



Research Article

Postgraduate Curriculum in Human Nutrition in Pakistan: Evaluation for Three Main Domains in Nutrition by Using the Novel Delphi Technique

Iftikhar Alam^{1*}, Sana Shah¹, Muhammad Farooq^{2*} and Samiya Rahman³

¹Human Nutrition and Dietetics, Bacha Khan University Charsadda, Charsadda, Pakistan; ²College of Food Science and Engineering, Northwest A and F University, Yangling, Shaanxi, 712100, PR China; ³Department of Biochemistry University of Okara, Pakistan

Abstract | The main purpose of this study was to identify new concepts for postgraduate nutrition education curriculum. The emergence of nutrition has created an incipient need for nutrition education to take a more globalized approach to prepare students for future careers in nutrition. A Delphi study technique was used to obtain a general consensus on three domains being reflected in nutrition curriculum by a panel of experts. Also the panel identified 34 overarching concepts that were to be incorporated into curriculum within. Most (21) of these new concepts came from the domain of Clinical Nutrition, followed by Applied Nutrition (9) and Basic Nutrition (4). Based on the findings of this study, we recommend the 34 concepts be used by curriculum specialists to the nutrition curriculum. Future research should investigate the utility of the concepts and best practices for teaching modern content in nutrition curriculum.

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***Correspondence** | Iftikhar Alam and Muhammad Farooq, Human Nutrition and Dietetics, Bacha Khan University Charsadda, Charsadda, Pakistan; College of Food Science and Engineering, Northwest A and F University, Yangling, Shaanxi, 712100, PR China; **Emails:** Farooq.fst28@gmail.com, iftikharalam@bkuc.edu.pk

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1. Introduction

Human nutrition, as a health science, is an emerging discipline (Nakamura, 2022; Begum *et al.*, 2019). The importance of nutrition in a community's general well-being and health is demonstrated by the inclusion of nutrition as a subject in many curricula (Cuerda *et al.*, 2021; Alam *et al.*, 2017). Nutrition education is viewed as a crucial catalyst for the accomplishment of food and nutrition security

policies. These, in turn, are necessary for ensuring that increased food production and income translate into better diets and healthy nutritional status. In the recent past, numerous reports have greatly emphasized on the use of nutrition education in fields of agricultural, food production and processing and nutrition security issues (Girard *et al.*, 2012; Leory and Frongillo, 2007; UNSCN, 2011; Hawkes and Ruel, 2008).

Any learning institution's curriculum is thought

of as its heart, hence academic institutions cannot function without one (Alam *et al.*, 2017; Bilbao *et al.*, 2008). A university degree in human nutrition should include the following three key domains, according to Donnini *et al.* (2017). Basic nutrition, applied nutrition, and clinical nutrition are these domains (Alam *et al.*, 2017).

Higher nutrition education in Pakistan is still in its infancy stages. In Pakistan, only a few public and private universities provide undergraduate and graduate degree programs (Alam *et al.*, 2017; Khandelwal *et al.*, 2014). The establishment of diverse nutrition programs' curricula has already begun intact in some cases. With the support of seminal initiatives of Higher Education Commission (HEC) of Pakistan's Curriculum Wing, a postgraduate curriculum in human nutrition has been developed (www.hec.org.pk). The curricula needed a critical review to further improve it. The present study goal is to assess the proposed curriculum taking in account the recommendations of some expert works in this field (Donnini *et al.*, 2017; Cowley *et al.*, 2015; Khandelwal *et al.*, 2014). We used the famous Delphi technique as a method for the present study. As a result of a critical look while using the Delphi technique, the curriculum in human nutrition for post-graduate degree program can then be improved in the future in this way.

2. Materials and Methods

An expert panel in nutrition and related topics was consulted for the current study in order to reach a general consensus. This was done using a modified Delphi technique. The Delphi approach, which was developed on the principle that two heads are better than one (Dalkey, 1969), has been widely applied to research in education. We may be better able to comprehend how foreign nutrition information could be provided within the nutrition degree-awarding program by polling subject-matter experts.

The following requirements were followed to guarantee qualified participants: (1) be currently employed in agricultural education; (2) be an extension agent or instructor with at least three years of classroom experience; (3) have knowledge of international agriculture. An email with a recruitment letter was sent to 51 recognizable authorities in nutrition and related subjects using the Snowball Method (Goodman,

1961). In case, the expert emailed the researcher to accept participation in the study, they were accepted as panel members. The newly discovered panelists were then sent a second email with a link to the first round of the poll. During round 1, non-respondents were contacted by phone and then email. With this recruitment, the sample went from 19 to 22 panelists. For rounds 1, 2, and 3, the expert panel's sample sizes were $n=22$ (32%), $n=19$, and $n=17$, respectively.

Round 1: Hard and soft copies of the curriculum were sent to the panelists on the addresses they provided. They were asked to go through course by course contents of the curriculum and then evaluate the curriculum against the three 'domains' and respond on which areas of knowledge from each domain are represented in the curriculum?. Also, an open-ended question was used to identify additional concepts that should be incorporated into curriculum in order to make up the deficiencies and/or to further fine-tune the curriculum. The initial question was what overarching concepts should be included in the curriculum to fill in the gap knowledge areas in the three domains of the nutrition curriculum?

Round 2: The responses from round 1 were received. These responses were of two types; (1) the agreement/disagreement of the panelists on 'how much of the three domains are represented/reflected in the curriculum; and (2) what overarching concepts should be included in the curriculum to fill in the gaps in each of the three 'domains' of the nutrition curriculum. From the ideas presented in round 1, a survey instrument was created for the panelists to complete in round 2. Participants rated their level of agreement or disagreement with each notion from round one on a five-point scale. In this survey, the following rating options were available as: 1 (extremely disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree), and 5 (highly agree). Participants were asked to rewrite any notions that didn't make the list of concepts or suggest new concepts that they thought should be included in addition to the five-point Likert system. Similar to round 1, we emailed notifications and follow-up reminders to entice panel members to participate. In round 2, 19 of the panelists took part.

The outcomes of the second round were examined to decide which novel ideas would be kept for the third round. We calculated a priori that 80% of

participants had to select either agree or strongly agree for a concept to be remembered. Additionally, we expanded the lists of AK in the three domains by six newly discovered concepts. Round 3 included the newly discovered concepts, and participants had the chance to rate them to see if they would be retained. A total of 35 concepts went on to the third round.

Using the same five-point likert scale as already used in round 2, the novel concepts discovered in round 2 were likewise rated in round 3. For round three, we predetermined that 80% of respondents would agree on the broad themes that should be included in the curriculum. Similar to rounds 1 and 2, we sent notifications and follow-up reminders to urge panel members to participate. In round three, fourteen of the seventeen panelists offered comments.

3. Results and Discussion

The main objective of this research study was to evaluate the curriculum under consideration against three main domains and to know whether the curriculum covers the knowledge areas under these three domains. Another objective was to identify additional concepts in all the knowledge areas of the three domains that should be incorporated into the curriculum in order to make up the deficiencies and/or to further fine-tune the curriculum. A modified Delphi method was applied which comprised of three distinct rounds. Round 1 featured the following two questions: which areas of knowledge from each domain are represented/reflected in the curriculum? and what overarching concepts should be included in the curriculum to fill in the gap knowledge areas in the three domains of the nutrition curriculum? The results on question 1 are summarized in [Table 1](#). As evident, the panelists showed their agreement that the curriculum under consideration reflects the inclusion of knowledge areas from the three domains.

Table 1: Level of agreement for three domains.

Domains	Level of agreement (%)
Basic nutrition	85%
Applied nutrition	82%
Clinical nutrition	80%

The results obtained from question 2 are shown in [Table 2](#). The panelists identified certain new additional concepts in round 1 to be incorporated into curriculum in order to make up the deficiencies

and/or to further fine-tune the curriculum. There were new concepts which were finally approved in round 2. An additional two more concepts (suggested by consultant members of NEAT) were also included and forwarded for consideration and approval by the panelists in round 3. In this way, a total of 17 new concepts were suggested to be incorporated in the existing curriculum. As evident, most of the new concepts related to the domain of clinical nutrition (12), followed by applied nutrition (3) and basic nutrition (2).

The panel of nutrition professionals reached consensus on (1) that the existing curriculum reflect excellently the areas of knowledge under the headings of the three domains as previously reported by [Doninnin et al. \(2017\)](#). There was also final overwhelmingly agreement on 34 out of 42 additional new concepts that may be incorporated in the curriculum. Most of these new concept were suggested for the domain of Clinical Nutrition, followed by Applied Nutrition and Basic Nutrition, respectively, with 9 and 4 additional new concepts suggested by the panelists to be incorporated in the curriculum. The emerging categories from this study support the claim that the agriculture sector has changed alongside the global economy. In this study, nutrition education specialists appeared to acknowledge clinical nutrition as a crucial part of a postgraduate degree curriculum. The efforts made to identify and categorize content were in line with steps three and four of the framework for developing curricula. It's interesting that all of the environmental ideas considered crucial utilized the word global or world.

Numerous nations have evaluated the nutrition curricula from various angles and interests ([Shill, 1990](#); [Hollander et al., 2002](#); [Crowley et al., 2015](#); [Hark, 2006](#); [Khandelwal et al., 2014](#); [Burke et al., 2002](#)). The conclusion drawn from these studies is that the curricula in human nutrition should include the three major fields of nutrition (1) basic nutrition, (2) applied nutrition, and (3) clinical nutrition ([Donini et al., 2017](#)). Should be a useful instrument for education and research in the subject of human nutrition, a comprehensive curriculum in nutrition has been advised to contain a number of themes and domains ([Donini et al., 2017](#)). In the present study, we assessed the proposed curriculum against 32 items based on the conclusions of [Donini et al. \(2017\)](#), who defined them as the key themes or domains of an efficient

Table 2: Concepts identified for post-graduate curriculum in human nutrition (n = 14).

Domains	Agree/ Strongly agree
A. Basic nutrition	
Nutritional role of bioactive molecules	100%
Relationship of nutrition sciences with other biological sciences	90%
Role of functional foods	100%
Application of knowledge in other fields in nutrition	90%
B. Applied nutrition	
Functional assessment of various organs and organ systems	85%
Nutritional status assessment of the fetus	85%
Nutritional trends and global food systems issues	90%
Particular issues for every stage of the life cycle	80%
Theories and techniques related to health behaviour that are used in a range of clinical, counselling, and nutrition education contexts to promote the modification of healthy behaviour.	80%
Nutritional approaches in disease prevention	100%
Comparative nutrition	85%
Nutrition program assessment	100%
required Culinary skills for clinical nutrition to guide the patients	90%
C. Clinical nutrition	
Basic concepts of immunology and its application to clinical nutrition.	100%
In order to diagnose and treat health and disease, consider the physiological and metabolic principles that underlie nutritional status.	80%
Nutrient metabolism in healthy, growing, ageing, and disease stages.	85%
Research that links diet and nutrition to specific illness conditions.	100%
Create the best nutritional therapy programmes for various clinical problems.	95%
Use nutritional needs concepts to manage patients with various conditions.	95%
Using case study methods, comprehend the role of diet in disease	100%
How nutrition is integrated in different clinics and hospital systems. Examples from USA, UK, Germany, and the rest of world.	100%
Useful dietary changes and dietary supplements will be used to reduce inflammation.	90%
Important terms related to behavioural nutrition, such as health psychology, behavioural epidemiology, mediating factors, theoretical framework, and cultural competence.	90%
The biological and pharmacological effects of herbal remedies; the biochemical components of plant extracts and the identification of their active	90%
Professional behaviours, establishing and maintaining healthy	100%
Boundaries with patients, credentials, the rights and limitations of the scope of practise, HIPAA, and risk management.	100%
The body's reactions to drug-induced nutritional depletions, an examination of the most significant herb/drug interactions, and a survey of relevant databases and information. These two primary issues with integrated medicine are supported by, documented by, and explained by scientific research.	100%
Therapeutic dietary modification.	95%
Various clinical nutrition ideas	100%
Management of food services in clinical nutrition 21	100%
Clinical nutrition practice scope and code of ethics.	100%
The responsibilities and accomplishments of national and international organisations involved in clinical nutrition.	95%
The effects of drug-induced nutritional depletions on the body; a study of the most important herb/drug interactions; and a review of databases and information on this subject. Scientific studies that document, support, and explain these two major problems in integrated medicine	95%

Table continued on next page.....

Domains	Agree/ Strongly agree
Clinical Sports Nutrition; nutritional theories on how the body uses macro- and micronutrients to fuel energy systems; well-known supplements for weight loss and performance enhancement; and dietary and exercise recommendations for athletes, adolescents, the elderly, and those with disease.	95%
Therapeutic dietary modification.	100%
Various clinical nutrition ideas	100%
Management of food services in clinical nutrition	95%
Clinical nutrition practice scope and code of ethics.	100%
The responsibilities and accomplishments of national and international organisations involved in clinical nutrition.	100%
Create the best nutritional therapy programmes for various clinical problems.	100%
Use nutritional needs concepts to manage patients with various conditions.	95%
Therapeutic dietary modification.	95%
Various clinical nutrition ideas	95%

nutrition program. According to the findings (Table 2), the suggested curriculum emphasizes the majority of the themes or domains. The themes or domains defined by Donin *et al.* (2017) are a great overview of these qualities because nutrition is a diverse field that involves a number of biological sciences and certain social sciences (Ministero, 2011).

The current investigation had certain strengths and limitations. The utilization of the Delphi technique to bring expert opinions into consensus was its main strength (Dalkey and Halmer, 1963). We had panelists from a variety of fields, as well as professors, researchers, and representatives from NGOs who had a wealth of academic training and research expertise in the area. According to Scheele (2002), a panel should be made up of a mix of experts and facilitators with relevant expertise who may offer alternative views, as well as stakeholders who are or will be directly impacted by the study. Although there is no standard number for the Delphi panelists in the literature, some studies (Torrance *et al.*, 2010; McIlraht *et al.*, 2009; Herring, 2004; Ager *et al.*, 2010; Wilson *et al.*, 2010) suggest that the number of panelists should range between 13 to 77, our sample size of panelists (n=46) was very appropriate. There were some flaws, the main one being our inability to make specific inferences from the panelists individual comments on various courses. These are insightful comments, but due to the length of the current work, we were unable to examine and present them. These qualitative data, though, will be presented in a different publication. Nevertheless, the quality of the data presented in this paper is unaffected by those sets of data. Another flaw is that the data may contain some uncertainty.

In order to grade each course based on its contents, we requested the panelists to review each course separately with the aim of determining how much (in percent) that specific course may satisfy the necessary requirements in their viewpoint and point of view. Although they added comments to their responses, it is still unclear to what specific standard they may have compared these courses. Even so, the image we were able to capture was somewhat blurry, which is typically indicative of qualitative data. Also, as indicated by most of the panel experts, aging is an emerging phenomena in Pakistan (Alam *et al.*, 2022), and nutrition for the elderly needs to be also reflected in any nutrition curricula developed.

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Novelty Statement

Although, the Delphi Technique is an old technique. However, it is very novel using the famous Delphi technique for reaching a consensus on topic related to curricula, importantly in human nutrition and dietetics.

Author's Contribution

IA conceived the research idea; IA and SS conducted the study and wrote the manuscript. MF and SR helped in write-up. SS, MF and SR helped in data collection, while IA analyzed the data. All the authors critically reviewed the manuscript and approved.

Conflict of interest

The authors have declared no conflict of interest.

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