

Original Article

A nutrition care process knowledge, attitudes, practices, and perceived barriers questionnaire

Zaini Bahari MSc, Zuriati Ibrahim PhD, Siti Nur Asyura Adznam PhD,
Barakatun Nisak Mohd Yusof PhD

Department of Nutrition and Dietetics, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Serdang, Selangor, Malaysia

Background and Objectives: Assessment of the nutrition care process (NCP) knowledge, attitudes, practices, and perceived barriers (KAPB) of dietetics practitioners is imperative before NCP is implemented completely in dietetics practice. No questionnaire assessing NCP KAPB has been developed and validated. Hence, we developed an NCP KAPB questionnaire called the KAPB-NCP and established its content validity. **Methods and Study Design:** A total of 116 items associated with sociodemographic characteristics (7 items), professional development (3 items), organisational culture's support for the NCP (2 items), knowledge (27 items), attitudes (39 items), practices (20 items), and perceived barriers to implementing the NCP (14 items) were generated for potential inclusion in the KAPB-NCP questionnaire. The questionnaire was reviewed online by an expert panel for its content validity. An in-depth review was conducted by the research team for evaluating the overall comprehensiveness of the questionnaire. **Results:** In total, 87 of 100 items of the KAPB sections showed an excellent content validity index (CVI; $k^* > 0.74$), whereas 10 showed a satisfactory CVI ($k^* = 0.60-0.74$). Only 3 items had a low CVI ($k^* < 0.40$). According to the expert panel revisions and the in-depth review, 72 items were incorporated into the questionnaire. **Conclusions:** The KAPB-NCP questionnaire is a content-valid instrument that can assess NCP KAPB.

Key Words: content validity, nutrition care process, questionnaire development, knowledge, attitude

INTRODUCTION

In 2003, a standardised nutrition care process (NCP) was developed by the Academy of Nutrition and Dietetics (AND), formerly known as the American Dietetics Association. The NCP aims to enhance the dietetics practices through its implementation and dissemination in the dietetics profession. The NCP, standardised for dietetics professionals, enables a consistent nutrition care delivery approach: it aids in providing each patient with individualised nutrition care according to their nutrition problems, rather than providing similar interventions to all patients. In other words, the NCP is a consistent framework for delivering nutrition care, with high emphasis on individualised patient care.¹

The NCP comprises 4 distinct but connected steps: (1) Nutrition assessment is a systematic method of obtaining, verifying, and interpreting data required for identifying nutrition problems and their etiologies and significance. (2) Nutrition diagnosis aids in determining the nutrition problems; the nutrition diagnosis statement is constructed on the basis of the nutrition assessment findings. (3) Nutrition intervention is implemented for changing nutrition-related behaviour, risk factors, environmental conditions, and health status. (4) Nutrition monitoring and evaluation are used to identify the extent of progress and determine whether goals are being reached or expected outcomes obtained and whether the interventions require modifications.¹

Research on NCP implementation in healthcare settings has been limited. Hence, little is known regarding the use of the NCP in dietetics practices. In Malaysia, published data regarding dietetics practitioners' awareness and understanding of the NCP are unavailable.

Despite emphasising NCP implementation when providing nutrition care to patients, no instrument measuring the quality and extent of NCP implementation in dietetics practices has been reported. Instruments for investigating NCP knowledge, attitudes, practices, and perceived barriers (KAPB) of dietetics practitioners can aid in determining the extent of NCP implementation in dietetics practices. Otherwise, the assessment of NCP KAPB implementation levels will remain insufficient.

As mentioned previously, development and validation of an NCP KAPB-related questionnaire, which can be used to assess NCP KAPB among dietetics practitioners, is urgently required. Therefore, we developed an NCP KAPB-related questionnaire called the KAPB-NCP and

Corresponding Author: Dr Zuriati Ibrahim, Department of Nutrition & Dietetics, Faculty of Medicine & Health Sciences, Universiti Putra Malaysia, 43400, Serdang, Selangor, Malaysia. Tel: +60389472464; Fax: +60389426769

Email: zuriatiib@upm.edu.my

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established its content validity.

MATERIALS AND METHODS

The following steps were involved in establishing the content validity of the KAPB-NCP questionnaire: (1) item generation, (2) expert panel selection, (3) quantitative and qualitative review by the expert panel, (4) data analysis, and (5) in-depth review with the research team.

Item generation

The questionnaire development process began with an extensive review of the related scientific literature for determining the content of the items to be included in the questionnaire. This is a deductive approach; in other words, it requires an in-depth review of the literature for developing a theoretical definition of a construct under investigation. Next, we used a well-defined construct as a basis for item generation.²

Furthermore, scientific literature associated with the NCP was reviewed thoroughly. Key terms such as 'nutrition care process', 'questionnaire development', 'knowledge of nutrition care process', 'clinical dietitians', and 'dietetics practitioners' were used during the literature search for identifying relevant sources in databases such as Ebscohost Academic Collection, Ovid Online, Scopus, ProQuest, Science Direct, and Google Scholar.

Because the NCP was introduced by the AND, the AND website was searched to obtain latest updates regarding the NCP and related materials. In addition, the literature search involved the revision of the knowledge, attitudes, and practices questionnaires from other study fields to obtain the pattern by which the items could be constructed. Finally, the concepts identified in the literature were extrapolated to determine key components for inclusion in the questionnaire. The constructs were clearly described to ensure that the developed instrument measured the intended constructs. A well-defined construct is essential because it facilitates the useful item construction and instrument validation process.³ Finally, the questionnaire items were developed on the basis of the combination of the aforementioned information sources, along with the instructions and scoring guidelines.

The questionnaire comprised 116 items in seven sections: sociodemographic characteristics, professional development, organisational culture's support for the NCP, knowledge of the NCP, attitudes towards the NCP, practices of the NCP, and perceived barriers to implementing the NCP. The details of the content structure of the questionnaire are shown in Table 1.

In the knowledge section, the response option 'do not know' was included to reduce guessing because it is much more reliable than the 'true-false' options.^{4,5} For reducing bias and increasing the response rate, the instructions and items were designed for maximal clarity and reduced ambiguity. A few items in Sections 5, 6, and 7 were phrased negatively for ensuring that the respondents read and processed each item carefully because a combination of positively and negatively phrased items can reduce possible acquiescent response bias; in other words, the tendency of respondents to agree with a state mentor answer in a similar manner to all items.⁶

Expert panel selection

In total, 17 potential reviewers from Malaysia, Australia, and the United States were invited to participate in the content validity testing of the questionnaire. Invitations were sent through email to potential reviewers individually. The reviewers were selected on the basis of their knowledge and experience in the NCP area, their advanced degrees, and their publications on NCP-related topics. However, only 8 reviewers agreed to participate, and a panel of 8 clinical dietitians and academicians from Malaysia (n=4), Australia (n=1), and the United States (n=3) was finalised; a panel size is considered satisfactory as a range of 5–10 experts provide a satisfactory control level for chance agreement.⁷

Qualitative and quantitative review by the expert panel

A cover letter explaining the background and objectives of our study was sent through email to the expert panel who agreed to participate in content validation. Because the questionnaire was revised online, a link to access the questionnaire and instructions on how to complete the revision were attached to the email. The panel of experts was asked to assess the questionnaire quantitatively and qualitatively. For quantitative review, a content validity index (CVI) was used; the experts were asked to rate individual items on a 4-point scale as follows: (1) 'not relevant', (2) 'somewhat relevant', (3) 'quite relevant', and (4) 'highly relevant'. This ensured the objectivity of the items forming the final questionnaire. This was conducted only on Sections 4, 5, 6, and 7.

The qualitative review was conducted for the overall content of the questionnaire. The questionnaire items were reviewed on the basis of the suitability and clarity of individual questionnaire items. The experts could recommend adding or deleting any questionnaire item. Moreover, the experts could provide overall comments at the end of each section and at the end of the questionnaire.

Ethical approval

Ethical approval was obtained from the University Research Ethics Committee of the Universiti Putra Malaysia.

Data analysis

For the quantitative analysis, the item CVI (I-CVI) was calculated for each item in the questionnaire. The I-CVI represents the rating scores of the experts according to the degree of agreement on the relevance and clarity of the items; in other words, it is the proportion of the experts who rate an item as 3 or 4. For each section and the entire questionnaire, the scale CVI (S-CVI) was calculated, which represents the content validity of the overall scale; in other words, it is the average of all the I-CVIs for individual items in the questionnaire. The CVI was considered satisfactory when the I-CVI and S-CVI were at least 0.78 and 0.90, respectively.⁸ The I-CVI was calculated as follows:

$$I - CVI = \frac{\text{Number of experts scoring an item as 3 or 4}}{\text{Total number of experts}}$$

After calculating the I-CVIs, the scores were then converted to a modified kappa statistic coefficient (k^*) to correct for the chance of agreement; in other words, k^* denotes the agreement among experts that the item is rel-

Table 1. Content structure of the KAPB-NCP questionnaire for content validity testing

Section	Number of items	Types of questions	Scoring	Description of the items
1: Socio-demographic characteristics	7	<ul style="list-style-type: none"> • Open-ended • Multiple choice question (MCQ) • Dichotomous 	NA	Items related to the background of the respondents.
2: Professional development	3	<ul style="list-style-type: none"> • Dichotomous (Yes/No) • Open ended 	NA	Items related to the training, courses, and self-training on the NCP.
3: Organisational culture's support	2	<ul style="list-style-type: none"> • Dichotomous (Yes/No) 	NA	Items related to the role of organisation and teamwork on NCP implementation.
4: Knowledge on the NCP	Part A: 10 Part B: 17	<ul style="list-style-type: none"> • MCQ (Part A) • Dichotomous (Part B) (Yes/No/Do not know) 	<ul style="list-style-type: none"> • Correct = 1 • Wrong and 'do not know'=0 	Items related to the understanding on the NCP.
5: Attitudes toward the NCP	39	<ul style="list-style-type: none"> • Likert scales (5=strongly agree, 4=agree, 3=neutral, 2= disagree, 1= strongly disagree) 	<ul style="list-style-type: none"> • Strongly agree=5 • Strongly disagree=1 	Items related to the beliefs on the NCP.
6: Practices of the NCP	Part A: 4 Part B: 20	<ul style="list-style-type: none"> • MCQ and dichotomous (Part A) • Likert scales (Part B); (5=always, 4=often, 3=sometimes, 2=rarely, 1=never) 	<ul style="list-style-type: none"> • Always=5 • Never=1 	Items related to how the knowledge and attitudes were translated into action.
7: Perceived barriers to implement the NCP	14	<ul style="list-style-type: none"> • Likert scales (5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree) 	<ul style="list-style-type: none"> • Strongly agree=5 • Strongly disagree=1 	Items related to the barriers to implement the NCP.

NA: not applicable; NCP: Nutrition care process.

Table 2. Content validity testing of the knowledge, attitudes, practices, and perceived barriers items in the questionnaire

Section	Number of items	Item content validity			Scale content validity index (S-CVI)
		Excellent [†]	Good [‡]	Poor [§]	
Knowledge	27	25	1	1	0.92
Attitudes	39	33	5	1	0.90
Practices	20	18	1	1	0.88
Perceived barriers	14	11	3	0	0.90

I-CVI: item content validity index; k^* : modified kappa statistic coefficient.

[†]I-CVI ≥ 0.78 and $k^* > 0.74$. [‡]I-CVI < 0.78 and $0.60 \leq k^* \leq 0.74$. [§]I-CVI < 0.78 and $k^* < 0.40$.

Table 3. Qualitative assessment of content validity

Theme	Description	Action taken
Technical	Some questions were difficult to understand Some items were too technical and inappropriate Few questions are too general	The questions were omitted from the questionnaire
Structure	There was confusion in the sentence structure There was few leading questions or statements Terms used were not clarified (example: inputs)	Improved on wordings Addition of terms to enhance clarity The questions were retained in the questionnaire
General	Overlapping questions Too many questions	The questions were eliminated from the questionnaire

evant.⁸ To compute k^* , the probability of chance agreement (p_c) was computed first:

$$p_c = \left[\frac{N!}{A!(N-A)!} \right] \cdot 5^N$$

Where N is the number of experts and A is the number of experts agreeing on satisfactory relevance; k^* was then calculated as follows:

$$p_c = \left[\frac{N!}{A!(N-A)!} \right] \cdot 5^N$$

The k^* was placed into 3 categories of rating scales: excellent ($k^* > 0.74$), satisfactory ($k^* = 0.60-0.74$), and fair ($k^* = 0.40-0.59$). The items with $k^* < 0.60$ were considered potentially problematic.^{9,10}

For the qualitative analysis, the comments obtained from the experts were revised and classified into separate themes.

In-depth review by the research team

Following the revision of the questionnaire based on the quantitative and qualitative assessment of the expert panel, an in-depth review by the research team was performed for evaluating the overall comprehensiveness of the questionnaire. The in-depth review mainly aimed to aid the researchers in reaching a consensus on the overall comprehensiveness of the questionnaire and establishing the finalised questionnaire. The items that were ambiguous or misunderstood were rewritten, whereas those that were redundant were deleted. The language of the items was ensured to be precise, simple, and devoid of any double-barrelled items.

RESULTS

Quantitative content validity assessment

Of the 27 items developed in the knowledge section, 25 were rated to have excellent content validity (I-CVI ≥ 0.78 and $k^* > 0.74$; Table 2). The S-CVI of the knowledge items was 0.92, exceeding the recommended cut-off point of 0.90. Of 39 items in the attitudes section, 33 showed

excellent content validity (I-CVI ≥ 0.78 and $k^* > 0.74$), whereas 5 showed satisfactory content validity (I-CVI < 0.78 and $0.60 \leq k^* \leq 0.74$); however, item 10, showed low content validity (I-CVI < 0.78 and $k^* < 0.40$). The S-CVI of the attitudes items was 0.91, exceeding the recommended cut-off point of 0.90.

Of the 20 items in the practices section, 18 showed excellent content validity (I-CVI ≥ 0.78 and $k^* > 0.74$), 1 showed satisfactory content validity (I-CVI < 0.78 and $0.60 \leq k^* \leq 0.74$), and 1 showed low content validity (I-CVI < 0.78 and $k^* < 0.40$). The S-CVI of the items in the practices section was 0.88. Of the 14 items in the perceived barriers section, 11 had excellent content validity (I-CVI ≥ 0.78 and $k^* > 0.74$), whereas the remaining 3 had satisfactory content validity (I-CVI < 0.78 and $0.60 \leq k^* \leq 0.74$). The S-CVI of this section was 0.90.

Qualitative content validity assessment

The comments from the expert panel were classified according to the themes given in Table 3.

Finalised questionnaire

According to the quantitative and qualitative revision of the questionnaire suggested by the expert panel and the in-depth review, a few amendments were made, as described in Table 4. The finalised questionnaire comprised 17 sociodemographic, professional development, and organisational culture support items; 16 knowledge items; 19 attitudes items; 10 practices items; and 10 perceived barriers items. The content structure details of the finalised questionnaire are presented in Table 5.

DISCUSSION

Content validity denotes how well an item represents the concept under investigation.^{7,8,11} It can be described as a rigorous assessment involving 2 process stages, namely development and judgement quantification. The devel-

Table 4. Questionnaire revisions

Section	Initial items	Amendment	Justification	Final items
1: Socio-demographic characteristics	7 items	<ul style="list-style-type: none"> Item number 5 was deleted: '<i>Years graduation from the degree?</i>'. Four items from section 6 Part A were added into this section. 	<ul style="list-style-type: none"> It was not necessary to know the number of years since graduation. 	10 items
2: Professional development	3 items	<ul style="list-style-type: none"> The open-ended section under item 1 and 2 were removed. '<i>If Yes, how many hours per week?</i>' '<i>If Yes, how long the duration of the course?</i>' 	<ul style="list-style-type: none"> It was difficult to quantify the duration of the time specifically. 	3 items
3: Organisational culture's support	2 items	<ul style="list-style-type: none"> Two items were added: support from HOD and resources provided. Open-ended section was added following each item. 	<ul style="list-style-type: none"> The previous question (question 1) was too general, need to be more specific. To get the response in details. 	4 items
4: Knowledge on the NCP	<ul style="list-style-type: none"> Part A: 10 items Part B: 17 items 	<ul style="list-style-type: none"> Part A: All items were removed Part B: Item number 9 was discarded '<i>Evidence based medicine (EBM) is one of the elements included in the NCP</i>' 	<ul style="list-style-type: none"> Most of the panel of experts stated that they were quite difficult and looked like memory test questions rather than testing on the understanding of the NCP itself. It was not really focusing on the NCP domain. 	16 items
5: Attitudes toward the NCP	39 items	<ul style="list-style-type: none"> Twenty-one items were eliminated One item was added: 'I personally have adequate knowledge to practice NCP in my setting' Item 23 was restructured Before: '<i>I feel that newly graduated dietitians should know how to use the NCP</i>' After: '<i>I feel it is important that new entrants to dietetics are well-educated in the use of the NCP</i>'. Item 24 was reworded Before: '<i>I feel that the senior dietitians with more than 10 years of experience should know how to use the NCP</i>' After: '<i>I feel that the senior dietitians with more than 5 years of experience should know how to use the NCP</i>'. 	<ul style="list-style-type: none"> They were redundant with the other items, not addressed the attitude domain, unclear term used, difficult to understand, and too lengthy. It was essential to know how the respondents perceived on how they self-equipped knowledge to implement the NCP The word 'newly graduated dietitians' was reworded to 'new entrants to dietetics' as not all junior dietitians were freshly graduated from the university, since some of them may had working in other areas prior to become a clinical dietitian. In the context of Malaysia, in general, a clinical dietitian was promoted to a new grade of post after 5 years of services as the previous post was offered to the new entrant dietitians. 	19 items
6: Practices of the NCP	<ul style="list-style-type: none"> Part A: 4 items Part B: 20 items 	<ul style="list-style-type: none"> Moved to section 1 Eleven item were eliminated 	<ul style="list-style-type: none"> The items look like asking on the respondents' background. They were redundant with the previous items in the attitude section. The inclusion of this item was crucial as to determine whether the respondents practise the NCP according to the standardised framework provided. 	10 items
7: Perceived barriers to implement the NCP	14 items	<ul style="list-style-type: none"> Five items were discarded. One item was added into 'characteristics of the NCP domain': '<i>NCP serves no purpose to the dietitians</i>' 	<ul style="list-style-type: none"> They were not addressed the respective domain. It was important to determine whether one of the perceived barriers to implement the NCP was due to the perception that NCP has no purpose in providing nutrition care to the patients. 	10 items

NCP: Nutrition care process.

Table 5. Finalised KAPB-NCP questionnaire

Section	Number of items	Types of questions	Scoring	Description of the items
1: Socio-demographic characteristics	10	<ul style="list-style-type: none"> • Open-ended • Multiple choice question (MCQ) • Dichotomous 	NA	Items related to the background of the respondents.
2: Professional development	3	<ul style="list-style-type: none"> • Dichotomous (Yes/No) • Open-ended 	NA	Items related to the training, courses, and self-training on the NCP.
3: Organisational culture's support	4	<ul style="list-style-type: none"> • Dichotomous (Yes/No) • Open-ended 	NA	Items related to the role of organisation and teamwork on NCP implementation.
4: Knowledge on the NCP	16	<ul style="list-style-type: none"> • Dichotomous (Yes/No/Do not know) 	<ul style="list-style-type: none"> • Correct=1 • Wrong and 'do not know'=0 	Items related to the understanding on the NCP.
5: Attitudes toward the NCP	19	<ul style="list-style-type: none"> • Likert scales (5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree) 	<ul style="list-style-type: none"> • Strongly agree=5 • Strongly disagree=1 	Items related to the beliefs on the NCP.
6: Practices of the NCP	10	<ul style="list-style-type: none"> • Likert scales (5=always, 4=often, 3=sometimes, 2=rarely, 1=never) 	<ul style="list-style-type: none"> • Always=5 • Never=1 	Items related to how the knowledge and attitudes were translated into action.
7: Perceived barriers to implement the NCP	10	<ul style="list-style-type: none"> • Likert scales (5=strongly agree, 4=agree, 3=neutral, 2=disagree, 1=strongly disagree) 	<ul style="list-style-type: none"> • Strongly agree 5 • Strongly disagree=1 	Items related to the barriers to implement the NCP.

NA: not applicable; NCP: Nutrition care process.

opment stage refers to domain identification, item construction, and instrument construction. The second stage, judgement quantification, refers to the evaluation of the items by a specific number of experts.⁷ The development stage is generally achieved through an in-depth literature review and qualitative research study.¹²

In this study, findings from the quantitative assessment indicated that 87 of the 100 items in the KAPB sections of the questionnaire were determined to have excellent content validity; in other words, 87% of the developed items in the KAPB sections had an I-CVI of 0.78 and k^* of >0.74 . These findings were consistent with the recommendation that the I-CVI of the items in a new instrument should be 0.78–0.80.^{7,13} Regarding the number of experts and CVI obtained, the results of the present study also corresponded to the recommendation by Lynn,⁷ who suggested that the I-CVI should be ≥ 0.78 when the expert panel comprises ≥ 6 individuals. The S-CVI for each section, except the practices section, was satisfactory and reached the cut-off point of 0.90; nevertheless, the S-CVI of the practices section (0.88) was not substantially lower than the recommended cut-off point.

Despite attainment of an excellent I-CVI for 87% of the KAPB section items, further qualitative assessment and in-depth review indicated that some items required revision and elimination because of the several reasons described in Table 4. In general, the revised or eliminated items had received several comments from the experts, despite having excellent I-CVI. Moreover, all the questionnaire items exhibiting low I-CVIs and some with satisfactory I-CVIs were eliminated. In summary, items' inclusion in the final questionnaire was not based on only the quantitative assessment results (i.e., I-CVI), but rather on a combination of the quantitative and qualitative assessment and in-depth review results.

Combining the results of the quantitative and qualitative assessments of the questionnaire facilitates further ensuring that satisfactory content validity was achieved. The comments and suggestions obtained from the qualitative assessments could provide justification for the I-CVIs that were obtained quantitatively. This was particularly essential for items with low I-CVIs and subscales with scores below the recommended cut-off points because the comments provided could justify the low CVIs of the respective items. Nevertheless, the comments obtained were also critical for justifying the elimination of several items with excellent I-CVIs. The qualitative assessment was also essential for testing the content validity of Sections 1, 2, and 3, which were not evaluated quantitatively.

Finally, the KAPB-NCP questionnaire can be a valuable tool for assessing the NCP KAPB among dietetics practitioners on the basis of its satisfactory content validity judged by the expert panel, because the content validity evidence indicates whether an anticipated content domain is adequately characterised by the items on the instrument.

Limitations

This study had two limitations. First, the qualitative assessment of the questionnaire for content validity was subjective because reviewers could have different opinions regarding a certain matter. Although various feedback responses were received, each was constructive and

valuable for improving the questionnaire. Second, the expert panel-recommended revision of the items was performed only once, even though 2 rounds of revision are generally recommended.⁸

Conclusion

The KAPB-NCP questionnaire is a content-valid instrument designed to assess NCP KAPB among dietetics practitioners. The final version of the KAPB-NCP questionnaire comprised 72 items (Table 5). Although content validity is one of the aspects of assessing the psychometric properties of the questionnaire, further testing for construct validity in the next phase of the study may further enhance the questionnaire validity.

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AUTHOR DISCLOSURES

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