

DEVELOPMENT AND VALIDATION OF A NUTRITION EDUCATION TOOL KIT ON MILLETS FOR PATIENS DIAGNOSED WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT

Diabetes has become a highly problematic and increasingly prevalent disease worldwide. Effectiveness of millets in improving glycemic control, decreasing fasting, and postprandial rise in blood glucose concentration, reducing insulin index and insulin resistance and lessening glycosylated hemoglobin (HbA1c) level. Millets have nutraceutical properties in the form of antioxidants that prevent and protect from the risk of Type 2 Diabetes Mellitus, despite its numerous health benefits the lack of awareness among the population is one of several reasons that contribute to the decline in millet consumption. Educating people about the benefits of consuming millet can easily be done with the help of educational materials. This type of practice can have positive results, such as improving knowledge and changing the behaviors and attitudes of patients coping with the disease. The study identified the need to develop a Nutrition Education Tool kit on Millets, designed to help health educators, dietitians, physicians, other health care and nutrition professionals to educate the patients to use the information it provides to understand the health benefits, value-added products, ways to consume and easy to make recipes, of millets and to include them in their daily diet.

Keyword: - Type 2 Diabetes Mellitus, Millets, Nutrition education, Nutrition value, Millets tool kit.

1. TYPE 2 DIABETES AND MILLETS

Type 2 diabetes mellitus is the greatest epidemic in human history. Millets can reduce the risk of developing type 2 diabetes and helps manage blood glucose levels in people with diabetes. Many studies have demonstrated the efficacy of millets in improving glycemic control, decreasing fasting, and postprandial rise in blood glucose concentration [1] reducing insulin index and insulin resistance and lessening glycosylated hemoglobin (HbA1c) level. In light of their benefits, millets hold a key to the well-being for those who suffer from, and those that are at risk of, diabetes. Despite the fact that millets are highly nutritious providing numerous health benefits, it is not consumed in the same proportion as mainstream cereals (i.e. rice and wheat). The lack of awareness among patients with diabetes is one of several reasons that contribute to the decline in millet consumption. Educating patients diagnosed with Diabetes about the benefits of consuming millets can easily be done with the help of educational

materials, audiovisual resources, and verbal language. Educational materials are frequently used in the services of the Health System and are made in the form of manuals, pamphlets and booklets. This type of practice can have positive results for the population, such as improving knowledge, changing behaviors and attitudes of patients coping with the disease. The Nutrition Education Tool kit on Millets will be designed to help health educators, dietitians, physicians, other health care and nutrition professionals to educate the patients to use the information it provides to understand the health benefits, value-added products, ways to consume and easy to make recipes, of millets and to include them in their daily diet.

1.1 Development of Millet Tool Kit

Considering the need for comprehensive nutrition education material on millets for patients diagnosed with Type 2 Diabetes Mellitus to be delivered in an exciting and engaging mode, a nutrition education Tool kit on millets was developed. In total, 76 resource materials from national or international literature were reviewed and the most relevant information for the knowledge of diabetes patients about the health benefits of consuming millet in their daily diet was selected. The final version of the tool kit consisted of a 5 min 13-sec video, a brochure that was 8 × 10 inches, and a recipe book that was 8x 8 inches consisting of 20 recipes. The brochure and the recipe book both contained 12 and 35 double-sided pages respectively. At the end of the tool kit, there was a handout added which had a short recipe for a live recipe demonstration and a short quiz on millets. The quiz was based on the information provided in the tool kit. The purpose of adding the quiz was to create an engaging assessment method to find out how much the participants understood from the toolkit. The tool kit was intended to be used for nutrition education on millets for patients diagnosed with Type 2 Diabetes mellitus.

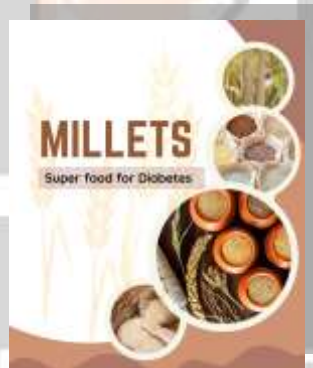


Fig 1. Cover page of the brochure



Fig 2. The cover page and index of the recipe book

2. CONTENT VALIATION OF THE TOOL KIT

Content validity refers to the degree that the research instrument covers the content that it is supposed to measure (i.e. in this case, measuring the relevance of the toolkit on millets for Diabetes) and is a subjective judgment of experts about the degree of relevant construct in the research instrument employed in the study. The content validity function also validates each item in the instrument that represents each measured construct [2].

The content validity evidence can be represented by the content validity index (CVI) [3]. A content validity index was calculated for both levels which are as follows

- A. Item-level Content Validity Index (I-CVI) - Item level Content Validity Index is determined by the relevance rating of 3 or 4 given by the proportion of experts. It is calculated by using the given formula (Lynn et.al 1986) **I-CVI = (agreed item) / (number of experts)**
- B. Scale level Content Validity Index (S-CVI) - Scale level Content Validity Index is calculated using two methods:
 - Method 1. The average of the I-CVI scores for all items on the rating scale (S-CVI/Ave), applying the formula **S-CVI/Ave = (sum of I-CVI scores) / (number of items)**
 - Method 2. And the number of items on the scale that receive a relevance rating of 3 or 4 from all experts (S-CVI/UA), by applying the formula **S-CVI/UA = (sum of UA scores) / (number of items)**

2.1 Professional Profile of Experts

Regarding the characteristics of the experts, Ten out of 13 experts who were contacted completed the evaluation forms. The only reason for non-completion was lack of time. Out of the 10 female experts, 5 (50%) were academicians, and 5 (50%) were clinical dietitians.

Regarding academic qualification, 4 (40%) had post-graduate degrees in Nutrition and Dietetics, and 2 (20%) were registered dietitians, 4 (40%) were Ph.D. holders. The data confirmed that these selected samples had the required expertise to evaluate the tool kit.

Regarding the area of their work, 5 (50%) academicians are currently teaching at Sir Vithaldas Thackersey College of Home Science in the Department of B.Sc. Food nutrition dietetics and M.Sc. Specialized Dietetics, 3 (30%) of the dietitians were working in the interdisciplinary clinic; and 2 (20%) in tertiary health care center.

Approximately (70%) of the experts had already participated in a research study before. The expert's average years of work experience was 18 years.

2.2 Patients Demographic Characteristics

The 50 eligible patients (n=25 male, n= 25 female) diagnosed with Type 2 Diabetes Mellitus participated in the study. The minimum age of the patients was 20 years and the maximum age was 50 years. The mean age of patients was 43 years. 96% (n=48) of the total participants were married and the rest 2% (n=1) and 2% (n=1) were single and widowed respectively. 78% (n=39) of the total participants were graduated followed by 8% (n = 4) who were post-graduate. Only 4% (n=2) and 10% (n=5) of all participants had completed a diploma/certificate course and secondary school education. 70% (n=35) of the total participants belonged to upper middle socio-economic status, 8% (n=4) of the total participants belonged to upper socioeconomic status, 14% (n=7) of participants belonged to lower middle socioeconomic status, and 8% (n=4) of the total participants belonged to upper lower socio-economic status.

The mean Diabetes duration of the patients was 8 years. Most participants 94% (n=47) were on oral hypoglycemic drugs and 6% (n=3) of the total participants were on a combination of insulin and oral hypoglycemic drugs. Comorbidities reported include high blood pressure 16% (n=8), high cholesterol 8% (n=6), and the rest 76% (n=38) participants had no comorbidities diagnosed so far.

2.3 Content validation of the video

The S-CVI/Ave score was 0.98 and the S-CVI/UA score was 0.81. The overall mean score for all the questions was 3.39 (0.27), and 3 was the most frequent (mode) rating in the 7 questions out of 10. All the 10 experts agreed that the visual explanation of concepts through images/video are clear, logical, and correct. In the assessment questionnaire, eight questions out of 10 received a universal rating of 1 from all 10 experts. Whereas Q.1 and Q.4 which stated that the video provides all the necessary information for millet-based nutrition education and the arrangements & size of the images are appropriate respectively obtained an I-CVI score of 0.9.

Table -1. Content Validity Index calculated for the Video

Questions	Mode	Mean (SD)	Experts Agreement	I-CVI	Universal Agreement
Q.1 The video provides all the necessary information for millet-based nutrition education	3	3 (1.15)	9	0.9	0
Q.2 The video content is appropriate for the target audience	3	3.3 (0.48)	10	1	1
Q.3 The scenes in the video are logical/accurate/appropriate/uninterrupted	3	3.2 (0.42)	10	1	1
Q.4 The arrangements & size of the images are appropriate	3	3.1 (1.19)	9	0.9	0
Q.5 The quality/resolution of graphics used for the video is high	4	3.6 (0.51)	10	1	1
Q.6 the video contains information desired to educate people on millet	3	3.4 (0.51)	10	1	1
Q.7 The video content is correct, well written and relevant to the goal/ topic of video	3	3.5 (0.52)	10	1	1
Q.8 The information provided within the scope of the video is comprehensive	3	3.4 (0.51)	10	1	1
Q.9 Visual explanation of concepts through images/video are clear, logical, and correct	4	3.7 (0.48)	10	1	1
Q.10 The video has been created based on an accurate scientific source	4	3.6 (0.51)	10	1	1
Q.11 This video can be recommended to people who might benefit from it	3	3.5 (0.52)	10	1	1
S-CVI/AVERAGE				0.98	
S-CVI/UA					0.81
Overall mean (SD)		3.39(0.27)			

2.4 Content validation of the Brochure

A brochure on the health benefits of consuming millet for Type 2 Diabetes Mellitus was created in order to facilitate the work of health professionals when guiding patients with Diabetes about the correct dietary choices, the nutritional significance of millets and their health benefits for Type 2 Diabetes. The brochure was designed with the help of colorful themes and visual cues, which may have aided in knowledge retention and the impact of information. The overall mean value for all the questions is 3.36 (0.32) and the most frequent mode is 3. The S-CVI /Average and the SCVI/UA score were 0.97 and 0.84 respectively. Thus the overall CVI of the brochure on millets for Diabetes

indicated a high level of agreement. The content theme of the brochure obtained a universal agreement score of 1, indicating that all the experts considered the brochure on millets it was relevant to the Diabetes population. Questions on content appropriateness of the brochure for the patients with Diabetes (questions 1.1, 1.2) sufficiency, and easy application in their daily routine (questions 1.3 and 1.4) had a mean score of 3.4, 3.6, and 3.4, respectively. Enabling the audience to connect to the content can improve its effectiveness and direct attention to key facts (Ferguson et.al 2012). The experts stated that the content supplied in the brochure for nutrition education on millets for Type 2 Diabetes patients was correct, well-written, appropriate to the target population, and based on reliable scientific sources.

Table – 2. Content Validity Index for the Brochure

Questions	Mode	Mean (SD)	Expert in agreement	I-CVI	Universal agreement
Content					
Q.1.1 The content covered is relevant for the promotion of millet for patients diagnosed with T2DM	3	3.4 (0.51)	10	1	1
Q.1.2 The content is suitable for patients diagnosed with Type 2 Diabetes Mellitus	3	3.4 (0.51)	10	1	1
Q.1.3 The content is enough to supply the target audiences needs	4	3.6 (0.51)	10	1	1
Q.1.4 The content can be easily applied to target audience's daily routines	3	3.4 (0.51)	10	1	1
Language					
Q.2.1 Writing style is compatible	3	3.1 (1.19)	9	0.9	0
Q.2.2 Writing style is attractive	3	3.5 (0.52)	10	1	1
Q.2.3 The language used is clear and objective	3	3.4 (0.51)	10	1	1
Illustrations					
Q.3.1 Illustrations are adequate to match the theme of the support material	4	3.6 (0.51)	10	1	1
Q.3.2 Illustrations are clear and allow easy understanding	4	3.6 (0.51)	10	1	1
Q.3.3 The number of illustrations is content suitable	3	3.4 (0.51)	10	1	1
Layout					
Q.4.1 The font type eases	3	3.5 (0.52)	10	1	1
Q.4.2 The font type eases reading	4	3.6 (0.51)	10	1	1
Q.4.3 Colors are adequate and easy reading	4	3.6 (0.51)	10	1	1
Q.4.4 Visual compositions is attractive and organized	4	3.6 (0.51)	10	1	1
Q.4.5 The size (dimensions) and the number of pages of the support material are appropriate	3	3.4 (0.51)	10	1	1
Q.4.6 Font size in headings and the copy is adequate	3	3.5 (1.15)	10	1	1
Motivation					
Q.5.1 The content is motivating and encourages full reading	3	3 (0.48)	9	0.9	0

Q.5.2 The content awakens interest in readers	3	3.3 (1.71)	10	1	1
Q5.3 The content solves doubts or clears things up for target population	3	2.4	7	0.7	0
Q.5.4 The content is motivating and encourages full reading	3	3.2 (0.42)	10	1	1
Culture					
Q.6.1 The brochure is appropriate to the target audience and the various knowledge-level profiles	3	3.3 (0.48)	10	1	1
S-CVI/AVERAGE				0.97	
S-CVI/UA					0.84
Overall mean (SD)		3.36(0.32)			

2.5 Content validation of the Recipe Book

The S-CVI/Ave score for the recipe on millets for Diabetes was 0.98 and S-CVI/UA score was 0.80 which indicates a high level of agreement between the experts. The overall mean value was 3.38(0.28) with the most frequent mode being 3. All the questions had an I-CVI score of 1 which indicate that the recipe book on millets for Diabetes was suitable for patients with Diabetes, included all the necessary information needed for recipe preparation, and was well-designed. The experts appreciated the format in which the recipes were presented as it is an important factor evaluated by consumers when deciding on whether to use a recipe or not [4].

Table – 3. Content Validity Index for the Recipe book

Questions	Mode	Mean (SD)	EA	I-CVI	UA
Q.1 The cover page of the recipe book is appealing	4	3.7 (0.48)	10	1	1
Q.2 Each specific ingredients list and exact measurement (amount) are mentioned precisely	3	3 (1.15)	9	0.9	0
Q.3 The preparation process is provided in a straightforward step-by-step format that is clear and simple to follow	3	3.3 (0.48)	10	1	1
Q.4 The ingredients in the recipe book are easily accessible in the market to the target population	3	3.1 (1.19)	9	0.9	0
Q.5 The number of serving size is specified	3	3.5 (0.52)	10	1	1
Q.6 The nutritional content for each recipe is specified	3	3.4 (0.51)	10	1	1
Q.7 The recipes included in the book are easy to prepare for an enthusiastic home cook	3	3.3 (0.48)	10	1	1
Q.8 The variety of recipes in the book is adequate	3	3.3 (0.48)	10	1	1
Q.9 The recipes in the book are suitable for the target audience	3	3.5 (0.52)	10	1	1
Q. 10 The recipe book is well-designed	4	3.7 (0.48)	10	1	1
S-CVI/AVERAGE				0.98	
S-CVI/UA					0.8
Overall mean (SD)		3.38(0.28)			

2.6 Content Validity Index of the entire Tool kit

Content validity index scores for the entire Millet tool kit for patients diagnosed with Type 2 Diabetes Mellitus. The questions were arranged according to the items in the millet tool kit, namely (i) Video (Q1–11), (ii) Brochure (Q12–30), and (iii) Recipe book (Q31–40). The experts scored nearly 83% (n=33) of questions as “agree” or “strongly agree” and 17% (n=7) as “neither agree nor disagree”. The mean score for all the questions was 3.39 (0.24), and 3 was the most frequent (mode) rating for the tool kit. The S-CVI/Average and S-CVI/UA scores are 0.98 and 0.83 respectively, indicating a high level of agreement between the experts. Various suggestions and recommendations given by the experts for changes in the images, terms, addition of a few other information, correction of errors, etc. The simplicity of the millet tool kit was one of its main strengths. The millet tool kit was designed to simplify the presentation of complicated subjects in order to improve the knowledge of patients diagnosed with Diabetes.

3. FACE VALIDATION OF THE TOOL KIT

Face validity, is a straightforward form of validity in which you make a superficial, subjective judgment about whether or not your study or test actually measures what it is intended to measure [5]. Patients with Type 2 Diabetes Mellitus gave the tool kit excellent feedback which indicated that the nutrition educational material on millets was relevant with respect to the graphics quality, the texts, language, the motivation to read, respect to the cultural appropriateness, as well as the clarity of understanding the tool kit. Out of 50 patients, n=26 patients validated the tool kit in the English language, n=11 in the Marathi language, and n=13 in the Hindi language. The mean score was 4.3(0.15) and the most frequent rating (mode) is 4. Only question 4 scored less than the mean score of 4. Rest all the questions had a mean score > 4.2, indicating that the patients found the tool kit informative and interesting.

Table – 4 Face validation of the tool kit by patients with Diabetes

Questions	Mode	Mean (SD)	Frequency (n = 50)								% of per Q. agreement
			<3		3		4		5		
			N	%	N	%	N	%	N	%	
1. The tool kit is clear to understand	4	4.3 (0.75)	2	4	3	6	24	48	21	42	90
2. The images & video are easy to see and understand	5	4.7 (0.47)	0	0	0	0	16	32	34	68	100
3. The text is easy to understand	4	4.3 (0.69)	1	2	3	6	23	46	23	46	92
4. All the words are easy to understand	4	3.8 (0.94)	6	12	10	20	22	44	12	24	68
5. You can understand all the language used	4	4.2 (0.57)	0	0	4	8	33	66	13	26	92
6. The layout catches your attention	5	4.6 (0.49)	1	2	0	0	19	38	30	60	98
7. The message of the tool kit is clearly understood by you	4	4.2 (0.65)	1	2	3	6	30	60	16	32	92
8. You understand the importance of millets better after viewing tool kit	4	4.2 (0.84)	0	0	2	4	28	56	20	40	96
9. Do you think viewing the tool kit will help to make a difference in dietary choices	4	4.3 (0.68)	3	6	4	8	28	56	21	42	98
Overall Mean (SD)		4.3 (0.15)									
% of overall agreement											92

3.1 Themes and Sub themes identified as per patients feedback

The data were categorized into four main themes, namely visuals, layout, length, and content. The results of qualitative data are supported by patient's feedback for the sub-theme questions which were asked during the face

validation process. The patients were asked to write feedback on each sub-theme of all visual clarity and appeal of the tool kit understanding to the topics, ability to remember information, cultural appropriateness of the tool kit, flow of information, and the Usefulness of the Millet Tool kit/implementation at clinics.

4. CONCLUSIONS

The tool kit was validated for its content and relevance. The evaluation process included the experts and patients with T2DM. The Scale level-Content Validity Index/Average and Scale level-Content Validity Index/Universal Agreement scores were **0.98 and 0.83** respectively, indicating a high level of agreement between the experts. Both experts and patients agreed that the content, layout, language, and visuals included in educational material about millets and their health benefits are relevant to T2DM patients. The mean score for all the questions about the millet tool kit was **3.39 (0.24), and 3** was the most frequent (mode) rating for the tool kit which indicates all experts agreed that visuals, illustrations, language, length, layouts, etc. of the millet tool kit encourage T2DM patients to better understand the importance of including millets in their daily diet and that the educational material may be applied in routine clinical patient health education practice. The millet toolkit received **92%** overall agreement by the patients for face validity. The content was deemed to be correct, accurate, and appropriate for patients with T2DM, by experts. The findings indicate that the identified goals of the study were successful in the development and validation of the millet tool kit for Diabetes. The tool kit is relevant and may be considered as a new teaching material for the benefits of consuming millet for Diabetes, in order to motivate the patients to make better dietary choices which will help them to cope with the diseases better.

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