Development and Testing of an Instrument to Assess the Preterm Infant Care Practice in Neonatal Care Units by Nurses

Tumla Shrestha, Archana Pandey Bista

Author Info:

Maharajgunj Nursing, Campus, Maharajgunj, Kathamandu, Nepal

*Corresponding Author:

Ms. Tumla Shrestha

Email/Contact:

tumlashrestha@gmail.com

ABSTRACT

Background: Preterm infants (PTIs) are vulnerable to morbidity, mortality, and disability. They require special treatment and care in neonatal care units (NCUs) for survival and developmental potential. Nurses have the significant responsibility for providing quality care to these infants. To find out the care status, it is necessary to have a valid and reliable instrument.

Objective: The study was conducted to develop and test an instrument to assess PTI care practice by nurses in NCUs.

Methods: The instrument was developed based on literature review and the finding of the focus group discussion (FGD). The instrument was developed in August 2020 and pretested among 30 nurses working in NCUs of two private teaching hospitals of Kathmandu during September 2020. Measures were used to ensure the validity of the instrument. The content validity index (CVI) scores for items and scale were calculated from the scores given by the eight experts. The Cronbach alpha (α) was calculated considering the acceptable α-value > 0.7.

Results: The instrument having four domains, 47 items and 5 sub-items was developed to assess PTI care practice. The instrument had a satisfactory CVI score for each item (>0.75) and overall scale (>0.9). The Cronbach alpha value for the subscales were between 0.79 and 0.88 and the overall scale was >0.93.

Conclusion: The instrument to assess preterm infant care practice provided by nurses in NCU was developed with adequate theoretical and contextual background. Necessary validity and reliability processes and criteria were also employed. Therefore, the instrument might be useful to assess the PTI care practice of nurses in NCUs in Nepalese context.

Keywords: Development and testing of instrument, preterm infant care practice, nurses, neonatal care unit

INTRODUCTION

Each year about 15 million preterm births take place globally and 81,000 in Nepal.[1,2] Immaturity related to preterm birth is the biological risk for morbidity, mortality, and disability.[3,4] Therefore, these infants require special care during the neonatal period for survival as well as for the development. The short and long-term outcome depends on the quality of treatment and care provided to preterm infants (PTIs) in neonatal care units (NCUs) of health care facilities.[5, 6]

Considering their vulnerability, the literatures recommended special care including neuro-protective care for these infants after birth in NCUs.[5–8] Some of the special and additional care recommended by WHO during neonatal period are feeding assistance, thermal care and kangaroo mother care (KMC), safe oxygen administration among others.[6,9] These special care are tracked also in National Neonatal Care Protocol by government.[10] Litarature also mentioned the need of developmental supportive care like safe guarding sleep with clustered care, minimized noise and light; skin care to mamintain skin integrity; minimizing pain and stress and involving parents in PTI care. [5–8,11,12]

Nevertheless, studies have reported suboptimal care in developing countries like Nepal.[13,14] Qualitative study done in Nepal indicated inadequate developmental supportive care practice in NCUs of hopsitals in Neapl.[15] On the other side, the national neonatal action plan "Nepal's Every Newborn Action Plan" has emphasized the quality inpatient care for small and sick infants in health facilities.[16] Nurses being the key frontline care provider, their care practice determine the quality of the care in NCUs.[5,13] For enhancement of their care practice, it is necessary to identify the situation using valid measurement tool. Some instruments are available to assess nurses' PTI care practice in NCUs. Those are based on developed country's context or are not available in English language.[17–19] Therefore, the study was conducted to develop an instrument to assess the PTI care provided by the nurses in NCUs.

MATERIALS AND METHODS

The instrument development was the part of the exploratory sequential mixed method study to assess the PTI care practice of nurses in NCUs. The initial instrument development process involved understanding the concepts, generating and testing (preliminary evaluation) testing items for the implementation in the final study. For this purpose, further literature review was done for thorough understanding of the study concept and its dimensions. Likewise, findings of the FGD conducted among nurses provided contextual information.[20 21] Accordingly, domains were identified and items were generated. Initially, adequate number of items (total 68 items and 6 sub-items) were generated. [21]

Measures were used to ensure the content validity of the developed instrument. Draft instrument was presented, discussed among the supervisor and the panel of nursing experts, and revised incorporating their suggestions. The instrument was reviewed and scored by the subject matter and research experts (six neonatal experts and two research experts) for the clarity and relevancy of the content. [22] Revisions were made in instrument according to experts' suggestions and comments. The content validity index (CVI) was calculated from the relevancy scores given by the eight experts for each items. The experts were asked to rate the relevance of each item on a 4-point scale: 1 if item not relevant, 2 if item somewhat relevant, 3- if item quite relevant, and 4- if item highly relavant. Then CVI for each item was computed as the number of experts giving a score either 3 or 4 divided by the number of experts. For example, for item 1, all eight experts had given score 3 or 4. So the CVI score for item 1 was 1. Whereas for item 2 one of the expert had given score 1 or 2 and CVI score for item 2 was 0.87. The CVI of subscales was calculated by computing the mean score of the item CVIs. likewise scale CVI was calculted by averaging the Scale CVIs. The items having CVI score < 0.75 were excluded, between 0.70 - 0.79 were included after modification as suggested by the experts, and I-CVI > 0.79 were included. Acceptable CVI score for overall scale was considered above 0.9. [22, 23- 25]

Total 12 items having low validity score were removed and some statements were modified based on comments and feedback provided by experts. A draft instrument having 56 items and 5 sub-items was prepared after exclusion, revision and sorting of the best items. Researchers tried to maintain clarity of items with simple language, avoiding jargon and complex long statements.

To minimize the risk of acquiescence effect, 12 items were kept in negatively worded statements. Five nurses working in NCU were requested to provide response on questionnaire and were asked about their feeling difficulty to respond these items.[20] Participants expressed difficulty and less clarity for the negatively worded items and other five positively worded items. Therefore, five negative and two positively worded items expressed as less clarity

were removed, six items were modified to positively worded statements and two items were merged. Some difficult words and items were simplified. Hence, the final draft instrument had 47 items and five sub-items.

With the ethical approval for the study from Nepal Health Research Council and Institutional Review Committee of Institute of Medicine and after obtaining administrative permission, the instrument was pre-tested among the 30 participants (nurses) 26 in Nepal Medical College (NMC), Teaching Hospital and Kathmandu Medical College (KMC) Teaching Hospital during 14-30 September, 2020. The internal consistency reliability was calculated considering the acceptable Cronbach alpha value > 0.7. [27, 28]

RESULTS

The final draft instrument had 4 domains, 47 items, and 5 sub-items: (1) supportive care of daily living: 20 items, (2) sleep promotion and pain management: 12 items, (3) supportive sensory environment: 10 items, (4) support for parental involvement in PTI Care: 6 items and 5 sub-items. Participants needed to respond to each care item in the form of frequency of their practice in clinical situation. The scoring system was unipolar five-point rating scale ranged from 'never practice (1), practice sometimes (2), practice time to time, (3), practice most of the time, (4), and always practice (5). The total score of the scale was 260. Findings can be reported by calculating the median and inter-quartile range for

Table 1: Items of Supportive Care of Daily Living (n=30)

I. N.	Items	Mean±SD	I-CVI
1.	Monitored oxygen saturation to identify the need for oxygen administration	4.73 ±0.64	1
2.	Administered oxygen at flow rate 0.5 to 2 liter through a nasal cannula	4.40±1.16	.87
3.	Positioned the PTI in shoulder slightly raised (sniffing) position using folded small linen	4.47±0.90	.87
4.	Assessed PTI's condition before feeding	4.73±0.52	1
5.	Provided exclusive expressed breast milk (EBM) feeding to PTI's	4.57±0.62	1
6.	Started gavage feeding of a small amount (2-3 ml) of EBM to stable PTIs	4.50±0.77	.75
7.	Provided EBM feeding (gavage, oral) according to readiness	4.70±0.53	1
8.	Positioned the PTI in lateral position for gavage feeding	4.40±0.81	.75
9.	Provided oral feeding holding in an upright position	4.87±0.34	.87
10.	Encouraged the mother for non-nutritive sucking	4.10±1.09	.87
11.	Provided support to mother for breast milk expression and feeding	4.70±0.53	.87
12.	Monitored the weight of the PTI daily	4.90±0.40	1
13.	Kept the head and trunk of the PTI in neutral midline position with flexion of extremities	4.40±0.67	.87
14.	Kept the PTI in the firm boundary of linen (nesting)	4.37±0.76	.87
15.	Handled the PTI gently with extremities flexed and body well supported	4.47±0.81	.87
16.	Applied emollients or oil in the PTI's skin after sponge bath	4.83±0.53	1
17.	Used special tape (Tegaderm) to fix IV cannula	3.97±1.37	.87
18.	Used minimum adhesive tape to fix the IV cannula.	4.43±0.93	1
19.	Maintained humidity in the incubator for the very PTI having birth weight <1000 grams	4.70±0.59	1
20.	Changed the position of the PTI after routine care	4.60±0.67	1

Average item score: 4.54 (minimum 3.97, maximum 4.90), Average scale score: 90.84±7.35
Cronbach α for the scale of the items: 0.81,
Cronbach α Based on Standardized Items: 0.83
I-CVI: Item content validity index
I. N.: item number

Table 2: Items of Sleep Promotion and Pain Management (n=30)

I. N.	Items	Mean±SD	I-CVI
21.	Provided routine care (e.g., hygiene care, feeding, vital sign monitoring) clustering by one nurse	4.57±0.77	.87
22.	Avoided handling the stable PTI in between care for 2-3 hours	4.00±1.25	1
23.	Closed the port-hole of the incubator aftercare	4.13±1.35	.87
24.	Kept the PTI wrapping with the blanket firmly in a radiant warmer	4.00±1.33	.87
25.	Maintained a quiet and calm environment in the unit	4.50±0.77	.87
26.	Assessed the pain of the PTI using pain assessment scale	2.43±1.27	.87
27.	Fed EBM before a painful procedure	3.03±1.21	1
28.	Hold extremities and head of the PTI flexed and near the body with palm support during the painful procedure	3.90±0.96	.87
29.	Used non-nutritive sucking (pacifier, thumb sucking) during the procedure	3.70±1.36	.87
30.	Comforted the PTI with cuddling after a painful procedure	4.07±1.17	1
31.	Wrapped the PTI firmly after a painful procedure	4.00±1.17	1
32.	Encouraged mothers' involvement for comforting the PTI after a painful procedure	3.13±1.45	.87

Average item score: 3.78 (minimum 2.43, maximum 4.57, Scale mean: 45.47±7.9
Cronbach α for the scale of the items: 0.79
Cronbach's Alpha Based on Standardized Items: 0.79
I-CVI: Item content validity index
I. N.: item number

Table 3: Items of Supportive Sensory Environment (n: 30)

I. N.	Items	Mean±SD	I-CVI
33.	Ensured room temperature > 25°C	4.67±0.71	.87
34.	Monitored temperature of the PTI regularly	4.67±0.66	1
35.	Regulate the temperature of the incubator/radiant warmer according to PTI's body temperature	4.67±0.84	1
36.	Facilitated parents of stable PTIs to provide KMC for at least 1 hour at a time	3.83±1.51	1
37.	Minimized light level in the unit during night	4.20±1.15	.87
38.	Covered the incubator with linen	3.53±1.57	.87
39.	Covered eyes when exposed to bright light like phototherapy	4.80±0.48	1
40.	Used low voice while the conversation in the unit	4.43±1.00	.87
41.	Maintained interaction and stimulation while providing care	4.70±0.59	1
42.	Encouraged mothers to be close, touch, and interact with the PTI	4.43±1.00	.87

Average item score: 4.39 (minimum 3.53, maximum 4.80), Scale mean: 43.93±6.07
Cronbach α for the scale of the items: 0.79,
Cronbach's Alpha Based on Standardized Items: 0.79
I-CVI: Item content validity index
I. N.: item number

Table 4: Items in the Parental Support for Involvement in PTI Care (n: 30)

I. N.	Items	Mean±SD	I-CVI
43.	Encouraged parents to visit their PTIs as far as possible	3.53±1.45	.87
44.	Interacted/communicated with parents during their visit to the unit	4.40±1.00	1
45.	Provided information about PTI care like breastfeeding, KMC	4.60±0.81	1
46.	Provided information about the possible danger signs in PTI's	4.40±0.89	.87
i.	Guided and supported for EBM feeding or Breastfeeding,	4.77±0.62	1
ii.	Guided and supported for KMC,	4.13±1.27	1
iii.	Guided for handling, and holding the PTI,	4.57±0.85	.87
iv.	Guided for identifying normal or abnormal behavior of the baby,	4.40±0.89	.75
v.	Guided for administering oral or topical medicine (if any)	4.40±0.72	.87
47.	Assessed parents' ability to care for their PTI before discharge	4.57±0.81	1

Average item means: 4.37 (minimum3.53, maximum 4.77), Scale mean: 43.77±6.73
Cronbach α for the scale of the items: 0.88
Cronbach's Alpha Based on Standardized Items: 0.90
I-CVI: Item content validity index
I. N.: item number

Subscales	Content Validity Index
Supportive Care of Daily Living	0.91
Sleep Promotion and Pain Management	0.90
Supportive Sensory Environment	0.93
Parental Support for Involvement in PTI Care	0.92
Overall Scale	0.90

each item and the mean score for sub-scales, and overall scale (normally distributed data).[30] A higher score indicates better practice in domain and overall practice. The instrument had CVI for each item > 0.75 and for overall scale > 0.9.

The demographic and professional characteristics of participants showed that the average age was 27.83±4.91 years (range 20-41 years). Fifty percent of participants had bachelor level education (B. Sc. Nursing: 3, Bachelor in Nursing Science/Post Basic Bachelor in Nursing: 12). Among them, 20 (66.7%) participants had working experience in NCUs for 6 months to five years, 23 (76.7%) participants were working as the staff nurse and 26 (86.7%) participants had not received any neonatal training.

Table 1 about items of supportive care of daily living shows that the lowest and highest mean score and standard deviation were for the practice of using special tape (Tegaderm) to fix intravenous cannula (3.97±1.37) and the practice of monitoring the weight of the PTI daily (4.90±0.40) with the mean

practice score 4.54. It showed that daily weight monitoring was the most often and using special tape was the least often practiced area. The Cronbach alpha for the 20 items scale was 0.81. The content validity indexes for items were 0.75-1.0.

Table 2 shows that using the pain assessment scale had the lowest mean score (2.43±1.27) and providing clustered routine care had the highest mean score (4.57±0.77) with an average practice score of 3.78. It indicated that participants used to practice clustered routine care more often and using pain assessment scales less often in their practice. The Cronbach alpha for the 12 items scale was 0.79. The content validity indexes for items were 0.87-1.0.

Table 3 about the supportive sensory environment care items shows that the highest and lowest mean scores were for the covering eyes when exposed to bright light (4.80±.48) and the covering the incubator with linen (3.83±1.51) with a mean practice score of 4.37. The Cronbach alpha for the ten items scale was 0.79. The content validity indexes for items were

0.87 -1.0.

Table 4 shows that the highest mean score was for the guidance and support for the EBM feeding or breastfeeding (4.77±.62) and the lowest mean score was for encouraging parents to visit their PTIs (3.53±1.45) with an average practice score (4.37). The Cronbach alpha for the ten items scale was 0.88. Similarly, the Cronbach alpha value for the overall scale was 0.93. The content validity indexes for items were 0.75-1.0. Table 5 shows that CVIs for subscales ranged from 0.90 to 0.93 and overall scale 0.90.

DISCUSSION

This paper discusses the development and testing of the instrument to assess the PTI care practice provided by nurses in NCUs. to understand the concept, literature review was done. Relevant gray literature related to recommended intervention for PTIs published by national and international organization, review articles, practice instrument related literatures were reviewed.[5,6,8-12,19] The findings of the FGDs conducted among 44 nurses working in NCUs in the first phase of the exploratory sequential mixed method design provided the contextual basis.[30,31] According to literature, deductive (literature review) and inductive (qualitative exploration like FGD data) methods are used for defining domains and generating items. Article mentioned the combining the both deductive and inductive method as the best practice.[20,21]

The instrument has four domains, and 47 items: supportive care of daily living (20 items), sleep, and pain management (12 items), supportive sensory environment (10 items), and parental support for involvement in care (five items, five sub-items). Similar instrument developed in Iran had five domains and 76 items. Four domains of that instrument: sensory care management; the family (parental involvement); sleep, pain and stress management' and routine care (daily support) were similar to this instrument.[19] That instrument was used in another study done to assess quality of developmental care in Tehran.[32] Likewise, study done in Egypt to evaluate the effect of developmental supportive care program on nurses' performance had used the instrument having care components like KMC technique, proper positioning, light and noise control, non-nutritive sucking in pre and post-test.[17]

This instrument has the five-point rating scale. Participants need to respond according to frequency of practice in clinical situation from '1' never practice to '5' always practice. Soleimani et al. 2016 had developed a instrument to measure the importance of the items from '1' not important at all to '5' absolutely important.[19]

The instrument was prepared and tested for use in final study to assess the preterm infant care practice of the nurses working in NCUs.[33] The final instrument reliability for larger use will be assessed after the final study. It was administered among 30 nurses working in NCUs considering the recommended sample size for the pretesting the quantitative instrument and sample prevalence.[26] Sample size was 30% of the final sample size.

Measures were used to ensure content validity like discussion among expert panel, peer review, and review and scoring by the subject matter and research experts.[20,21] Literature suggested the acceptable content validity validity scores for scale as > 0.9, and for items > 0.79. Similarly, scores 0.70-0.79 can be included with modification and < 0.70 as unacceptable.[22-25] In this instrument, 3 items had I-CVI 0.75. Those items were included with revision as suggested by experts. Other items had validity scores 0.87 to 1. Literatures indicted minimum required internal consistency (Cronbach α value) value as 0.70, 0.70-0.88 as high and > 0.90 as excellent value.[20,27,28] In this instrument, the Cronbach α scores for overall scale was > 0.93 and subscales were 0.79-0.88 which indicates high internal consistency of the scale.

CONCLUSION

The instrument to assess the PTI care practice of nurses has been developed with an adequate theoretical and contextual basis. The researchers have employed the validity and reliability processes and criteria for the pretesting of the quantitative instrument as suggested by the literature. Therefore, the instrument might be useful to assess the PTI care practice of nurses in NCUs in the Nepalese context.

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