ORIGINAL ARTICLE

Face Validity and Internal Consistency of the Modified General Nutrition Knowledge Questionnaire: A Study Among Malaysian Medical and Nutrition Undergraduates

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ABSTRACT

Introduction: Limited nutritional knowledge is associated with nutrient-related diseases such as diabetes, osteoporosis, iron deficiency and cardiovascular diseases. This study assessed the clarity and internal consistency of a modified General Nutrition Knowledge Questionnaire (GNKQ) tailored to Malaysian dietary guidelines. **Materials and methods:** A cross-sectional study was conducted among undergraduate medical students from a private university and undergraduate nutrition students from a public university in Malaysia. The questionnaire included domains of dietary recommendations, nutrient sources, food choices, and diet-disease relationships. Thirteen students participated in face-to-face interviews to evaluate the clarity of each item, and subsequent amendments were made in accordance with the feedback. The revised questionnaire was then administrated online by 300 students to assess internal consistency using Cronbach's alpha. **Results:** Most of the items were clear and understandable. The majority of participants were females (68%), aged 18 to 22 (66%) and single (96%). Cronbach's alpha indicated acceptable internal consistency following the removal of one item ($\alpha = 0.713$ for dietary recommendations, $\alpha = 0.889$ for nutrient sources, $\alpha = 0.763$ for food choices, $\alpha = 0.805$ for diet-disease relationships, and $\alpha = 0.937$ overall). **Conclusion:** The questionnaire demonstrated satisfactory face validity and acceptable internal consistency, indicating its reliability as a tool for assessing general nutrition knowledge among undergraduate students in health-related fields. However, the findings may have limited generalisability due to the homogeneous student sample. Further validation in a larger population is recommended to enhance its applicability.

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Keywords: General Nutrition Knowledge Questionnaire, Malaysia, Internal consistency, Cronbach's alpha, Face validity

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INTRODUCTION

Non-communicable diseases (NCDs) are a major public health concern worldwide, including in Malaysia, where they are the leading cause of mortality (1). Cardiovascular diseases, cancer, chronic respiratory diseases, diabetes, and obesity are among the NCDs that have resulted in a significant burden of disability in addition to mortality (2). These major NCDs share four common behavioural risk factors: tobacco use, poor dietary habits, physical inactivity, and excessive alcohol consumption (3).

A healthy diet, defined as a pattern of food consumption that benefits health or has no adverse effects, is one of the most effective strategies for reducing the risk of NCDs (4). Extensive literature indicates that adopting healthy eating habits can lower the risk of mortality and reduce the incidence of major diseases both in the general population and in individuals with pre-existing medical conditions (5). Nutritional knowledge plays

a pivotal role in promoting healthy eating habits and empowering individuals to make informed food choices (6). Understanding the factors that influence dietary decisions is therefore critical for developing effective health promotion strategies (7).

The General Nutrition Knowledge Questionnaire (GNKQ) is a widely recognised tool in the scientific community, originally developed and validated by Parmenter and Wardle in the 1990s for the adult population of the United Kingdom (8). Over time, it has been adapted and validated for various populations to conform with regional dietary guidelines and cultural contexts (9 -13).

The use of valid and reliable questionnaires is crucial in research to ensure the accuracy of the data collected and the credibility of the results. Questionnaire validation is a systematic process that assesses the accuracy and reliability of a tool in measuring its intended constructs (14). Content validity, face validity, and reliability testing are essential components typically incorporated in the validation process.

Content validity ensures that the questionnaire adequately covers the domain of interest and incorporates all essential elements, as determined by expert evaluation (15). Although content validity is fundamental, it alone is insufficient to guarantee the usefulness of a questionnaire. Face validity is of equal importance which evaluates the clarity, comprehensibility, and relevance of a tool from the perspective of the target respondents. This process helps in identifying and addressing potential issues that may arise during the actual administration of the questionnaire. Internal consistency evaluates the extent to which items within the questionnaire measure the same construct, thereby ensuring coherence and reliability in responses (16).

The content validity of the GNKQ adapted to the Malaysian context was established in a previous study through qualitative and quantitative research, based on a rigorous evaluation by public health and nutrition experts (17). Building on this foundation, the current study aims to assess the face validity and internal consistency of the previously utilised questionnaire. This comprehensive validation process ensures that the tool is both robust and understandable.

University students are an important group for assessing general nutrition knowledge because they are in a transitional phase of their lives during which lifelong dietary habits are being formed. Education on nutrition is essential, particularly for students in health-related fields, such as medicine and nutrition (18). They are expected to have a higher level of nutritional knowledge, which may influence their future roles in healthcare and public health promotion.

While the content validity of this modified version has been established previously, further evaluation is required to assess its face validity and internal consistency that suited the Malaysian population. Therefore, this study was conducted to assess the clarity and internal consistency of the modified GNKQ among undergraduate health-related university students in Malaysia, and to develop a reliable instrument for measuring students' nutritional knowledge.

MATERIALS AND METHODS

Study Design & Study Population

A cross-sectional study was conducted among undergraduate students aged 18 years and above, consisting of medical students from a private university and nutrition students from a public university located in Selangor, Malaysia. The sample size calculation was based on a respondent-to-item ratio, with a requirement of at least 5 samples per item. The questionnaire comprised of 5 sections and 57 items in total, necessitating a minimum of 285 samples (19).

Data Collection, Research Tools & Parameters of Interest
A face-to-face interview was conducted among the purposively selected students to assess the face validity of the questionnaire. Feedback collected during this process was carefully reviewed and considered to enhance the clarity and relevance of the questionnaire items. To assess internal consistency, data were collected via a Google form that was distributed to eligible university students. Participants were required to provide informed consent and sociodemographic information prior to the commencement of data collection. This study was reviewed and approved by the Ethics Review Committee of University of Cyberjaya (Approval Number: UOC/CRERC/ER/527).

A GNKQ consisted of 4 independent sections, each of which evaluated a different aspect of nutritional knowledge. These sections include the understanding of current dietary recommendations, the knowledge of nutrient-related food sources, the use of nutritional information to make food choices, and the relationship between diet and diseases. A correct answer for each item in every section received 1 mark.

Data Analysis

Descriptive statistics, including frequencies and percentages, were calculated to analyse participants' sociodemographic characteristics. Cronbach's alpha (α) was calculated using Jamovi 2.5 statistical software (20) to assess the internal consistency of each section. An α of greater than 0.70 was considered acceptable internal consistency (21).

RESULTS

Demographic Information

The characteristics of the participants in this survey are shown in Table I. For face validity, of the 13 samples, the majority were females, single and between the ages of 18 and 22. The online survey aimed at evaluating internal consistency included a sample of 300 individuals, of which 96 were males (32%) and 204 were females (68%). Sixty-six percent of the participants were between the ages of 18 and 22, followed by those between the ages of 23-27 (28%), 28-32 (4%), and 33-37 (2%). The majority of the participants were single, 289 (96%), and 11 (4%) were married.

Table I: Demographic characteristics of the participants

Demographic Variables	Face validity	Online
	n (%)	n (%)
Gender		
Male	4 (31%)	96 (32%)
Female	9 (79%)	204 (68%)
Marital Status		
Single	12 (92%)	289 (96%)
Married	1 (8%)	11 (4%)
Age (years)		
18-22	9 (79%)	197
23-27	4 (31%)	85
28-32	0	13
33-37	0	5

Face Validity and Internal Consistency

According to the interview feedback, all items in Section 1 were clear and understandable. In Section 2, several modifications were implemented for clarity: "Prawn sauce" was changed to "Fermented Shrimps", "Oats" was specified as "Grain oats" and, Legumes (e.g., dhal) was revised to "Dhal"

For internal consistency, the initial analysis of Section 1 (dietary recommendation), which included whole grains (e.g., oats, rice) resulted in Cronbach's alpha value of 0.684. A higher Cronbach's alpha value of 0.713 was obtained upon the removal of the item "oats". The internal consistency of the source of nutrition section was excellent (38 items, α=0.889), while the dietary food choice section was good (3 items, α = 0.763), and the diet-disease relationships section was strong (20 items, α = 0.805). The overall scale (57 items) demonstrated excellent internal consistency (α = 0.937).

Table II: Internal consistency of the modified GNKQ

Subsection (Number of items)	Cronbach's α
Dietary Recommendations (9)	0.713
Sources of Nutrients (10)	0.889
Daily Food Choice (12)	0.763
Diet-disease Relationship (16)	0.805
Total (47)	0.937

DISCUSSION

The modified General Nutrition Knowledge Questionnaire (GNKQ) adapted to the Malaysian diet demonstrated satisfactory clarity and internal consistency. Participants generally perceived the items in all sections to be clear and understandable during the face validity process, with the exception of minor revision in Section 2 to improve cultural relevance and clarity. These adjustments underscore the importance of localising questionnaires to ensure that they are in accordance with the dietary context and terminology that are well-known to the target population.

The internal consistency analysis yielded an overall Cronbach's alpha of 0.937, indicating excellent reliability. The domain-specific alphas demonstrated acceptable to high consistency across all sections, with a range of 0.713 to 0.889. These findings indicate that the modified GNKQ is a reliable tool for assessing the general nutrition knowledge among undergraduate students in Malaysia. In comparison to previous studies, the reported Cronbach's alpha values for measuring internal reliability in similar adaptations were also relatively low, highlighting the common challenges in achieving optimal reliability across diverse populations (22,23). The one item that was withdrawn from Section 1 may require refinement rather than removal in order to achieve acceptable reliability and ensure that the questionnaire's content is comprehensive and sufficient.

This study has a limitation in that it was conducted solely among undergraduate students from two institutions, which restricts the generalisability of the findings to a more diverse population. Future research should validate the questionnaire across a broader demographic spectrum, encompassing various age groups, genders, and educational backgrounds, to enhance its applicability.

This study demonstrates the potential of the modified GNKQ as an effective instrument for evaluating nutrition knowledge among Malaysian health-related undergraduates. The Romanian version of the GNKQ was evaluated for known-group validity and external reliability (24). Similarly, the revised GNKQ for the Australian population was evaluated using test-retest reliability (25). This would provide stronger evidence of its validity as an assessment tool. Furthermore, it is also recommended to translate the questionnaire into Malay language to ensure accessibility for the entire Malaysian population. This localised version of the GNKQ can serve as a valuable resource for nutrition education and public health interventions among undergraduate students in Malaysia.

CONCLUSION

The modified GNKQ-R is a suitable instrument for

assessing the general nutritional knowledge among Malaysian undergraduate students in health-related fields, as it is clear, understandable and demonstrates acceptable internal consistency.

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