

Development and Validation of Factors Affecting Telenutrition Adoption among Malaysian Dietitians Questionnaire

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ABSTRACT

This study aimed to determine the validity of a newly developed questionnaire to assess dietitians' understanding of the factors influencing telenutrition adoption in Malaysia. As such, a questionnaire was developed to assess dietitians' professional changes, acceptability, barriers, and facilitators to telenutrition implementation. It was constructed based on published questionnaires and an extensive literature review. The questionnaire comprising 52 items, underwent content and face validity assessments. Eight dietetics experts with academic and clinical backgrounds and more than five years of experience in the field evaluated the questionnaire items for relevance, clarity, simplicity, ambiguity, readability, and practicality. The experts quantitatively assessed the questionnaire using a Likert scale rating and additional comments. The Content Validity Index (CVI) was determined using item and scale indices (I-CVI/S-CVI/Average). The findings show that the I-CVI score ranged between 0.78 and 1.00, and the S-CVI/Average was >0.87. Thirteen items with an I-CVI score of <0.83 were deleted. Based on the feedback, revisions were made to the instructions and questions regarding clarity, redundancy, ambiguity, or item length. Then, face validation was qualitatively conducted by cognitive review (n=7). This utilized think-aloud and verbal-probing techniques on participants with experience providing telenutrition services for >2 years. The interview was transcribed verbatim and analyzed using ATLAS.ti software. Twelve items were amended due to ambiguity and unclear meanings. The final questionnaire with thirty-nine items is valid to assess the factors influencing telenutrition adoption among Malaysian dietitians.

Keywords: content validation, face validation, questionnaire development, telenutrition

INTRODUCTION

Telenutrition is one of the aspects of telehealth used by a dietitian to provide medical nutrition therapy and nutrition counseling to a patient at a remote location. It is a virtual consultation via remote technology-supported video/audio visits to deliver nutritional therapy to patients (McCabe *et al.* 2001). This includes nutritional assessment, analysis, management plan, and follow-up (Thrisha *et al.* 2016). Meanwhile, the Academy of Nutrition and Dietetics defined telenutrition as virtual nutritional consultation using telecommunications technologies to provide the Nutrition Care Process (Coşkun *et al.* 2023).

Telenutrition is utilized for long-term monitoring and chronic disease management. It is suggested as one of the strategies during crises such COVID-19 pandemic to overcome obstacles and elevate access to nutrition care (Mehta *et al.*

2021). In addition, digital health services and self-monitoring promote cost-effective, rapid, personalized, and available medical care and dietary advice (Gentili *et al.* 2022). These aspects allows patients to receive timely information to prevent devastating nutrition effects, food-drug interactions, and poor health management of diabetes and hypertension (McCabe *et al.* 2001).

The COVID-19 pandemic led to a rapid expansion of telenutrition services provided by Registered Dietitian Nutritionists (RDNs). Clinical dietitians face challenges when shifting from in-person patient interaction to telenutrition consultations during the COVID-19 pandemic (Farid 2020). RDNs along with other healthcare providers must adapt to the implementation of telenutrition and telehealth in delivering healthcare, including establishing infrastructure and applying procedures and tools in providing telehealth throughout the practice settings (Rozga

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et al. 2021). There are a variety of telenutrition questionnaires across countries such United States, Arab and Italy that discuss practitioners' perceptions and experiences, current practices, barriers, and facilitators to providing telenutrition (Alghamdi *et al.* 2022; Brunton *et al.* 2021; Gnagnarella *et al.* 2022; Rozga *et al.* 2021). In designing a questionnaire, various steps are required for questionnaire construction and validation to comprehend the study's objective and avoid wrong interpretations or bias (Bujang *et al.* 2021; de Yébenes *et al.* 2009; Kishore *et al.* 2021).

In Malaysia, there are limited studies regarding telehealth, including telenutrition. In addition, no validated instruments are available to understand the factors influencing telenutrition adoption. As such, a questionnaire was developed to assess the professional changes, facilitators, and barriers to telenutrition intervention among Malaysian dietitians, especially during crises such COVID-19 pandemic. This research aimed to determine the validity of a newly developed questionnaire to assess dietitians' understanding of the factors influencing telenutrition adoption in Malaysia.

METHODS

Design, location, and time

In the current study, a questionnaire on telenutrition adoption and the changes in professional practices, acceptability, barriers, and facilitators among dietitians in Malaysia was developed. This questionnaire underwent two phases of validity assessments: content validity, and face validity via cognitive interview to indicate that the items and scales possess validity. The present study was approved by the National Medical Research and Ethics Committee, Ministry of Health Malaysia (RSCH ID-22-02610-2CJ).

A literature search via PubMed, Google Scholar, and Scopus databases for articles published until 2022 was conducted to gather existing validated questionnaires on the implementation of telehealth and telenutrition. A combination of keywords related to acceptance, facilitators, and barriers was used. The inclusion criteria were full-text peer-reviewed articles and published in English. Based on the literature search, an initial version of the questionnaire was generated comprising 52 items that were categorized into five domains: demographic

data, the changes in professional practices, acceptability of telenutrition services, barriers in implementing telenutrition services, and facilitators in implementing telenutrition services.

Three original questionnaires were adapted in this study. The initial original questionnaire utilized in this study was produced by experts from the Academy's Research, International, and Scientific Team (ASAND) executive committee (Rozga *et al.* 2021). The survey comprised 37 items that enquired about the changes in RDNs' practice during the COVID-19 pandemic by delivering nutrition care via telemedicine. It also consisted of experience providing telenutrition before and during the COVID-19 pandemic, facilitators, and barriers faced by RDNs providing telenutrition.

The second questionnaire was developed by the Academy of Nutrition and Dietetics, Avalere Health, and stakeholders (Brunton *et al.* 2021). The survey consists of 20 items that enquire about the application of telehealth before and during the pandemic and the positive/negative impacts and future implications of using telenutrition. Almojaibel *et al.* (2019) constructed and validated the third questionnaire, which included a 17-item section on telerehabilitation acceptance scale for healthcare practitioners and a 13-item section on telerehabilitation acceptance scale for patients. In addition, some of the items were drawn from the literature (Alghamdi *et al.* 2022; Almathami *et al.* 2020; Gnagnarella *et al.* 2022; Kruse & Heinemann 2022).

Sampling

The expert panels for content validity in the current study were chosen based on their profession and working experience. The eligibility requirements included a bachelor's degree in dietetics, five years or more of working experience, and ability to understand English. Eight assessors comprising dietetics academics, clinical dietitians, and dietetics clinical instructors, were involved in the content validation process. They were contacted through email and WhatsApp for the evaluation. Meanwhile, the inclusion criteria for the cognitive interview participants were a bachelor's degree in dietetics and experience in providing telenutrition services for at least two years. The interview was conducted at the participants' preferred time in two rounds. The interview sessions lasted between 30 and 55

minutes, including the time spent answering the questionnaire.

Data collection

In content validity, although the acceptable minimum number of experts is two, six is the most proposed number (Yusoff 2019). Meanwhile, Lynn (1986) recommends six to eight experts. An evaluation instrument was utilized to facilitate the expert's assessment. It comprised six categories: relevancy, clarity, simplicity, ambiguity, readability, and practicality, each rated by a Likert scale from one to four. The experts rated each item and provided feedback on the adequacy, relevancy, clarity, language, wording, and sentence structure of the items. Their opinions and suggestions were summarized in Microsoft Word for further assessment. After that, three researchers (Nur Liyana Hasnaa Mohd Daud, Noraishah Mohamed Nor, and Nor Azwani Mohd Shukri) discussed the findings to reach a consensus, made necessary changes and improvements to the item with discrepancies.

The face validation was conducted using cognitive interview to investigate whether a questionnaire accomplishes its proposed purpose in terms of attitude, behavioural, or factual (Willis & Artino 2013). Generally, about 5 to 15 individuals are tested in an interview round before the outcomes are reviewed and interpreted (Willis & Miller 2011). The cognitive interview procedures involved think-aloud, concurrent probing, and retrospective probing. Cognitive interviewing is conducted with two key procedures; first, the think-aloud protocol requires that the respondents verbalize and report their opinions as they attempt to answer the survey questions. Second is verbal probing, in which the interviewer administers a series of probe questions, which are precisely designed to prompt comprehensive information beyond that usually provided by respondents (Willis & Artino 2013).

In the first round, four participants were interviewed regarding instructions, items, and any issues that might arise to answer the questions. Round 2 was then evaluated based on the revisions and adjustments made to the questionnaire. After interviewing three participants, the data collected were descriptively validated by checking the key points that the participants made before item revision or termination was done.

Data analysis

Results for content validity were analyzed quantitatively by calculating Content Validity Indices (CVI) and qualitatively by revising narrative comments from expert rates. CVI is comprised of two forms which are CVI for item (I-CVI) and CVI for scale (S-CVI) (Said 2022; Yusoff 2019). The I-CVI and S-CVI/Average were used as acceptable content validity for quantitative indicators. Experts were asked to rate by 1 (item not relevant) to 4 (item very relevant) based on the items' relevancy in the telenutrition questionnaire implementation. The rates of 3 and 4 were defined as 1 (relevant), whereas the rates of 1 and 2 were defined as 0 (not relevant). Eight experts were involved in the review; thus, the I-CVI should be at least 0.83 (Davis 1992; Polit & Beck 2006; Yusoff 2019). In addition, excellent content validity was proposed for a scale of items with an S-CVI/Average of ≥ 0.90 and an I-CVI of ≥ 0.78 (Polit *et al.* 2007).

All the cognitive interviews in the face validation process were audio/visual recorded and transcribed verbatim using Microsoft Teams and were analyzed descriptively using ATLAS.ti software. Then, a data table was created to combine narratives on each questionnaire item and to categorize parallel patterns and interpretations. Cognitive interviewing data analysis focuses on coding and interpreting written notes taken during the interview. As described in Hibben & Jong (2016), "The process of carrying out the cognitive interview itself—a process that reveals how the respondent made sense of and went about answering a survey question and requires the interpretation and judgment on the part of the interviewer—constitutes the first stage of analysis". The findings were sorted and grouped into themes using thematic analysis to support conclusions for revising the questionnaire and detecting complicated items.

RESULTS AND DISCUSSION

A total of 52 items were adopted and adapted from validated questionnaires and literature reviews. These were categorized into five domains as listed in Table 1. Based on the reviewers' comments, certain items were found to be redundant, prompting the suggestion to remove or compile those items into the same question. Revisions were made to the

instructions, questions, and answers to improve the adequacy and clarity of the content, as well as the language (wording, and sentence structure) of the questionnaire based on the reviewers' comments and suggestions. Meanwhile, the S-CVI score of the questionnaire revealed that all the elements (relevance, clarity, simplicity, ambiguity, readability, and practicality) were higher than 0.87. Thirteen items with an I-CVI score of less than 0.83 were deleted from the list. Thirty-nine items were left after the removal for the subsequent cognitive interview.

Seven participants were interviewed in the cognitive interview phase. The cognitive interview was conducted with the think-aloud protocol verbal probing, in which the interviewer administered a series of probe questions adapted from Willis & Artino (2013) as listed in Table 2.

The interview's mean length was 45±10 minutes. Four participants were interviewed for Round 1. During this, a few items and sentences were misinterpreted due to being ambiguous, unclear, or too general (Table 3). Thus, addition of more examples and revision of the sentences were done to make them clearer. Answer choices regarding practice area were added based on the respondent's working experience, such as "retail pharmacists" and "sports institutions." Three of the respondents were confused and misinterpreted "private practice" as "freelancing", thus the term "private practice" was removed.

In Round 2, three participants completed the whole questionnaire smoothly. However, one of the participants suggested that the answer options for a particular item be arranged according to the Nutrition Care Process sequence. In

general, the participants unanimously agreed that the questionnaire was easy to understand and be completed. Therefore, the finalized questionnaire comprising 39 items will be used for further psychometric tests.

This questionnaire was developed to assess dietitians' professional changes, acceptability, barriers, and facilitators to telenutrition intervention, especially during crises such COVID-19 pandemic in Malaysia. This research, based on our current knowledge, was the first to adapt, develop, and validate an instrument aimed at measuring the understanding of factors influencing telenutrition adoption among dietitians in Malaysia. It specifically focuses on work environment changes, dietitians' perception of telenutrition usage, barriers impeding telenutrition services, and facilitators for enhancing telenutrition services. In Malaysia, telenutrition is not fully utilized by dietitians, specifically in hospitals and health clinics. However, evidence shows that telenutrition services are increasingly used in other countries. In the United States, a study presented that the number of RDNs who implement telenutrition services to provide the Nutrition Care Process had increased substantially during the COVID-19 pandemic (Rozga *et al.* 2021).

The adoption of telehealth accelerated during the COVID-19 pandemic as an alternative to physical healthcare appointments (Guntu *et al.* 2022). RDNs shifted to telenutrition intervention and audio/visual remote monitoring from in-person visits to provide nutrition assessment, diet, analysis, management strategies, and patient follow-up (Gnagnarella *et al.* 2022). A study

Table 1. Number of items adapted from existing questionnaires and literature to measure each construct

Construct	Number of items	Sources
Demographic data	9	Rozga <i>et al.</i> 2021; Gnagnarella <i>et al.</i> 2022; Brunton <i>et al.</i> 2021
The changes in professional practices	26*	Rozga <i>et al.</i> 2021; Gnagnarella <i>et al.</i> 2022; Brunton <i>et al.</i> 2021
Acceptability of telenutrition services	8*	Alghamdi <i>et al.</i> 2022; Almojaibel <i>et al.</i> 2019
Barriers to implementing telenutrition services	3	Rozga <i>et al.</i> 2021; Gnagnarella <i>et al.</i> 2022 ; Kruse & Heinemann 2022; Almathami <i>et al.</i> 2020
Facilitators in implementing telenutrition services	6	Kruse & Heinemann 2022; Almathami <i>et al.</i> 2020

*Including sub-items

Table 2. Types and examples of verbal probes used in the cognitive interview (Adapted from Willis & Artino 2013)

Type of cognitive probe	Example of probing questions
Comprehension	“What does the term ‘telenutrition’ mean to you?”
Paraphrasing	“Can you repeat the question in your own words?”
Confidence judgment	“How sure are you in participating in telenutrition intervention?”
Recall	“How did you come up with the answer?”
Specific	“Why do you say that it is important that dietitians continue providing telenutrition intervention?”
General	“Was the question easy to answer?” “Is the answer suitable?” “I noticed that you hesitated. Tell me what’s on your mind?”

concluded that telenutrition consultation may not replace face-to-face consultation in type 2 diabetes patients due to the result being more accurate and comprehensive. Nonetheless, during the COVID-19 pandemic, telenutrition consultations have provided consistent results if repeated and when in-person visits were not possible (Mahmoodi *et al.* 2023). A few studies proposed that telenutrition interventions were a preferable alternative in a crisis. They found that during the follow-up, diabetes care in the telenutrition group had a significantly better improvement from the baseline. They demonstrated that self-reported diet and exercise knowledge, practices, and behaviors were improved through using telemedicine for diabetes management (Benson *et al.* 2019; Chen *et al.* 2013; Izquierdo *et al.* 2010). Thus, it is crucial to understand the factors affecting telenutrition adoption among dietitians

to provide efficient and sustainable telenutrition services.

Validity is crucial in choosing or applying an instrument to measure the properties of the construct under study. Content validity receives the most priority in developing instruments due to its prerequisite over other validity (construct validity and criterion-related validity) (Zamanzadeh *et al.* 2015). Content validity provides a comprehensive sample of the content in the instrument while addressing the extent to which the item instrument sufficiently characterizes the content domain (Zamanzadeh *et al.* 2015). In terms of themes, wording, and item or question format, content is important in instrument development where evidence shows content validity is having a panel expert assess the relevance and clarity of the questionnaire items. Most items with an acceptable I-CVI scale

Table 3. Amended sub-items from Round 1 due to ambiguity

Actual sub-items	Amended sub-items
Difficulty with establishing a relationship	Difficulty with establishing relationships with patients via telenutrition (to build rapport)
Cost is not financially supported by the employer	Cost is not financially supported by the employer (internet connection such as data, wifi, top-up, etc.)
Discomfort with providing nutrition care via telenutrition	Discomfort with providing nutrition care via telenutrition (not conducive environment/surroundings, prefer in-person interaction, etc.)
Not having the equipment to deliver telenutrition at my workplace	Not having suitable technology devices to deliver telenutrition at my home/workplace (digital camera, audio recording device, video camera, computer, etc.)
Lack of employer support	Lack of employer support (training, motivation, guidelines, technology devices)
Not interested in receiving any nutrition services at this time	Not interested in receiving nutrition services at a certain time (scheduled follow-up dates and times, festival season, etc.)
Not having a telephone (landline or cell phone)	Not having an electronic device (landline or cell phone, smartphone, laptop, iPad, etc.)

show an excellent S-CVI scale (Cabatan *et al.* 2020). Our study proportion for relevance shows most of the items achieved higher than 0.88 (except one item <0.83) with S-CVI/Average of 0.91. Meanwhile, the clarity proportion shows nine out of fifty-two items I-CVI <0.83, with S-CVI/Average of 0.87. Therefore, the items were revised due to a lack of clarity, redundancy, and ambiguity.

While diverse problems are associated with the survey evidence quality, it is critical to validate the response processes. For example, the respondents' judgments, ideas, opinions, perceptions, and experiences when answering the questionnaires. Survey methodologists and psychologists have followed the cognitive aspects of survey methodology to investigate the respondents understanding and interpretation of the survey questions with various methods since the 1980s (Ryan *et al.* 2012). Individual interviews through cognitive thinking can disclose discrete issues such as ambiguous terms or recall difficulty. Therefore, systematic analysis of the interview's entire set is essential to classify informative themes and explanatory patterns (Willis & Miller 2011; Buschle *et al.* 2022). This model describes several processes participants are involved in (1) comprehension, (2) relevant information to retrieve, (3) judgment or valuation, and (4) responsiveness to question (Meadows 2021). The current study involved the think-aloud protocol and verbal probing of the questionnaire, which led to the amendment of 12 items due to ambiguity and unclear meanings.

Verbal probing may lead to bias in the respondent's behavior through the additional demands related to answering and explaining the answers (Güss 2018). It may create reactivity effects if not carefully done. In addition, think-aloud analysis transcripts can be an intimidating task because of the absolute quantity of the occasionally twisting verbalizations obtained (Güss 2018). Thus, more training is required before conducting cognitive interviews. On the other hand, the advantage of this study was that it included a qualitative assessment of the items from the target population, which improved the relevancy, clarity, simplicity, practicality, ambiguity, readability, and understanding of the questionnaire items among the dietitians in Malaysia.

CONCLUSION

The current study validated a newly developed questionnaire assessing the changes in professional practices, acceptability, barriers, and facilitators of telenutrition implementation among dietitians in Malaysia. The final instrument, with a total of 39 items, exhibits good content as well as face validity. These indicate that the questionnaire is a valid tool for use in identifying the facilitators and barriers to the implementation of telenutrition services among dietitians in Malaysia.

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DECLARATION OF CONFLICT OF INTERESTS

The authors have no conflict of interest.

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