CVI of over 0.8 (n = ≥4), except for item E1 under domain E, which had an I-CVI of 0.6 (n = 3) in Delphi I, which was not acceptable, and item E1 under domain E was revised. It should be noted that although the S-CVI (>0.9) indicates a valid content in Delphi I, the bundle was re-formulated, more items were added into different domains based on reviews of experts, and a new format was sent for the second round of reviews to reach a consensus [Table 3].

Modification after the first Delphi round

Iteration of the items was performed. Among 12 items, nine items were not deemed redundant and reached consensus and were accepted for the final bundle, without any modifications in the items.

However, two items (A2, C4) were modified based on comments and reviews of experts and included in the final bundle. However, one item (E1) was completely revised, which was found to be irrelevant based on the relevance agreement of experts, and did not reach a consensus.

Item A2 under domain A: Hand hygiene: With soap and water if hands are visibly soiled before and after making each contact with the patient modified *to Hand hygiene with soap and water, followed by hand rub with alcohol sanitiser if hands are visibly soiled before and after making each contact with the patient.*

Item C4 under domain C: Oral care: In high-risk neutropenic patients: Oral rinse with chlorhexidine solution without alcohol (0.12%–0.2%) three to four times for 1 minute a day after tooth brushing (ultrasoft bristle) with fluoridated toothpaste and oral flossing were modified to *oral care: In high-risk neutropenic patients: Oral rinse with chlorhexidine solution without alcohol (0.12%–0.2%) three to four times for 1 minute a day after tooth brushing (ultrasoft bristle) with fluoridated toothpaste and oral flossing, but avoid oral rinse with chlorhexidine solution if > grade 1 mucositis is present.*

Item E1 under domain E: Perianal care: Sitz bath using Matrine solution (0.3 g/L) added into the bathtub (Tem: 40°C) for 20 minutes three times a day (morning, noon, and night) after disinfecting the peri-anal skin routinely was modified to *peri-anal care: Regular Sitz bath with warm water (105–110°F) and three to four tablespoons of betadine solution for 15–20 minutes once a day.*

The bundle earlier had five domains and 12 items; then, after incorporating the expert's suggestions, they were increased to seven domains and 26 items. Domain diet with the item (F1–F9) and environmental hygiene (G1–G5) were added, and a modified NNC bundle was circulated among experts for Delphi round 2.

Major findings from the second round of Delphi

After iteration, I-CVI and S-CVI were again calculated for the modified NNC bundle based on relevance rating by the experts after the second round of Delphi for the development of the final NNC bundle. The result showed that all items met the cutoff values of item content validity index (>0.8) and scale level content validity (>0.9) after the second round of Delphi, and it was signified that the bundle was having a good content validity [Table 4].

Final neutropenic nursing care bundle

No content was suggested to supplement or remove after the second round of Delphi. It was suggested to make it more practical and usable by nurses [Annexure 1].

Table 3: Agreement of the experts concerning items and domains of the bundle for the NNC bundle based on the CVI (Delphi round I)

Code	Domains	Items	I-CVI	S-CVI
			Delphi round 1	Delphi round 1
(A)	Hand hygiene	AI	1	
		A2	1	
(B)	Care of central/peripheral lines	B1	1	
		B2	1	
		B3	1	0.95
		B4	1	
(C)	Routine oral care	C1	1	
		C2	1	
		C3	1	
		C4	1	
(D)	Antiseptic bath	D1	0.8	
(E)	Peri-anal care	E1	0.6	

*I-CVI - Item level content validity index, S-CVI - Scale level content validity index[22]

Table 4: Agreement of the experts concerning items and domains of the bundle for the NNC bundle based on the CVI (Delphi round II)

Code	Domains	Items	I-CVI	S-CVI
			Delphi round 2	Delphi round 2
(A)	Hand hygiene	AI	1	
		A2	1	
(B)	Care of central/peripheral lines	B1	1	
		B2	1	
		B3	1	
		B4	1	
(C)	Routine oral care	C1	1	
		C2	1	
		C3	1	0.99
		C4	1	
(D)	Antiseptic bath	D1	0.8	
(E)	Peri-anal care	E1	1	
(F)	Diet	F1	1	
		F2	1	
		F3	1	
		F4	1	
		F5	1	
		F6	1	
		F7	1	
		F8	1	
		F9	1	
(G)	Environmental hygiene	G1	1	
		G2	1	
		G3	1	
		G4	1	
		G5	1	

*I-CVI - Item level content validity index, S-CVI - Scale level content validity index[22]

Discussion

The quality and consistency of clinical care can be improved by the ready availability of clear evidence-based

guidelines. The objective of the present study was to develop and validate the NNC bundle. This study adopted two-phase exploratory methods to develop an NNC bundle that captured major evidence-based nursing components to prevent infection in neutropenic cancer patients.

In the first phase, data were collected from the focused group discussion with oncology nurses and the best evidence-based literature by using various national/international oncology journals using electronic data from reputed e-sources such as PubMed, Cochrane library, and so on for generation of the item pool, and furthermore, a bundle draft of NNC was developed. It was validated through two rounds of Delphi for the consensus of clinical experts. After consulting with the guide and co-guides, a final bundle was developed.

The findings from the present study demonstrated that the NNC bundle consisted of seven major domains, which were hand hygiene, care of central and peripheral, routine oral care, antiseptic bath, peri-anal care, diet, and environmental hygiene. The I-CVI was found to be >0.8 and S-CVI >0.9 for the final NNC bundle.

However, a similar study conducted in India by Kumar P *et al*.[23] for the development of a protocol for nurses and caregivers related to prevention, early detection, and management of chemotherapy-induced neutropenic complications stated the consistent results with the present study. They reviewed the relevant literature and assessed the current practices of the nurses and caregivers, conducted group discussions with the oncology nurses, and developed a protocol with three rounds of Delphi.

The final protocol was formed in the booklet form as per the expert's suggestions. The CVI of the protocol was 100%. The overall Cronbach's alpha value was 0.859. The protocol was found feasible in terms of understanding, clarity, and easy implementation.[23] A similar study was conducted by Kumar A to develop the risk assessment tool for the prediction of pressure ulcers. A review of the literature was performed to determine the various risk factors that are causing pressure ulcers in patients. Journals, books, periodicals, and pressure ulcer risk assessment tools such as Braden's scale, Norton's scale, and Waterlow tool were reviewed for the current topic. Three rounds of Delphi were conducted among nine experts to reach the final consensus, and the tool was developed with consultation of a guide and co-guide. The I-CVI was ranged from 0.86 to 1. The CVI of the risk assessment tool (S-CVI) came out to be 0.92.[24]

Practise standards are not only desirable but are necessary for the healthy growth of the nursing profession for professional dignity and identity. Neutropenia-related complications should be minimized with effective nursing care. Nurses are empowered to make decisions and initiate changes in patient care. This bundle can be used to provide continuous and consistent care to neutropenic patients to prevent infections.

Limitations and recommendation

In the present study, the developmental process was limited to only content validity computations because of time constraints and the COVID-19 pandemic situation. The NNC bundle should be subjected to other levels of evaluation, such as the psychometric aspect of the validation, and reliability that measures the suitability of the bundle for the intended field. Oncology nurses should be guided to practice this bundle to improve neutropenic patients' quality of care and outcome.

Conclusion

The sequential, exploratory, mixed-method approach assisted in viewing the context of the study from multiple perspectives. Integrating qualitative and quantitative methods enhanced the understanding of knowledge gaps and facilitators of NNC. These findings will have implications for clinical nurses in the next phase of the study.

Acknowledgements

The researchers would like to thank Dr. Vasantha Kalyani, Dr. Suresh K. Sharma for their valuable inputs and recommendations on how to improve the study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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Annexure 1: Final Neutropenic Nursing Care Bundle

Name _____ Age ____ Gender____Diagnosis_____ Date_____Date of admission_____Last chemotherapy_____ Absolute neutrophils counts____

S. No.	Nursing Activity	Frequency	Solution used	Morning Shift	Evening shift	Night shift
1.	Hand Hygiene	Before and after making each contact with patients	Chlorhexidine if hands are not visibly soiled. Soap and water followed by alcohol sanitiser rub if hands are visibly soiled.			
2.	Care of central/peripheral lines					
2.1	Hand hygiene	Before every catheter/tubing/ dressing interaction	As given in the first domain			
2.2	Daily dressing/site assessment (look for redness at the site, swelling or warmth at the site, yellow or green drainage, pain/ discomfort/fever)	Every shift and whenever required	*Report if any signs of infection are seen			
2.3	Cutaneous/skin antisepsis of the catheter insertion site	When the transparent dressing is changed every 7 days unless soiled, dampened, and loosened	>0.5% chlorhexidine alcohol-based solution			
2.4	Dressing of the site	Once weekly, unless there are signs of local contamination/ inflammation/ detachment	Transparent CHX-impregnated gel dressings. *Mention the date of last dressing			
3.	Routine oral care					
3.1	Hand hygiene followed by oral assessment	Every shift	*Record if abnormality detected			
3.2	Grading of mucositis using oral mucositis assessment scale (OMAS, WHO) if present	Every shift	Grade: 0 (none) – None; I (mild) – Oral soreness, erythema; II Moderate – Oral erythema, ulcers, solid diet tolerated; III Severe – Oral ulcers, liquid diet only; IV (life-threatening) – Oral alimentation impossible			
3.3	Tooth brushing/oral flossing with fluoridated toothpaste using ultra-soft bristle followed by an oral rinse	3-4 times a day after meal followed by oral rinse for 1 min	*In low-risk neutropenic patients: Oral rinse with sodium bicarbonate (10 g of SB in 1 L of sterile water) *In high-risk neutropenic patients: Chlorhexidine solution without alcohol (0.12-0.2%) *avoid CHX if >grade 1 mucositis is present			
4.	Antiseptic bath (*Patients older than 12 years of age)	Once a day	Chlorhexidine (2%) impregnated washcloths for the bath or antiseptic bath using 2 ounces of 4% CHG solution added to a half basin of warm water			
5.	Peri-anal care					
5.1	Regular Sitz bath	For 15-20 minutes once a day	Warm water (105-110° F) and 3-4 tablespoons of betadine solution			
6.	Diet					
	Ensure:					
6.1	Patient washes hands with soap and water before and after taking eatables.					
6.2	Food material is suitably covered while transportation and while storing.					
6.3	Keep raw foods away from cooked foods.					
6.4	Personal belongings are kept away from food and food contact surfaces.					
6.5	The patient takes fruits that can be easily washed and peeled off, for example, apple, banana, papaya, and orange.					
6.6	Patients do not take raw vegetables, salads, and fruits such as cucumber, tomato, spinach, radish, carrot beetroot, cabbage, broccoli, sprouts, etc.					

Contd...

Annexure 1: Contd...

Name _____ Age ____ Gender____Diagnosis_____ Date_____Date of admission_____Last chemotherapy_____ Absolute neutrophils counts____

S. No.	Nursing Activity	Frequency	Solution used	Morning Shift	Evening shift	Night shift
6.7	Rinse fruits with water before eating.					
6.8	Food is consumed within 2 hours after cooking.					
6.9	Discard the leftover food.					
7.	Environmental Hygiene					
	Ensure:					
7.1	Frequent extensive hand disinfection by the patient, visitors/relatives, doctors, and nurses.					
7.2	Use of barrier precautions, personal protective equipment (i.e., gloves, surgical masks, eye/face protection, and gowns) during procedures and activities, when contact with body fluids is anticipated.					
7.3	No plants and dried or fresh flowers in the patient's surroundings.					
7.4	Restricted access to visitors.					
7.5	Patients wear N95 masks while going outside the unit for diagnostic procedures.					
	Sign of Nursing Officer with date					

*Low-risk patients: Estimated neutropenia (<500 neutrophils//μL) for no>7 days and no organ failures. *High-risk patients: Anticipated prolonged neutropenia >7 days profound neutropenia (ANC ≤100 neutrophils/μL) and/or clinical conditions such as hypotension, pneumonia, neurological symptoms, and abdominal pain.