Diabetes-Related Nutrition Knowledge Among Nurses in Primary Health Care

Amani Busili (abusili@jazanu.edu.sa)
Jazan University
Eman Alhalal
King Saud University

Research Article

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Abstract

Aim: This study aimed to: (1) to investigate PHC nurses' level of diabetes-related nutrition knowledge; (2) to assess PHC nurses' perception about knowledgeability and role in provision of diabetes nutrition education; (3) to explore the relationship between nurses' diabetes-related nutrition knowledge with nurses' background and organizational support.

Background: Diabetes is a prevalent global health issue that can be diagnosed and managed in primary health care (PHC). Nurses are the largest number of health care providers who work with diabetic patients to manage its complications. One of significant diabetes management components is nutrition.

Method: A descriptive cross-sectional, correlational study with 163 PHC nurses in Jazan, Saudi Arabia was conducted. Self-administered survey was used with each nurse two times for test-retest reliability. Data was analyzed using descriptive statistics and correlational test.

Results: Nurses had limited diabetes-related nutrition knowledge with a mean score of 11.65 out of 20, yet the majority perceived themselves competent and responsible in provision nutrition education to diabetic patients. The availability of time to attend courses and read about diabetes nutrition, and being informed about time and venue programmers of diabetes diet were positively correlated with nurses' diabetes-related nutrition knowledge.

Conclusion: The study highlighted the need to improve the education of PHC nurses in the field of diabetes nutrition, in particular the majority of PHC nurses regarded themselves as responsible for the nutrition education of diabetic patients. As well, organizational factors, such as availability of time and support, should be considered to enhance nurses' knowledge.

Relevance To Clinical Practice

This study has highlight that primary health care nurses do not have adequate knowledge related diabetes nutrition even they perceived themselves responsible about it. In addition, the nurses need organization support to improve their knowledge related diabetes nutrition as most primary health care nurses always or frequently give diabetic patients nutritional advice.

What does this paper contribute to the wider global clinical community?

- Primary health care nurses have inadequate diabetes-related nutrition knowledge
- The majority of PHC nurses perceived themselves responsible in provision diabetes nutrition education. Therefore, may they be willing to engage in diabetes nutrition education program.
- Nurses' diabetes-related nutrition knowledge is positively associated with availability of time to read about diabetes nutrition as well as being informed about time and venue programmers of diabetes diet.

- A majority of the primary health care nurses reported that they “always” counseled diabetic patients related nutrition. Therefore, nursing educators and PHCC need to consider a better approach during diabetes nutrition education to facilitate nurses' improvement.
- Primary health care organizations should provide nurses with the time and opportunities to acquire and update diabetes-related nutrition knowledge.

Introduction

Over the past few decades, several studies have focused on the impact of diet on diabetes incidence and prevalence [1, 2]. The literature underscores not only the widespread effects of nutrition on diabetes progression and complications but also the role that nurses play in the empowerment of diabetic patients [4]. Helping patients with chronic health problems acquire self-management skills is one of the major responsibilities of professional nurses. This is often achieved by educating and counseling them [4]. It is nurses who are primarily responsible for providing diabetic patients with essential information to enhance their quality of life [5]. Past studies have shown that patient education has a positive effect on patient outcomes [6]. Therefore, nurses should possess adequate knowledge to provide patients with the required information. Patients with diabetes have higher hospitalization rates and tend to be hospitalized for longer durations than their nondiabetic counterparts [7]. Glycemic control has been found to be a cost-effective means of reducing the risk of diabetes complications, and it can be achieved through effective management [8]. Nutritional management of diabetes, such as consuming a calorie-restricted and/or low-glycemic-index diet has a great capacity to improve insulin sensitivity [9] reduce the number of hypoglycemic and hyperglycemic events [9] and control glycated hemoglobin (HbA1c) levels [10]. Affordable and easily implementable nutritional alternatives that enhance the prevention and management of diabetes are highly valuable [11]. Yet, selecting healthy dietary choices and judging whether a food item is suitable for consumption based on the dietary requirements is considered challenging for diabetic patients [12]. This lack of an understanding has been found to be a major barrier to diabetes self-management regimens [12]. Primary Health Care (PHC) is the first contact of individuals with health care system to receive comprehensive services, such as prevention, diagnosis and treatment, health promotion, referral [13]. Nurses in PHC, worldwide, are seen as a key in the successful delivery of primary care services for chronic disease patients [14]. Yet, the majority of previous studies that look to nurses’ diabetes-related nutrition knowledge focused on nurses in acute care setting, with very limited studies look to PHC nurses [15, 16]. Moreover, previous studies show the most people benefit from primary health service are patient with chronic disease such as diabetes [17]. To address these gaps in the literature, this study aimed to (a) investigate PHC nurses' diabetes-related nutrition knowledge, (b) assess PHC nurses’ perception about knowledgeability and role in provision of diabetes nutrition education, and (c) examine the relationship between PHC nurses’ diabetes-related nutrition knowledge with background characteristics and organizational support.

Background

Diabetes is a major cause of premature mortality worldwide. Approximately half of all patients with T2DM die prematurely as a result of diabetes complications such as cardiovascular diseases and renal failure. The complications that are associated with T2DM increase social and financial burdens [18]. One patient dies every 10 seconds, and one patient is amputated every 30 seconds [18]. A majority of past findings have underscored the importance of diet quality and quantity to diabetes management. Limiting one's consumption of carbohydrates reduces his or her risk for T2DM [19]. A systematic review found that T2DM is strongly associated with high-carbohydrate, -fat, and -sugar intake. For example, soft drinks increase blood glucose levels and body mass index to dangerous levels [1]. In contrast, diets that are rich in fruits and vegetables, which are a good source of soluble/fermentable fiber, reduce one's risk of developing diabetes [9]. Diabetic patients who possess limited knowledge about recommended dietary practices believe that receiving nutrition education from a knowledgeable health educator (i.e. nurses) will enhance their adherence [20]. In healthcare settings, nurses are leaders in transforming the health care from treatment-focused to prevention-oriented as a result of their holistic perspective [21]. They have central role in the interdisciplinary teams that provide diabetes education and self-management support as well as protect health [22] Providing patients with accurate and consistent instructions can reduce diabetes complications, their duration of hospitalization, rates of readmission [23]. However, the beliefs, attitudes, and knowledge of healthcare providers (including nurses) influence diabetic patients' perceptions of diabetes self-care management [24]. Nurses' knowledgeability is a significant factor that influences their provision of proper care to diabetic patients [25]. In primary care, nurses perceived that uncertainty about clinical role between nurses and physicians and lack of appreciation of diet role in glycemic control are barriers for managing T2DM [15]. A major challenge that diabetic patients face is poor dietary compliance and an inadequate understanding of dietary components and nutritional strategies [23]. Among diabetic patients in Saudi Arabia, dietary adherence tends to be poorer than adherence to other diabetes management strategies [26]. Their level of nutrition knowledge has also been found to be poorer than their level of knowledge about other aspects of diabetes self-management [27]. Diabetic patients who possess adequate nutrition knowledge make healthy food choices and are motivated to engage in appropriate self-care [27]. PHC settings play a pivotal role in the provision of nutrition-related health education [28]. This responsibility is often assigned to dietitians and/or nutritionists [29], but not all PHC centers in Saudi Arabia have dietitians [30]. Nurses who work in PHC institutions are first-line healthcare providers, and they need to provide evidence-based nutrition recommendations and health education. Thus, it is important to assess nurses' knowledge about diabetes nutrition to develop and implement evidence-based interventions that aim to support nurses who work in PHC institutions.

Methods

The study was adherent to the strengthening of the reporting of observational studies in epidemiology (STROBE) statement "see Supplementary File 1"

Aim

This study aimed to: (1) to investigate PHC nurses' level of diabetes-related nutrition knowledge; (2) to assess PHC nurses' perception about knowledgeability and role in provision of diabetes nutrition education; (3) to explore the relationship between nurses' diabetes-related nutrition knowledge with nurses' background and organizational support.

Design

A cross-sectional descriptive correlation research design was undertaken.

Study Setting

This study was conducted in the province of Jazan, which is located in the southern region of Saudi Arabia. Jazan was selected because approximately 74% of diabetic patients in Jazan have been found to have poor glycemic control and a lack of understanding about diabetes management [31], with increasing in diabetes complications [17]. This province has 173 PHC centers, which provide free curative, preventive, health-promoting, and rehabilitative services. For the purposes of this study, 25 PHC centers, which are located in different neighborhood and have the highest numbers of nurses, were selected.

Sample

A convenience sample of 163 nurses who had been working in PHC centers was recruited. The institutional ethics committee of King Saud University and MOH approved this study. Nurses are eligible if they had been working in PHC centers for more than six months and provide direct patient care. A total number of 200 questionnaires were distributed, and 163 were returned resulting in 81.5% completion rate. To determine the required sample size, Sample Size Calculator by Raosoft was used and showed that the required sample size was 163 participants. Rates of item-level missing data were < 1% for all variables. As well, to determine the required sample size for two tails correlation test, G-Power was used with an alpha of 0.05, a power of 0.80, a medium effect size (ρ = .3). The minimum sample size was 82.

Data Collection

In May 2019, the researcher met the head nurses of each PHC center and informed them about the purpose of the study and inclusion criteria and sought their permission to collect data. The nurses were given a copy of the written instructions and objectives of the study. Written informed consent was taken from all the participants. Questionnaires were given to nurses who agreed to take part of the study. After one week, the researcher collected the questionnaires from the nurses. To examine the test-retest reliability of the scale, the assessment was administered a second time (i.e., after one week); 135 participants agreed to complete the assessment a second time, but 28 of them declined the invitation.

Measurement

Data were collected using self-administered questionnaire. It included three part, first part includes the Nutritional Management of Diabetes Knowledge Test [32, 33]. This 20-item test assesses nurses'

knowledge about diabetes. The questionnaire has five items about diabetes in general, one item about treating a hypoglycemic patient, and 14 items about basic meal planning for diabetic patients. It includes 12 multiple-choice items and eight questions with right and wrong answers. The score can range from 0 to 20, where 20 means the highest level of knowledge. Originally, the questionnaire was developed in accordance with the recommendations of the WHO and Nutrition Guidelines of the ADA with evidence of validity. The questionnaire was tested, according researcher developed it [32], the survey reviewed by a focus group expert, members of the Drexel nursing faculty and two Certified Diabetes Educators/Registered Dietitians for content validity and clarity. Appropriate changes were made based on the reviewers' feedback. Several questions were eliminated from the survey because they were interpreted differently by reviewers indicating unreliability. The survey was pilot tested with graduate nutrition students who had received similar diabetes education as nursing students. Nutrition students reported that it took approximately 10-15 minutes to complete the survey [32]. This scale has been used in past published studies that have aimed to assess nurses' knowledge about diabetes and diabetes nutrition [32, 33, 34].

The second part has nine survey questions to assess nurses' perceived knowledgeability and role about provision of diabetes nutrition education [32]. In the third part, seven survey questions were included to assess the extent to which nurses' organizations had supported them in their efforts to enhance their knowledge about diabetes nutrition [35]. As well, background questions, such as age, gender, and years of experience were asked.

An integrated method of adapting and translating the measure was used to develop a linguistically and culturally equivalent translation of the instrument [36]. The conceptual equivalence of the adapted scale was assessed by rating the comprehensibility and cultural relevance of each item on a 10-point scale that ranged from *not at all* to *very much* [36]. This assessment was undertaken by five bilingual healthcare professionals who were knowledgeable about diabetes and the dietary habits of Saudi individuals. They were required to offer recommendations to modify items. The most items were found to be clear and comprehensible (i.e., comprehensibility scores > 5). Some items were modified to reflect the dietary habits of Saudi individuals. The content validity index was computed. Based on the reviewers' recommendations, a few items were modified to improve their clarity and cultural relevance. Then, two translators translated the assessment into Arabic. The final pool of items was pilot tested to examine whether the items were clear and easy to understand and estimate the time that would be required to complete it. A convenience sample of 27 nurses was recruited from PHC centers. Items that were found to be unclear were modified and refined. As a part of the main study, the test-retest reliability of the scale was examined to ascertain the level of consistency between repeated measurements. The results of reliability analysis revealed that the scale has excellent test-retest reliability. The intraclass correlation (ICC) coefficients ranged from 0.955 to 0.977 (average = 0.968).

Data Analysis

The Statistical Package for Social Sciences (SPSS) version 25 was used to analyze the data. Descriptive statistics (i.e., frequencies, percentages, means, and standard deviations) were computed to describe the sample and the questionnaire items. Both Pearson's correlation analysis and Spearman's rank-order correlation analysis were conducted to examine the relationships between nurses' diabetes-related nutrition knowledge and background characteristics (i.e., age, years of experience, number of nutrition-related courses completed, and counseling patients with diabetes) as well as between nurses' diabetes-related nutrition knowledge and organizational support (e.g., the availability of time to attend courses on diabetes and read about diabetes at work, being informed about time and venue programmers of diabetes diet)

Ethical Consideration

The institutional ethics committee of King Saud University and MOH approved this study. The nurses were informed that their participation in the study was voluntary and this study was not a "test" or an evaluation. The informed consent form contained the aims of the study. It also included sections that outlined their right to decline or withdraw their participation, the anonymity and confidentiality of their data, and the risks and benefits of participation. The researcher's contact information was included in the informed consent form so that the participants could contact her regarding any queries. All participant data were anonymized and kept confidential as all participants were assigned identification numbers (IDs).

Results

Participants' Background Characteristics

The background characteristics of the participants are presented in Table 1. Their mean age was 32.49 years (SD = 5.460, range = 23–50). The mean duration for which they had been working was 9.39 years (SD = 6.222, range = 1–34), and a majority (90.8%) of them were female nurses. With regard to their educational level, 79.8% of them held a diploma in nursing, 18.4% of them had a baccalaureate (Bachelor of Science in Nursing) degree, and 1.8% of them had a master's degree. With regard to prior participation in courses related to nutrition, they had attended an average of 1.11 courses (SD = 0.49, range = 1–5) over the past five years. However, 77.9% of them had not attended any course on nutrition during the past five years. In terms of the frequency with which nurses counseled diabetic patients, more than half of nurses (69.3%) chose the option "always or frequently."

Nurses' Diabetes-related Nutrition Knowledge

The mean score of knowledge was 11.65 (SD = 2.60, range = 1–18) out of 20. The total percentage of correct result ranged from 5% to 90% (median = 60%, Interquartile Range = 50–65). Only 49.1% of the nurses believed that patients with diabetes should limited trans fats from their diet, and 54% of them did not know that patients with diabetes should restrict their intake of animal fats. Approximately 62% of the nurses did not know that the carbohydrate contents of foods can be ascertained by referring to food

labels. In addition, 49.1% of them did not know that nonfat or low-fat milk has fewer calories than whole milk. Moreover, 79.1% did not know that daily cholesterol intake should be limited to 300 mg. With regard to the items that assessed basic knowledge about diabetes, more than half of the nurses (46.4%) could not correctly identify the fasting plasma glucose levels that are indicative risk of diabetes. As well, 31.9% of the nurses did not provide correct responses to the items that pertained to the treatment of the symptoms of hypoglycemia.

Perceived Knowledgeability and Role in Provision of Diabetes Nutrition Education

As show in Table 2, The majority (71.2%) of PHC nurses perceived their competency to provide nutrition advice to diabetic patients as “excellent” or “good”, yet 79.8% of them reported that they need to update their knowledge about diabetes nutrition. Fewer than half of the nurses (42.3%) were satisfied with the nutritional education that they had received. Most of them believed that the nutritional management of diabetes falls within the scope of their practice. Nurses’ responsibilities include the following: 1) providing basic nutrition education, 2) reinforcing nutrition education, 3) providing comprehensive nutrition education, and 4) teach patients the principles of the daily nutritional management of diabetes and assist them with meal planning.

Organizational Support

With respect to diabetes management policies, 76.1% of the nurses reported that their PHC centers had such policies, but only 31.9% of the nurses reported that they “always or frequently” referred to these policies when providing care to a patient with diabetes. Most nurses (84%) did not have the time to attend continuing education programs on diabetes, and only 6.1% of them “always” had the time to read about diabetes nutrition at work. Only 9.8% of them had access to the resources (i.e., printed information or electronic resources) that were necessary to acquire or update their knowledge about diabetes nutrition. Most of them (73.6%) reported that their head nurses rarely helped them improve their knowledge about diabetes nutrition. Nineteen percent of the participants had “rarely” been informed about existing diabetes nutrition programs.

Variables Associated with Nurses’ Diabetes-related Nutrition Knowledge

With regard to nurses’ background characteristics, their level of knowledge was unrelated to their age, years of clinical experience, and the number of nutrition-related courses completed because $P > 0.05$. Yet, results of the Spearman correlation indicated that there was a significant positive correlation among nurses’ diabetes-related nutrition knowledge with previous experience in counseling diabetic patients ($r_s(161) = .332$, $P = .00$). Nurses’ organizational background was positively associated with diabetes-related nutrition knowledge. Among organizational factors, nurses’ level of knowledge was positively correlated with the availability of time to attend courses on diabetes ($r_s(161) = .197$, $P = .012$) and read about diabetes nutrition at work ($r_s(161) = .255$, $P = .001$), and being informed about time and venue programmers of diabetes diet ($r_s(161) = .186$, $P = .018$), but there is no significant correlation between knowledge level related diabetes nutrition and other organizational support variables (referring to the

diabetes management guidelines/policy in providing care to diabetic patients, having diabetes management policy guidelines on the center, accessing needed resources to update diabetes-related nutrition knowledge, and support from head nurses in developing diabetes knowledge), as $P > 0.05$.

Discussion

This study yielded the following important findings: 1) nurses' diabetes-related nutrition knowledge was poor; 2) most nurses had not attended nutrition-related courses during the past five years; 3) a majority of the nurses believed that they have a role and competency in the provision of diabetes nutrition education to patients; and 4) there was a positive relationship between the nurses' diabetes-related nutrition knowledge and organizational factors. Healthcare professionals who work in PHC centers are perceived as those who primarily offer care to patients with chronic diseases [37]. However, 75.5% of PHC nurses were found to possess below-average levels of knowledge. The finding is consistent with previous studies which found that the mean of nurses' diabetes-related nutrition knowledge to be 12.13 out of 20 [33] to 49.44 out of 100 [38]. In contradistinction to the ADA and WHO guidelines for diabetes management [39], only 50.9% of the nurses believed that diabetic patients should limited trans fats from their meals. Simultaneously high cholesterol and low-density lipoprotein (LDL) levels in diabetic patients increase their risk of developing heart disease [40], yet more than half of nurses did not know that diabetic patients should restrict their intake of animal fats and daily intake of cholesterol. Their lack of knowledge about the need to restrict one's intake of fats may pose challenges to dietary adherence among patients, increase complication rates, length of hospital stay, readmission rates, mortality, and cost of care [41]. Moreover, very few nurses were able to correctly indicate the average amount of calories that should ideally be derived from carbohydrates and proteins daily. This result is consistent with the findings that have been reported by [42]. It means that learning daily calories requirement for diabetic patients based on the evidence needed to address in nursing curriculum with focuses in patient preference and update guideline [43]. Hypoglycemia is a serious and common issue as the prevalence of hypoglycemia is found to be 65.2% among patient with diabetes [44]. In this current study, 68.1% of the nurses were able to correctly identify the appropriate initial treatment for hypoglycemia. The corresponding figures were 62% in past studies [32, 33]. It means the current finding is consistent with previous studies in different part of the world. Yet, one-third of the nurses in the current study could not identify the appropriate treatment for hypoglycemia; their lack of knowledge can lead to serious consequences for patients, such as loss of consciousness, seizures, and mortality [45]. Nurses need to educate patients and "significant other" in dealing with hypoglycemia [45].

Although nurses in the current study have limited diabetes-related nutrition knowledge, more than half of them (69.3%) had provided dietary education to diabetic patients. This is more than the result of PHC physicians who counsel their patients on diet (66%) [46]. This finding raises concerns about the quality of the advice that nurses provide to diabetic patients. Nurses' low levels of knowledge can cause them to provide incorrect and inappropriate nutrition advice to patients. Diabetic patients may also feel upset and confused when they learn that the health information that they have been provided with is inaccurate. The ADA has observed that education in the area of nutrition is an important element of the curriculums

that should be used to train all healthcare professionals [47]. In the current study, a majority of the nurses reported that their level of confidence in their ability to provide nutrition education was “excellent” or “good”. This result is consistent with past findings, which suggest that nurses overestimate their knowledge about nutrition and diabetes (i.e., perceived knowledgeability > actual knowledgeability) [32, 33]. Fewer than half (42.3 %) of the nurses were satisfied with the nutrition education they had received as part of their nursing program. Compared to another studies, in the United States, more than 70 % of nurses and nursing students surveyed were satisfied with the nutritional education they received during their nursing program [32] and (77.5%) were satisfied with the nutritional education they received during school education in another study [33]. This study indicates a lower level of satisfaction among nurses than previous study (42.3%). This suggests that at least two-thirds of them will respond favorably to changes in the nutrition education that is provided as a part of nursing programs.

There have been inconsistencies related to the effect of background characteristics on nurses’ knowledgeability about nutrition. In this study, there was no significant relationship between nurses’ educational level, work experience, and age and their levels of diabetes-related nutrition knowledge. This indicates that knowledge about the nutritional management of diabetes may not be acquired across the years of one’s work experience. The present findings are consistent with the results that have been reported by previous studies. They found that there was no significant correlation between years of experience and nurses’ knowledge about nutrition [34, 42]. The number of courses that nurses had attended did not have a significant association with their level of knowledge. The insignificant relationship might be rationalized by the limited number of attended courses among these nurses because on average they attended 1.1 nutrition-related courses and only 22.1% of them have ever attended. Updating nutrition knowledge by participating in continuing education programs has been proven to be important [34] so redesigning the existing education programs might be required. In this study, organizational factors (i.e., the availability of time to attend continuing education programs, read about diabetes nutrition at work, and being informed about time and venue programmers of diabetes diet) had a significant positive relation with nurses’ diabetes-related nutrition knowledge. It means receiving organizational support can increase PHC nurses’ knowledge. The availability of support and guidance assistance for nurses can increase their ability in acquiring and updating their knowledge. The majority of nurses believed that the organization played an important role in improving nurses’ knowledge of diabetes care by organizing workshops and seminars. Managers’ support for nurses to participate in continuing diabetes education and training was perceived as a priority [35]. Past studies have shown that educational programs are effective in helping nurses bridge gaps between their knowledge and skills [22]. In this regard, the present findings can be used to develop evidence-based educational programs for nurses to improve their knowledge about diabetes. These educational programs can be offered as in-service training (continuing nursing education). Further, clinical guidelines that focus on delivering diabetes nutrition education can be developed and implemented in PHC centers. In addition, based on the study findings, nursing curriculums can be redesigned to ensure that future nurses become adequately competent in the provision of diabetes nutrition education. Moreover, by

understanding the role that organizational support plays in nurses' diabetes-related nutrition knowledge, pertinent factors can be addressed to enhance their knowledge.

Limitations

The use of convenience sampling and recruiting participants from PHC centers in Jazan limit the generalizability of this study. However, 25 PHC centers throughout the providence were selected to decrease the bias of sampling. In addition, self-report measures are vulnerable to the social desirability bias. Moreover, Nurses' perception and organization support were measured using survey questions which might be not be suffice and precise in capturing the variables. The classic measurement theory emphasized on the need for multi-item measurement scales to have responses that are more consistent with less random error. However, single survey question has used to gain valuable information in a simple manner [48].

Conclusion

This study highlighted the lack of diabetes-related nutrition knowledge among PHC nurses and how it is associated with the availability of time to attend courses and read as well as being informed about time and venue programmers of diabetes diet. PHC nurses are at the front line in dealing with diabetic patients but they need to be well equipped to take their role. Thus, nutrition-related courses ought to be offered as a part of undergraduate nursing programs or in-service training to equip nurses with adequate knowledge. The selected teaching methods should include interactive strategies to enhance student learning. This will help nurses develop their skills, acquire knowledge, and transform theoretical concepts into practical advice. Studies should also examine the effects of such programs on nurses' diabetes-related nutrition knowledge and patient outcomes. Our study suggests that organizational factors influence nurses' knowledge. Specifying time for these nurses to attend courses and read up-to-date materials related to diabetes nutrition is an important strategy. Managerial support in acquiring and updating knowledge is a key imperative in making PHC nurses prepared. Education programmes should focus on improving nutrition management in patients with diabetes for primary health care nurses with focused on weakest point among nurses such as read food label as well as treatment of hypoglycemia symptoms.

Abbreviations

PHC	**- Primary Health Care**
PHCC	- Primary Health Care Center
HbA1c	- Hemoglobin A1c
ADA	- Americana Diabetes Association
WHO	- World Health Organization
T2DM	- Type 2 Diabetes Mellitus
ICC	- Intraclass correlation coefficient
SPSS	- Statistical Package for Social Sciences

Declarations

Ethics approval and consent to participate

The institutional ethics committee of King Saud University and Saudi Ministry of Heath approved this study with reference NO. 1911. Before distributing the questionnaire, the objectives and methodology of the study were explained to the participants. Written informed consents were obtained from the nurses. In this way, the participants were ascertained that participation in the study was voluntary.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Consent for publication

Not applicable

Competing interests

The author(s) declare that they have no conflict of interests

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Authors' contributions

Both AB and EA participated in the conception, designed the study, and drafted the manuscript. AB chose the study measures, recruited the participants as well as analyzed the data. EA provided guidance in the

analysis and interpretation of results. Both authors critically reviewed the manuscript and finalized it prior to submission.

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Relevance to Clinical Practice

The study suggests that primary health care nurses need to improve their knowledge of diabetes nutrition. Understanding the PHC nurses perceived related their role in providing nutrition education to diabetic patients would enable health care organizations to concentrate on improve nursing in diabetic nutrition. Additionally, PHC nurses need time and support for professional development to empower them and increase their confidence in provide nutrition education for diabetic patients, thereby increasing the quality of care for diabetic patients.

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Table

Table 1 *Background characteristics of the participants (N = 163)*

Characteristic	**Mean**	**SD**	**Range**
Age	32.49	5.46	23–50
Years of experience	9.39	6.22	1–34
Number of nutrition-related courses attended	1.11	0.49	0–5
Characteristic	**Frequency (n)**		**Percentage (%)**
Gender			
Female	148		90.8
Male	15		9.2
Educational level			
Diploma	130		79.8
Bachelor	30		18.4
Master	3		1.8

Table 2 *Nurses' Perceived Knowledgeability and Role in Diabetes Nutrition Education (N = 163)*

Items	Frequency	Percentage
Do you believe that you need to update your knowledge about diabetes nutrition?		
Yes	130	79.8
Level of satisfaction regarding nutrition education		
Very satisfied/satisfied	69	42.3
Perceived competence in one's ability to provide nutrition advice		
Excellent/good		
Fair/poor	116	71.2
	47	28.8
Perceptions regarding Nurses' Responsibilities		
Providing basic nutrition education	145	89
Providing comprehensive nutrition education	119	73
Reinforcing nutrition education	125	76.7
Assisting with meal planning	115	70.6
Teaching daily management	115	70.6
Not responsible for providing nutrition education	40	24.5

Table 3 *Variables Associated with Nurses' Diabetes-related Nutrition Knowledge*

Variables	Diabetes-related nutrition knowledge
Age	.071
Years of clinical experience	.073
Number of nutrition-related courses completed	.065
counseling diabetic patients	.332*
Availability of time to attend courses on diabetes	.197*
Referring to the diabetes management guidelines/policy in providing care to diabetic patients	.076
Read about diabetes nutrition at work	.255*
Having diabetes management policy guidelines on the center	.071
Informed about time and venue programmers of diabetes nutrition	.186*
Support from head nurses in developing diabetes knowledge	.092

Supplementary Files

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