Original Article

Nutrition & Dietetics Curriculum for BS Study Program – Assessment and Evaluation

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Abstract

The main objective of this study was to evaluate the curriculum for BS degree program in Human Nutrition & Dietetics in Pakistan. For this purpose, a working group comprising of experts in the field from NEAT (a Pakistan based registered organization: www.neat.org.pk) was assigned the responsibility to evaluate the curriculum. As suggested by the working group, a modified Delphi technique was used and a group of expert panelists (n=46) was identified. Three main 'areas of enquiry' '(AE)' were proposed, where the responses from the panels were requested: AE(1) evaluated the curriculum against a set of 15 characteristics reported in the literature; AE(2) evaluated the curriculum against 32-item 'knowledge areas' based on findings of a recent investigation. AE(3): scored the course contents of individual courses against a 'perceived standards' in light of a 14-item Battery. For AE(1) and (2) and (3), the panelists responded, respectively, on scoring scale (0 – 4) and ticked any one from 1 -3. The data were analyzed for mean and median scores for each individual item. Findings of AE(1) suggest that majority of the panelists agreed that the curriculum 'adequately'/'excellently' highlighted the fifteen criteria set-forth. Findings of AE(2) suggest 8 out of 32 'knowledge areas' being 'poorly' reflected in the curriculum. Findings of AE(3) suggest majority (28/43: 65%) of courses fulfill the perceived standards except 2 courses ("Nutrition through Life Cycle"; and "Research Methods in Nutrition") fulfilling <50% of the required standards. In all, the findings are of suggestive that the curriculum is 'good' except certain shortfalls. It was recommended that the deficiencies may be addressed in the coming revision.

Keywords

Curriculum, Nutrition and Dietetics, www.neat.org.pk

Introduction

The study of Human Nutrition has emerged as one of the main disciplines in the applied medical sciences. The reason for including nutrition as a subject in various curricula manifests the important role of nutrition that it can play towards the overall well-being and health of a community. *Nutrition education and communication* is increasingly recognized as an essential catalyst in the success of food and nutrition security interventions, ensuring that increased food production/income translates into improved nutrition status and improved diets. Several recent reviews and key documents support the role of nutrition education in agricultural/food and nutrition security interventions.[1-5]

As a separate subject, Human nutrition has been part of the curricula in many degree programs including biochemistry, medicines, pharmacy both at under- and post-graduate levels. The subject of human nutrition covers broad range of medical, social, commercial, and ethical domains and thus represents a wide, interdisciplinary scientific and cultural discipline.[6]

As considered an intrinsically complex topic, the study of human nutrition ranges from agriculture and zoo-technics, to food technology, from nutrition in different physiological states (growth, pregnancy, breast-feeding, aging), to the nutritional approach to acute and chronic diseases, from birth to the old age and then to the end of life.[7,8] Therefore, the gray line separating the purely physiological and cultural aspects from the specifically medical domains of human nutrition is extremely thin, and this partly explains why the training offered today is still qualitatively and quantitatively inappropriate to target the different professionals involved in the field of human nutrition.[9,10] Conceptually, training for human nutrition should feature in different degree courses, with training programs calibrated to specific professional requirements.[11]

With some exceptions, however, this training is inconsistent in the various academic courses worldwide and the appropriate teaching of knowledge–competencies–skills is unevenly delivered.[12] In some cases, there may be no training at all in human nutrition, even where it would be logical to expect it. This is true, for instance, in many study courses in biology and pharmacy. Last, but not least, teaching of human nutrition is generally insufficient even within medical education,[13,14] particularly as regard the clinical aspects,

which is surprising, considering the importance of nutrition in relation to both prevention and therapy of diseases.[15,16]

A curriculum is considered the "heart" of any learning institution meaning that academic institutions cannot exist without a curriculum. With its importance in formal education, curriculum has become a dynamic process due to the changes that occur in any society. Therefore, in its broadest sense, curriculum refers to the total learning experiences of individuals not only in academic institutions, but in society as well.[17] *Curriculum development* is a planned, purposeful, progressive, and systematic process in order to create positive improvements in the educational system. Every time there are changes or developments that have a direct effect on curricula and there is a need to update them in order to address the society's needs. In today's knowledge economy, curriculum development plays a vital role in improving the physical, health social and intellectual traits of a country.

In Pakistan nutrition education at the level of higher education has been given particular importance due to the reason that the discipline has not been given due importance in the past. With the exceptional support of Higher Education Commission (HEC) Pakistan, many universities, both in the public and private sectors, offer degree programs at the undergraduate and postgraduate levels.[18] Curricula for various programs in nutrition have been developed and some are under the process of development. A curriculum for BS degree in Nutrition and Dietetics has been recently developed with the help of active engagement of the Curriculum Wing of Higher Education Commission (HEC) of Pakistan (www.hec.org.pk). The objective of

this study is to evaluate the proposed curriculum in the light of a large body of work already done in the area, [12, 18-22] in order to identify its strengths as well as weaknesses. In this way, the curriculum can be further improved in future.

Material and method

The working group:

A working group from NEAT (Nutrition, Education, Awareness and Training) (www.neat.org.pk) – a registered organization, working in the spheres of nutrition education and training – was requested to provide their technical assistance for development/evaluation of the curricula. There were a series of online and face-to-face brainstorming meetings in order to identify the suitable mechanism for curriculum development/evaluation in Human Nutrition & Dietetics.

Delphi Technique:

A modified Delphi method was used for this study due to its acceptance and ability to identify a consensus from a panel of expert.[23-25] The working group suggested the Delphi technique for the purpose and proposed that the curriculum under question may be evaluated against the standardized curriculum criteria as proposed by CDC,[26] and extensively reported.[27-30]

A questionnaire was developed with three main 'areas of enquiry' '(AE)' proposed by the working group, where the responses from the panelists were requested: AE(1) evaluate the curriculum against a set of 15 characteristics reported in the literature; AE(2) evaluate the curriculum against 32-item 'knowledge areas' based on findings of a recent investigation. AE (3): score the course contents of individual courses against a perceived international standards.

The Panel of Experts:

The working group identified the panel of international and national experts (panelists) both from academic and developmental sectors of human nutrition. This study also included among the panelists practitioners, academics and NGO members in order to establish different points of view and maintain the variety of opinions. These experts were identified by the working group and an initial email, describing the objective of the study and a request for their participation, was sent.

Inclusion Criteria:

The inclusion criteria were: PhD education in nutrition or allied fields with at least 2-3 years teaching/research experience. The panelists were searched on the internet and a list of potential participants was prepared. We received willingness of 46 (out of 174) experts, who gave their willingness to participate in the study. These included 13 (%) national and 23 (%) international experts.

Procedure:

Round 1: Once a written willingness for the participation in the study was received from the panelists, we sent them a package of the questionnaire along with the proposed curriculum (available on www.hec.org.pk). There was a separate one-page '*Guide to Study*" and one-page "*Introduction to the Curriculum*" annexed with the questionnaire. In this round, the panelists were asked to report on three distinct 'areas of enquiry (AE)' on the curriculum: AE (1): analyze the curriculum as a whole against a set of 15 characteristics reported earlier.[26,30] AE(2): whether the curriculum as a whole cover 32 fundamental 'knowledge areas' or 'themes' from the three main 'domains', based on the findings of Donini et al. (2017),[31] and finally, AE (3): to what

percentage, in the opinion of the panelists, the contents of a course under consideration fulfill the 'perceived standards'. This part was completed with the help of a perceived "Battery traits of effective contents of courses for human nutrition" developed by the NEAT working group. This 14-item Battery is based on extensive literature review, [32-34] and available on the website (www.neat.org.pk: retrieved on 22-1-2017). Briefly, this 14-item Battery contains these items: 1. "Contents are closely **aligned** with the international standards"; 2. "**Learning targets** are clearly defined in each topic"; 3. "The content is carefully **sequenced** to maximize deep learning"; 4. "Lessons are made up of **engaging activities** and tasks that are rigorous and worthwhile, providing multiple entry points for all students"; 5. "There is a balance of **conceptual understanding**, skill, application, and opportunity for reflection"; 6. "The text is engaging with effective use of **primary sources** and/or meaningful connections"; 7. "**Performance-based** and Constructed Response assessments that allow students to apply concepts, skills, reasoning, and problem-solving"; 8. "Contents has **web based activates** that provide outlets for application, presentation and implementation"; 9. "Understanding is developed through **classroom discourse**, visuals and reading/writing"; 10. "**Provide outlets** for application, presentation and implementation"; 11. "Lessons plan is such that to **trigger questions** to encourage students to think deeply about a topic and defend their claims"' 12. "There is a range of support to **accommodate the varying levels of students' abilities**" 13. "Instruction is presented to meet various learning styles of students"; 14. "There is an **appropriate balance of depth and breadth** of content coverage").

The panelists were asked to review the curriculum thoroughly and answer the above mentioned three areas of enquiry. For the 'area of enquiry' (1), the panelists were expected to report their answers on a scoring scale from 0 – 4; where, 0 means that a particular characteristic is 'not' highlighted at all; 1 means that a particular characteristic is 'poorly' highlighted; 2 means that a particular characteristic is 'satisfactorily' highlighted; 3 means that a particular characteristic is 'adequately' highlighted; and 4 means that a particular characteristic is 'excellently' highlighted in the curriculum. In this way, these answers were completed for all 15 characteristics of the proposed curriculum. For 'area of enquiry' (2), the panelists were expected to report their answers on a scoring scale from 0 – 4, where 0 means (for a particular 'theme' of a set of 32 items) that is 'absent at all' from the proposed curriculum; 1 means (for a particular 'theme' of a set of 32 items) that is 'reflected to some extent' in the proposed curriculum; 2 means (for a particular 'theme' of a set of 32 items) that is 'satisfactorily reflected' in the proposed curriculum; 3 means (for a particular 'theme' of a set of 32 items) that is 'adequately reflected' in the proposed curriculum and 4 means for a particular 'theme' that is 'excellently' reflected in the proposed curriculum. These answers were completed for all 32 'themes' or 'domains'. For 'area of enquiry' (3), the panelists were expected to report their answers and tick 1 ("if in your opinion, the contents of a course under consideration fulfill <50% of the international standards"), 2 ("if in your opinion, the contents of a course under consideration fulfill 50 - 60 % of the international standards"), 3 ("if in your opinion, the contents of a course under consideration fulfill 61 – 70 % of the international standards"), 4 ("if in your

opinion, the contents of a course under consideration fulfill 71 – 80 % of the international standards") and 5 ("if in your opinion, the contents of a course under consideration fulfill >80 % of the international standards"). The panelists were guided to refer to the 14-items Battery while completing this part. So for example, if the contents of a course cover at least 14 out of 14, then tick '5', and similarly tick, respectively, 4, 3, 2, 1, if the contents of a course cover 11-13 out of 14, 8-10 out of 14, 7-9 out of 14 and <7 out of 14.

Data Analysis:

Descriptive statistical analysis was applied to the answers collected from the panelists. Frequency of strongly. The qualitative data were analyzed as previously reported elsewhere.[35] With some appropriate modification as recommended by Korkmaz and Erden (2012), [35] it was specified that in order for an item that has been adequately 'highlighted' or 'reflected' in the proposed curriculum, its corresponding mean and/median should not be fewer than 3.0 each and the ratio of "strongly agree" and "agree" answers of the panelists should at least be equal to 3/4 of the total number of panelists.

All the data were analyzed using Graphpad Prism Version 7 (GraphPad Software, Inc. USA)

Result

This study was conducted with the objective to analyze a proposed curriculum for BS degree program. The said program is an eight-semester program with a total of 64

Credit Hours. The curriculum consists of three broad categories of courses i.e. 1) Compulsory and Foundation courses, 2) Major and Elective Major Courses. The first four semesters (year 1, 2) include all the Compulsory and Foundation courses and some General courses (total 24 courses; 69 CH). The entire Major and Elective Major and some General courses (total 23 courses; 68 CH) are taught in the last four semesters (year 3, 4).

A course entitled 'Internship/Project', of 6 CH, is also included, where students are involved in an internship or to carry out a research project.

In this study, it was decided to use mean, median and percentage of agreement to be used together as the agreement criteria. As evident from Tables 1 and 2, 15 and 32 items were evaluated in order to know to what extent each of the characteristics or 'knowledge areas' are 'highlighted' or 'reflected' in the proposed curriculum. For 'area of enquiry' (AE (1), Table 1 shows the mean and median scores of the panelists with responses of 'adequately' highlighted plus 'excellently' highlighted regarding the 15 characteristics required for curriculum.

Table 1 also shows the frequency (f3+4) of panelists with responses of 'adequately' highlighted plus 'excellently' highlighted regarding the 15 characteristics required for curriculum. As evident from Table 1, the mean values range from 3.1 to 3.6 and the median score ranged from 3 - 4. Similarly, the f3+4 ranged from 36 – 42.

Table 1: Mean, Medium Scores of 15-Charactristics of curriculum

		n	F3+4*	Mean	Median
1	"Focuses on clear health goals and related behavioral outcomes".				
1	"Focuses on clear health goals and related behavioral outcomes".	46	38	3.6	3.0
2	"Is research-based and theory-driven"	46	38	3.2	3.0
3	"Addresses individual values, attitudes and beliefs"	46	39	3.3	3.0
4	"Addresses individual and group norms that support health-enhancing behaviors"	46	42	3.4	4.0
5	"Focuses on reinforcing protective factors and increasing perceptions of personal risk and harmfulness of engaging in specific unhealthy practices and behaviors".	46	41	3.3	3.0
6	"Addresses social pressures and influences"	46	41	3.3	3.0
7	"Builds personal competence, social competence, and self-efficacy by addressing skills"	46	37	3.2	
8	"Provides functional health knowledge that is basic, accurate, and directly contributes to health-promoting decisions and behaviors"	46	38	3.2	3.0
9	"Uses strategies designed to personalize information and engage students"	46	38	3.2	3.0
10	"Provides age-appropriate and developmentally appropriate information, learning strategies, teaching methods and materials"	46	40	3.3	4.0
11	"Incorporates learning strategies, teaching methods and materials that are culturally inclusive"	46	41	3.3	3.0
12	"Provides adequate time for instruction and learning"	46	36	3.1	3.0
13	"Provides opportunities to reinforce skills and positive health behaviors"	46	39	3.3	3.0
14	"Provides opportunities to make positive connections with influential others"	46	39	3.3	
15	"Includes teacher information and plans for professional development and training that enhance effectiveness of instruction and student learning"	46	41	3.3	3.0

*f3+4: Frequency of panelists with responses 'adequately' highlighted plus 'excellently' highlighted

Table 2 shows the findings for 'area of enquiry' (2), depicted in mean and median scores of the 32 items ('themes' or 'domains'). Table 2 also shows the frequency (f3+4) of the panelists with responses for a particular 'theme' (from the set of 32) that is 'adequately' reflected and

'Excellently' reflected in the proposed curriculum. the frequency (f3+4) of panelists with responses of ''adequately' reflected and 'excellently' reflected regarding the 32 items that are suggested to be as 'themes' or 'domains' proposed for nutrition curriculum. As evident from Table 2, the mean values range from 1.8 to 3.5 and the median score ranged from 2 - 3. Similarly, the f3+4 ranged from 4 – 45

. Table 2: Mean and Median Scores for 32-item 'themes' or 'domains'

1	"Genetic and molecular basis of metabolism"	n	fF3+4*	Mean	Median
2	"Bioavailability, metabolism, and nutritional role of nutrients and bioactive molecules"	46	41	3.3	3
3	"Food composition (nutrients and bioactive molecules)"	46	42	3.5	3
4	"Nutrient profiling"	46	45	3.5	3
5	"Effects of transformation and preservation on the nutritional characteristics of food"	46	40	3.0	3
6	"Development and utilization of functional foods"	46	41	3.3	3
7	"Food and nutrition safety (best practice, novel foods, contaminants, additives, preservatives)"	46	39	3.3	3
8	"Food allergies and intolerances"	46	31	2.9	3
9	"Assessment of nutritional status"	46	45	3.5	3
10	"Clinical diagnosis of nutritional status"	46	43	3.5	3
11	"Nutritional surveillance"	46	37	3.1	3
12	"Nutritional epidemiology"	46	41	3.3	3
13	"Physiological nutrition at different ages"	46	42	3.3	3
14	"Nutrition during pregnancy and breast-feeding"	46	41	3.4	3
15	"Sports nutrition"	46	41	3.3	3
16	"Assessment of dietary adequacy"	46	41	3.4	3
17	"Assessment of lifestyles"	46	32	2.9	2
18	"Assessment of eating habits, behavior, and food choices"	46	37	3.2	3
19	"Assessment of interactions between food and drugs"	46	41	3.4	3
20	"Primary and secondary prevention of nutrition-related diseases"	46	38	3.2	3
21	"Tertiary prevention of nutrition-related diseases"	46	31	2.7	3
22	"Promotion of healthy eating and dietary education"	46	36	3.4	3
23	"Communication and dissemination of information in nutrition"	46	32	2.7	3
24	"Commercial catering and food services"	46	28	2.8	3
25	"Catering and food services in health-care settings (hospital, nursing	46	27	2.1	2

	homes)"				
26	"Training for food business operators"	46	6	2.1	2
27	"Assessment and nutritional treatment of eating disorders"	46	41	3.4	3
28	"Assessment and nutritional treatment of nutrition-related diseases"	46	41	3.5	3
29	"Assessment and nutritional treatment of inborn metabolic disorders"	46	36	3.2	3
30	"Artificial nutrition (enteral and parenteral)"	46	38	3.3	3
31	"Pharmaconutrition and nutraceuticals"	46	38	3.2	3
32	"New food production technologies (genetically modified foods, nanotechnologies, etc.)"	46	4	1.8	2

*F3+4= frequency of the panelists with responses for a particular 'theme' (from the set of 32) that is 'adequately' reflected and 'excellently' reflected in the proposed curriculum

As shown in Fig 1 ('area of enquiry' (AE (3)), the percent number of courses that fulfill <50%, 50-60%, 61-70%, 71-80% and >80% of the required standards.

Figure 1: Number of Courses (in percentage) that fulfill <50%, 50-60%, 61-70%, 71-80% and >80% of the required standards.
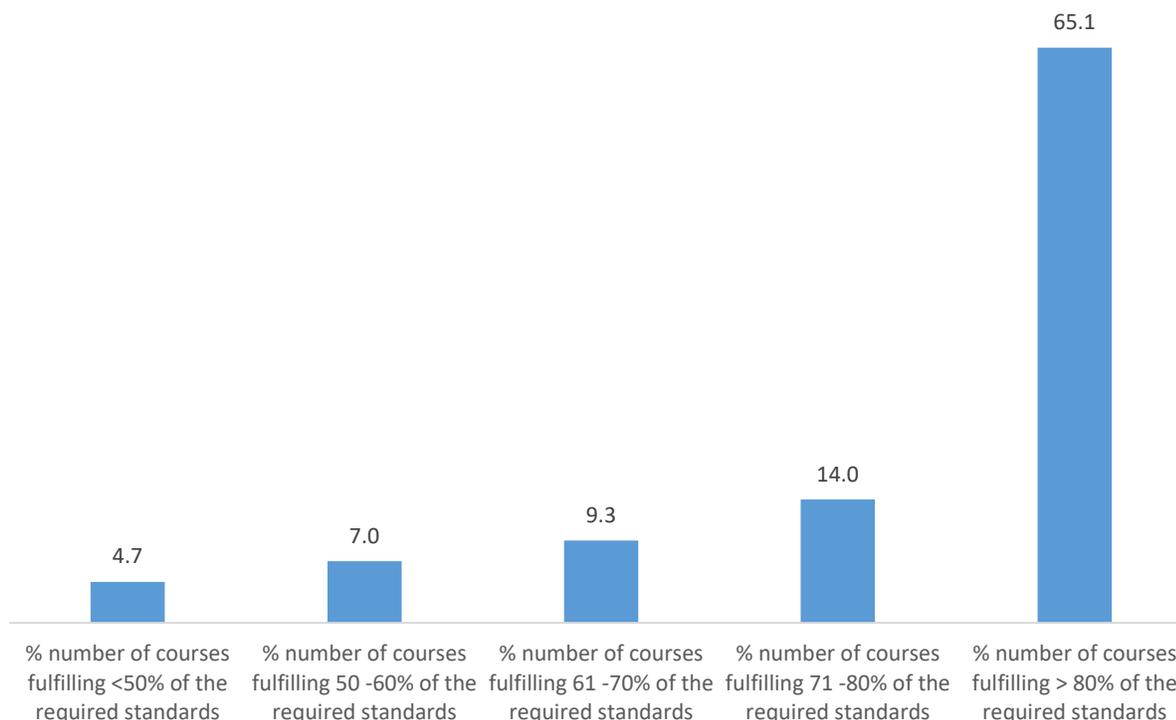
Responses of panelists were completed as guided by a "Battery traits of effective contents of courses for human nutrition" developed by the NEAT working group. This 14-item Battery is based on extensive literature review (e.g. Moss and Brookhart, 2012; Bain and Zimmerman,

2009; Finkel, 2000)[31-33] and available on the website (www.neat.org.pk: retrieved on 22-1-2017). Briefly, the this 14-item Battery contains these items: 1. "Contents are closely aligned with the international standards"; 2. "Learning targets are clearly defined in each topic"; 3. "The content is carefully sequenced to maximize deep learning"; 4. "Lessons are made up of engaging activities and tasks that are rigorous and worthwhile, providing multiple entry points for all students"; 5. "There is a balance of conceptual understanding, skill, application, and opportunity for reflection"; 6. "The text is engaging with effective use of primary sources and/or meaningful connections"; 7. "Performance-based and Constructed Response assessments that allow students to apply concepts, skills, reasoning, and problem-solving"; 8. "Contents has web based activates that provide outlets for application, presentation and implementation"; 9. "Understanding is developed through classroom discourse, visuals and reading/writing"; 10. "Provide outlets for application, presentation and implementation"; 11. "Lessons plan is such that to trigger questions to encourage students to think deeply about a topic and defend their claims'" 12. "There is a range of support to accommodate the varying levels of students' abilities" 13. "Instruction is presented to meet various learning styles of students"; 14. "There is an appropriate balance of depth and breadth of content coverage".

Discussion

The present study was carried out with the objective to evaluate a curriculum which has been recently developed for BS degree program in Human Nutrition & Dietetics by the curriculum wing of higher education commission (HEC) of Pakistan. To the best of our knowledge, this is the first study of its type to systematically evaluate a curriculum in the field of nutrition using the Delphi technique. The finding of the present study suggest that the proposed curriculum got excellent scores for almost all 15 characterizes (Table 1). The overall picture emerged from the data presented in Table 1 shows that the curriculum under consideration reflects the fifteen characteristics in a way suggesting the proposed curriculum excellently fulfill these characteristics. These characteristics emphasize teaching functional health information (essential concepts); shaping personal values that support healthy behaviors; shaping group norms that value a healthy lifestyle; and developing the essential health skills necessary to adopt, practice, and maintain health–enhancing behavior. These characteristics have been shown to be the essential elements of any health curriculum.[36-38]

The nutrition curricula has been reviewed in many countries with different perspectives.[12,18,19,20,21,22,31] What can be concluded from recommendations from these and many other studies regarding a comprehensive curriculum for human nutrition, the curricula should address certain main areas in nutrition. Donini et al (2017)[12] argue that the curriculum for nutrition must address three main 'domains' i.e. basic nutrition, applied nutrition and clinical nutrition. It has been recommended that a comprehensive curriculum in nutrition must include certain 'themes' or 'knowledge areas' from these three 'domains' to be an effective tool for education and research in the field of human nutrition.[12] The authors have identified 32 knowledge areas and based on the findings of Donini et al. (2017),[12] we also evaluated the proposed curriculum against 32 items identified by Donin et al (2017)[12] as the main 'themes' or 'domains' of an effective nutrition curriculum. The results show (Table 2) that the proposed curriculum highlight most of the 'knowledge areas' from the three

'domains'. As nutrition is a multidisciplinary field - engaging a number of biological sciences and certain social sciences,[7,39] - the 'themes' or 'domains' identified by Donin et al. (2017) is an excellent summary of these characteristics.[12] Our finding show that out of 32, only 8 'themes' or 'domains' are identified in the proposed curriculum, which are only 'satisfactorily' reflected in the proposed curriculum (mean score for all these 8 'themes'<3; Table 2). These eight 'knowledge area' from the three 'domains', which are not reflected in the proposed curriculum need to be addressed in the next issue of the revised curriculum.

In the present study, we also evaluated individual courses to know how much a course (based on the course contents) may fulfill the criteria of the required standards (Fig 1). There were a total of 43 course evaluated by the panelists, out of which substantially a higher number (28 course: 65% of the curriculum) fulfilled >80% of the required standards. There were only two course ("Nutrition through Life Cycle"; and "Research Methods in Nutrition"), which were very poor with this regard (fulfilled <50% of the required standard) and these need extensive improvement in their contents, mainly in their practical work (comments from the panelists, data not shown).

There were certain strengths as well as weaknesses of the current investigation. The main strength was that Delphi technique was used with the aim of reaching shared agreement among expert opinions.[40] We included panelists from various disciplines, professors, researchers, officials in NGOs with ample academic qualification and research experience in the field). Scheele (2002)[41] suggests that in order to create a successful mixture of panelists should include stakeholders who are or will be directly affected by the study, as well as experts and facilitators who have related experience who can provide alternative ideas. Our sample size of panelists (46) was very appropriate although, in the literature, there is no set number for the Delphi panelists as some of the studies[42-46] suggest the number of panelists should range from 13-77. Witkin and Altschuld (1995) also indicate that the mean number is fewer than 50.[47] We also used a special tool–a 14-items Battery to guide the panelists to assess the course contents of each course in the light of traits as given in this 14-items Battery. This 14-item Battery is based on extensive literature review[32-34] and available on the website (www.neat.org.pk: retrieved on 22-1-2017). The Battery highlights some important traits of a course, for example, alignment with the the international standards, their learning targets, course contents sequence, opportunity for students engagement, conceptual understanding, primary sources performance-based. These characteristics of a course have been extensively reported in the literature.[48]

There were certain weaknesses; the main one our inability to draw a concrete conclusions from the individual comments we received from the panelists regarding individual courses. These are valuable comments, but we could not analyze and present them in the present paper mainly because of the length of the current paper. However, we will present those qualitative data in a separate paper. Nevertheless, those set of data do not affect the quality of the data presented in this paper. Another weakness is some possible uncertainty associated with the data presented in Fig 1. As we asked the panelist to review each course individually with an objective to score each course, based on their contents, as if how much (in percent) that particular course may fulfill the required criteria

according to their perception and point of view. Nevertheless, we were able to get a picture – although a bit blurred, which is usually associated with qualitative nature of the data.

In all, the evaluation of the proposed curriculum suggest that as a whole it is assumed to be an effective and comprehensive curriculum for the degree program (BS Human Nutrition & Dietetics). Nevertheless, there are some weaknesses identified, particularly as certain 'themes' or 'knowledge areas' from the three 'domains' are lacking as shown in Table 2 (items with mean score<3.0). These shortfalls need to be addressed in the revised curriculum. Furthermore, certain course are weak as per as their contents are related and these need to be revised with this aspect in the revised curriculum.

Conflict of Interest

All the authors declare no conflict of interest.

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References

1. Girard, A. W., Self, J. L., McAuliffe, C., & Olude, O. (2012). The effects of household food production strategies on the health and nutrition outcomes of women and young children: a systematic review. Paediatric and Perinatal Epidemiology, 26(s1), 205-222.

2. Leroy, J. L., & Frongillo, E. A. (2007). Can interventions to promote animal production ameliorate undernutrition?. The Journal of Nutrition, 137(10), 2311-2316.

3. Meinzen-Dick, R., Behrman, J., Menon, P., & Quisumbing, A. (2012). Gender: A key dimension linking agricultural programs to improved nutrition and health. Reshaping agriculture for nutrition and health, 135-144.

4. Hawkes, C., & Ruel, M. T. (2008). From agriculture to nutrition: Pathways, synergies and outcomes.

5. UNSCN report (2010). World Nutrition Situation. Sixth report on the world nutrition situation by the United Nations System Standing Committee on Nutrition (UNSCN). Available online.

6. CEPHC. Council of Europe. Public Health Committee. (2002). Committee of Experts on Nutrition, Food Safety and Consumer Health. Ad Hoc Group Nutrition Programmes in Hospitals. Food and Nutritional Care in Hospitals: How to Prevent Under-Nutrition. Report and Guidelines. Strasbourg.

7. ADI (ADI (Associazione Italiana di Dietetica e Nutrizione Clinica). Manifesto delle criticità in nutrizione clinica e preventiva (2015–2018). Recenti Prog Med (2015) 106:5–31. doi:10.1701/1886.20572.

8. Kushner, R. F. (1995). Barriers to providing nutrition counseling by physicians: a survey of primary care practitioners. Preventive medicine, 24(6), 546-552.

9. Eaton, C. B., Goodwin, M. A., & Stange, K. C. (2002). Direct observation of nutrition counseling in community family practice. American journal of preventive medicine, 23(3), 174-179.

10. Heber, D. (1995). Physician's Curriculum in Clinical Nutrition: A Competency-Based Approach for Primary Care. The American Journal of Clinical Nutrition, 62(4), 846-847.

11. Hark, L. A. (2006). Lessons learned from nutrition curricular enhancements. The American journal of clinical nutrition, 83(4), 968S-970S.

12. AMSANCPAB. American Medical Student Association Nutrition Curriculum Project Advisor Board. (1996). Essentials of nutrition education in medical schools: a national consensus. Acad Med, 71:969–71

13. CNME. Committee on Nutrition in Medical Education. (1985). Food and Nutrition Board, Council on Life Sciences, National Research Council. Nutrition Education in U.S. Medical Schools. Washington, DC: National Academy Press.

14. SINU. Formazione Universitaria in Nutrizione Umana. Società Italiana di Nutrition Umana (SINU). Rome: (2012). Please mention its APA form.

15. Ball L, Crowley J, Laur C, Rajput-Ray M, Gillam S, Ray S. (2014). Nutrition in medical education: reflections from an initiative at the University of Cambridge. J Multidiscip Healthc, 7:209–15.

16. Bilbao, P. P., Lucido, P. I., Iringan, T. C., and Javier, R. B. (2008). Curriculum development. Philippines: Lorimar Publishing, Inc.

17. Khandelwal S, Paul T, Haddad L, Bhalla S, Gillespie S, Laxminarayan R (2014). Postgraduate education in nutrition in south Asia: a huge mismatch between investments and needs. BMC medical education.7;14(1):3.

18. Crowley, J., Ball, L., Laur, C., Wall, C., Arroll, B., Poole, P., & Ray, S. (2015). Nutrition guidelines for undergraduate medical curricula: a six-country comparison. Advances in medical education and practice, 6, 127.

19. Burke, M.J., Bonamini, G., Walling, A. (2002). Implementing a systematic course/clerkship peer review process. Academic Medicine. 1; 77(9):930-1.

20. Hollander, H., Loeser, H., & Irby, D. (2002). An anticipatory quality improvement process for curricular reform. Academic Medicine, 77(9), 930.

21. Shils, M. E. (1990). Nutrition in the curriculum: medical experience. Journal of dental education, 54(8), 502-505.

22. Shewade, H. D., Jeyashree, K., Kalaiselvi, S., Palanivel, C., & Panigrahi, K. C. (2017). Competency-based tool for evaluation of community-based training in undergraduate medical education in india–a Delphi approach. Advances in medical education and practice, 8, 277.

23. Hsu, C. C., & Sandford, B. A. (2007). The Delphi technique: making sense of consensus. Practical assessment, research & evaluation, 12(10), 1-8.

24. Linstone, H. A., & Turoff, M. (2002). The Delphi method: Techniques and applications (Vol. 18). Addison-Wesley Publishing Company, Advanced Book Program.

25. CDC: Centers for Disease Control and Prevention (CDC). (2011). Health education curriculum analysis tool. CDC, Atlanta, GA. Available at: http://www.cdc.gov/healthyyouth/hecat/index.htm

26. Meeks, L., Heit, P., & Page, R. (2006). Comprehensive school health education. Washington.

27. Speros, C. (2005). Health literacy: concept analysis. Journal of advanced nursing, 50(6), 633-640.

28. Harden, R. M. (2000). The integration ladder: a tool for curriculum planning and evaluation. MEDICAL EDUCATION-OXFORD-, 34(7), 551-557.

29. Story, M., Nanney, M. S., & Schwartz, M. B. (2009). Schools and obesity prevention: creating school environments and policies to promote healthy eating and physical activity. The Milbank Quarterly, 87(1), 71-100.

30. Donini, L. M., Leonardi, F., Rondanelli, M., Banderali, G., Battino, M., Bertoli,

E., & Caretto, A. (2017). The domains of human nutrition: the importance of nutrition education in academia and medical schools. Frontiers in Nutrition, 4.

31. Moss, C. M., & Brookhart, S. M. (2012). Learning targets: Helping students aim for understanding in today's lesson. ASCD.

32. Bain, K. & Zimmerman, J. (Spring 2009). Understanding great teaching. Peer Review: Emerging Trends and Key Debates in Undergraduate Education, 1(2), 9-12.

33. Finkel, D. (2000). Teaching with your mouth shut. Portsmouth, NH: Heinemann.

34. Korkmaz, H. E., & Erden, M. (2012). The characteristics of the curriculum for designing democratic educational environment. Procedia-Social and Behavioral Sciences, 46, 2496-2502.

35. Benes, S., & Alperin, H. (2016). The Essentials of Teaching Health Education: Curriculum, Instruction, and Assessment. Human Kinetics.

36. Wiley, D. C., & Cory, A. C. (Eds.). (2013). Encyclopedia of school health. Sage Publications.

37. Page, R. M., & Page, T. S. (2010). Promoting health and emotional well-being in your classroom. Jones & Bartlett Publishers.

38. Ministero della Salute. Linee di Indirizzo Nazionale per la Ristorazione Ospedaliera ed Assistenziale. Suppl. ord. G.U. n.37 del 15 febbraio. (2011). Available from: http://www.salute.gov.it/

39. Dalkey N, Helmer O. An experimental application of the Delphi method to the use of experts. Management science. 1963 Apr;9(3):458-67.

40. Scheele, D. S. (2002). Reality construction as a product of delphi interaction. In H. A. Linston, M. Turoff & O. Helmer (Eds), The Delphi Method Techniques and Applications (pp. 35-67). Available from http://is.njit.edu/pubs/delphibook/

41. McIlrath, C., Keeney, S., McKenna, H., & McLaughlin, D. (2010). Benchmarks for effective primary care-based nursing services for adults with depression: a Delphi study. Journal of Advanced Nursing, 66(2), 269-281.

42. Herring, M. C. (2004). Development of constructivist-based distance learning environment. The Quarterly Review of Distance Education, 5, 231-242.

43. Torrance, N., Smith, B. H., Elliott, A. M., Campbell, S. E., Chambers, W. A., Hannaford, P. C., & Johnston, M. (2010). Potential pain management programmes in primary care. A UK-wide questionnaire and Delphi survey of experts. Family practice, 28(1), 41-48.

44. Wilson, D., Koziol-Mclain, J., Garrett, N., & Sharma, P. (2010). A hospital-based child protection programme evaluation instrument: A modified delphi study. International Journal for Quality in Health Care, 22, 283-293.

45. Ager, A., Stark, L., Akesson, B., & Boothby, N. (2010). Defining best practice in care and protection of children in crisis-affected settings: A Delphi study. Child development, 81(4), 1271-1286.

46. Witkin, B. R. (1984). Assessing needs in educational and social programs. Jossey-Bass.

47. McKay, J. & Kember, D. (1997). Spoon feeding leads to regurgitation: A better diet can result in more digestible learning outcomes, Higher Education Research and Development, 6(1), 5567

48. Rhem, J. (1995). Close-up: Going deep. The National Teaching & Learning Forum, 5(1), 4.