Assessment of nutritional needs for diabetic adults at the local level in Riyad city in The Kingdom of Saudi Arabia

Nasreldin Marhoum Ahmed[1], Moneer Ali Abdallah[2], Ahmed Bolad[2]

[1]College of Medicine-Academic Department -Al Faisal University-Riyadh – KSA

[2]Al Neelain University-Faculty of Medicine

Corresponding author: Nasreldin Marhoum Ahmed

Author Details
Dr, Nasredldin Marhoum Ahmed: had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis, results, and discussion.
Dr. Moneer Ali Abdulla Ali: Study concept and design, administrative, technical, and material support. Study supervision
Prof. Ahmed Bolad: Critical revision of the manuscript for important intellectual content. Study Cosupervision

Abstract

Introduction: diet is reported to be the biggest problem experienced by patients with diabetes. Adherence to recommended diet or eating patterns is generally low. In this study, we are aiming to determine the locally prepared nutritional programs that will satisfy diabetic nutritional needs in Saudi Arabia. **Method:** the study was carried out at the Diabetic Center and two Primary Health Care Centers in Riyadh. The target population was 202 diabetic Saudi adults, aged 35 years or more. 125 patients from the Diabetic Center and 77 patients from PHC. The used interview questionnaire included information about the patient's nutrition knowledge, practices, attitudes, and beliefs. **Results:** The sample of 202 diabetic adults, was composed of 103 (51%) males and 99 (49%) females with a mean age of 46.08 ± 7.74 years. The levels of dietary knowledge and medical awareness vary among the participants, 17.3% of patients had a good level, 69.3% were fair and 13.4% had poor dietary knowledge and only 0.5% attained a good level of medical awareness. The most common sources cited for obtaining knowledge were physicians (45.2%) and dieticians come next (38.5%). Participants had good knowledge scores from physicians and dieticians 21.3 & 21.2% respectively. While media had the less

percentage as a source of obtaining knowledge (14.1%) however, it is the highest percentage in gaining good knowledge (42.1%). The dietary practices of the diabetic patients showed a varied response. The higher mean practice was for the use of artificial sweeteners, the number of regular daily meals, and the use of herbals. Baseline assessments of dietary practices in the present study showed that only less than one-quarter of the patients got good dietary practices meanwhile. They had less adherence to the diet which is not in favor of well diabetic control. **Conclusion:** dietary recommendations should be highlighted in any structured nutrition education program. The availability of well structured and simple educational nutritional program for diabetics is a necessity for the diverse understanding among elderly diabetics. It may be more feasible and valid since diabetics are part of the decision to decide their needs.

Introduction

Prevention programs to reduce the risk of chronic diseases such as diabetes and hypertension appear to be a continuous trend in both developed and developing countries. However, many researchers have started to focus their interest and attention on older adults. This change in outlook has come about due to demographic changes; people are now living longer, and consequently, the older population is increasing rapidly and medical expenditure is rising with the onset of several major chronic diseases (Health, United States, 1999; Federal Interagency Forum on Aging, 2000). Many factors appear to have an evident impact on the health status of the elderly. Dietary practice and nutrient needs are part of these factors that have a clear effect on elderly health status. In addition, knowledge of the nutrition needs has changed and it has become quite clear that some of the nutrient needs particularly for older adults are different from those of younger adults (Sahyoun, 2002). Here comes; a question that arises frequently, whether nutrition interventions made at a later age can improve health status and quality of life and reduce health care expenditure. Particularly, the impact of nutrition interventions on chronic diseases such as diabetes mellitus among the elderly.

Successful diabetes care requires a systematic approach supporting patients' behavior change efforts, including healthy lifestyle changes such as physical activity, healthy eating, and weight management (ADA, 2014 & Duncan et al, 2009).

Historically, nutrition recommendations for diabetes and related complications were based on scientific knowledge, clinical experience, and expert consensus. It was often difficult to distinguish the level of

evidence used to construct the recommendations. However, many factors must be taken into account such as individual circumstances, preferences, and cultural preferences, and the person with diabetes should be involved in the decision-making process (Franz, etc., 2002).

One of the goals of medical nutrition therapy that apply to all persons with diabetes according to the American Diabetes Association (ADA, 2008 & 2014) is to improve health through healthy food choices and physical activity and address individual nutritional needs taking into consideration personal and cultural preferences and lifestyle.

Nutritional education is a crucial part of the treatment plan for diabetes mellitus. Nutrition therapy is viewed as a cornerstone of diabetes care and often is the primary form of therapy for patients with type 2 diabetes mellitus (Susan et al, 1997). The goal of nutrition education is to facilitate positive behavior changes, not simply to transfer knowledge, particularly when related to eating habits. This can occur when support and guidance are available consistently and when realistic goals are set (Wing et al, 1987).

A healthy food pattern, physical activity, and medications are the main components of diabetes management. Although for many diabetic persons, the most challenging part of the management plan is to determine what to eat. The ADA recognized the integral role of nutrition therapy in overall diabetes management which includes the development of an individualized eating plan (ADA, 2014). One of the Goals of Medical Nutritional Therapy (MNT) that apply to individuals with diabetes is to maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence (ADA, 2008).

Several theories of behavior modification were used to assess the nutritional needs and to design interventions, particularly in the more recent studies. These theories were applied in a variety of ways and appeared most successful when participants were expected to assess their readiness for change and set their own achievable goals, (Hochbaum, 1958; Bernstein et al, 2002; Miller et al, 2002). This allowed participants to exercise control and incorporate change into their lifestyles. There was also a greater likelihood of achieving a behavior change when active interaction existed between program participants and health professionals (Taylor-Davis et al, 2000). The **Health Belief Model** (HBM) is one of the important behavior change theories, (Hochbaum, 1958) it involves using concepts such as a person's perception of his/her chance of developing a condition, and of how serious the condition and its consequences would be, as motivating factors for behavior changes. The components of the model would be quite applicable to older adults because of the heightened possibility of ill health.

The impact of nutrition education programs on the control of diabetes mellitus among adults requires more investigations to be done particularly after the technological revolution and the global intention toward the efficient control of non-communicable diseases.

Here in this study, we are aiming to determine the locally prepared nutritional programs that satisfy diabetic nutritional needs.

METHOD

Setting and participants

Participants were 202 Saudi adults with type 2 diabetes followed up in a diabetic center and two primary health care centers in Riyadh city. A questionnaire was developed through a review of the literature and reviewed by two experts in nutrition and behavioral sciences with the principal investigator. A pilot study was conducted on 20 patients to test the clarity and validity of the questions. Patients involved in the pilot study were not included in the actual study. Some questions were then modified or omitted. The questionnaire duration according to the pilot study ranged between 15-20 minutes.

The questionnaire included six parts to collect the following data: Socio-demographic data, Medical, diet, Source of information about dietary management, nutritional knowledge, dietary practice, and diabetic patients' Attitudes, perception, and nutritional beliefs.

Data collection

Patients were referred by physicians in the diabetic center to a dietician after finishing the routine clinical visit or referred to the nutrition clinic by PHC physicians. The questionnaire was filled out by the interviewer since some of the patients were illiterate.

Data analysis

Data collection was followed by pre-coded data analysis; tabulated and presented by numbers and percentage, mean, and standard deviation. Statistical analyses were performed using SPSS packages.

Results

Socio-demographic characteristics

Participants were 202 diabetic adults, 103 (51%) males, and 99 (49%) females, their ages ranged from 41-50 years (45.1%) with a mean age of 46.08 ± 7.74 years. 38% were governmental employees, 47.5% were non-employees (housewives and retired patients), about 8% were business workers, 4% were military personnel and only 3% were laborers. 28% of the participants had no formal education, 15.4% were primary school graduates, about 15% were intermediate, and 17% were secondary school graduates. Only 18.8% completed their university education and about 6% were postgraduates.

The duration of diabetes since it was first diagnosed was 0-10 years, with a mean duration of 4.15 ± 3.11 years. Newly diagnosed diabetics (less than one year) were only 17.8%. Less than half of the participants (47.5%) had diabetes for 1-5 years, while 34.7% had diabetes for 6-10 years. Most of them (74.8%) used oral hypoglycemic agents, 5.4% were using insulin injections, 1.0% used both, and 18.8% were managed by diet without any kind of drug therapy. However, about 44% of the total sample suffered from diabetic complications. One-quarter of the sample (25%) suffered from hyperlipidemia, 17.32% from obesity, 9.41% from retinopathy, 2% from neuropathy, 1.48% from nephropathy, and 0.5% of the sample had cardiovascular problems.

Dietary knowledge and medical awareness

Findings showed that the levels of dietary knowledge and medical awareness among the participants vary with only 17.3% of participants having a good level of dietary knowledge, while 69.3% and 13.4% had fair poor dietary knowledge respectively. Only 0.5% attained a good level of medical awareness. The results showed that 80% of the patient gave a correct and satisfactory answer about choosing the right snacks recommended for diabetics. More than half of the patients (58.9%) answered correctly about diseases resulting from high cholesterol, foods that help in controlling the blood sugar (56.9%), food rich in fat (55.4%), number of snacks recommended (54.5%) and food which raises blood sugar (52%). A low percentage (1.5%) of participants did not know the types of snacks required for diabetic patients. About 11% of the patients were choosing foods that are high in cholesterol and about 12% chose foods that can increase their blood sugar level.

Still, a considerable number of patients gave wrong answers for items such as the number of daily meals that should be eaten by a diabetic (53.0%), the number of snacks (39.1%), and their role (43.6%) food rich in protein (43.1%), food helping in controlling blood sugar (35.1%) or suitable for hypoglycemia (32.2%). 95% did not know about the most convenient time to inject insulin and 46% did not know the

purpose of using oral hypoglycemic agents, whereas 36.6% did not know the symptoms of hypoglycemia. (Table1)

Table 1. Dietary Knowledge and medical awareness of diabetic patients

Question related to dietary knowledge					N=202	
	A wrong answer or don't know		Correct & incomplete answer		A correct and satisfactory answer	
	N	%	N	%	N	%
Which food raises the blood sugar level?	24	11.9	73	36.1	105	52.0
Which food is rich in fat?	43	21.3	47	23.3	112	55.4
Which food is protein?	87	43.1	26	12.9	89	44.1
Which foods are high in cholesterol?	23	11.4	96	47.5	83	41.1
Which diseases are caused due to high blood cholesterol levels?	40	19.8	43	21.3	119	58.9
Which food helps in controlling blood sugar?	71	35.1	16	7.9	115	56.9
Which foods are high in fiber?	44	21.8	107	53.0	51	25.2
How many meals are recommended for diabetics per day?	107	53.0	0	0	95	47.0
How many times a diabetic are recommended to take a snack	79	39.1	13	6.4	110	54.5
What is the role of snacks in a diabetic diet?	88	43.6	5	2.5	109	54.0
What types of snacks are recommended?	3	1.5	37	18.3	162	80.2
Drinks permitted with an unlimited amount	140	69.3	28	13.9	34	16.8
Best (suitable) timing to drink juices	147	72.8	3	1.5	52	25.7
When do diabetic patients feel hypoglycemia which food should be best?	65	32.2	46	22.8	91	45.0
Question related to medical knowledge	**N**	**%**	**N**	**%**	**N**	**%**
What is the most convenient time to inject insulin?	192	95.0	1	0.5	9	4.5

What is the purpose of giving OHA?	93	46.0	5	2.5	104	51.5
What are the symptoms of hypoglycemia?	74	36.6	35	17.3	93	46.0

Dietary knowledge and the sources of dietary information

135 of the participants had one or more than one sources for obtaining their dietary information. The most common sources cited for obtaining knowledge were physicians (45.2%) and dieticians (38.5%). It was further observed participants who mentioned these two sources had a good knowledge score of 21.3 & 21.2% respectively. Nurses/diabetic educators represented only 9.6% as a source of information but the participants' good knowledge was very high ((38.5%). While media had the less percentage (14.1%) but the highest percentage in good knowledge (42.1%). Table 2.

Table 2. Distribution of diabetic patients according to their level of total knowledge score and their sources of dietary information.

ITEMS	TOTAL KNOWLEDGE SCORE						TOTAL n=135	
	Poor N	%	Fair N	%	Good N	%	N	%
Physician	7	11.5	41	67.2	13	21.3	61	45.2
Nurse/Diabetes educator	2	15.4	6	46.2	5	38.5	13	9.6
Dietician	3	5.8	38	73.1	11	21.2	52	38.5
Friends and relatives	1	4.8	16	76.2	4	19.1	21	15.6
Media	1	5.3	10	52.6	8	42.1	19	14.1
Medical pamphlets	2	5.4	24	64.9	11	29.7	37	27.4
Others	0	0	1	50.0	1	50.0	2	1.5

Diabetic Patients' Practices:

The dietary practices of the diabetic patients showed a varied response. Higher mean practice scores (≥ 2.5) were for the use of artificial sweeteners, several regular daily meals, and the use of herbals. Most of them (57.9%) had regular three meals. 75.7% never or sometimes ate snacks, 57% ate only one snack per day and only 13.9% were using unhealthy snacks. In addition, 23.3%

 online ISSN 1858-6279 ISSN 1858-6155

and 16.8% of the sample were usually using sugar and soft drinks respectively. Further, it was observed that the most commonly skipped meal was dinner (41.9%) followed by breakfast (36.8%), and then lunch (21.3%). Table 3

Table 3. Dietary practices of diabetic patients

Question related to dietary practices	Level of dietary practices N	%	Mean ± SD Item score 1-3
*How many regular meals do you eat daily?			
Regular three meals	117	57.9	
Regular two meals	76	37.6	2.53 ± 0.58
One or sometimes two meals	9	4.5	
Do you skip meals?			
No	47	23.3	
Sometimes	119	58.9	2.05 ± 0.64
Usually	36	17.8	
Do you eat snacks between meals?			
Usually	49	24.3	
Sometimes	120	59.4	2.07 ± 0.63
No	33	16.3	
How many times do you snack per day?			
More than two	62	30.7	2.18 ± 0.64
One-two	114	56.4	
No snacks	26	12.9	
What is the type of snack used?			
Healthy	126	62.4	2.49 ± 0.73
Healthy and unhealthy	48	23.8	
Unhealthy foods	28	13.9	
Do you use sugar?			
No	100	49.5	2.26 ± 0.54
Sometimes	55	27.2	
Usually	47	23.3	
Do you use artificial sweeteners?			
No	144	71.3	2.67 ± 0.54
Moderate amount	50	24.8	
Large amount	8	4.0	
Do you use low-calorie soft drinks?			
Not at all	87	43.1	2.26 ± 0.72
Yes	81	40.1	
I used regular soft drink	34	16.8	

 online ISSN 1858-6279 ISSN 1858-6155

The assessment of the daily macronutrient intake of diabetic patients showed that the mean total energy intake was 1890.1±860 kcal and the percentage of total calories from carbohydrates 52.4%, protein 16.8%, and fat 30.8%.

Physical activity practices were not common among the participants. About 37% had never practiced any physical activity, only 17.8% of them followed regular exercise, and 45% practiced exercise occasionally. About 11% were practicing exercises at least 3 times per week and about 9% were practicing exercises for more than 20 minutes each time.

Diabetic Patients' beliefs, attitudes, and perceptions:

Figure (1) demonstrates the levels of perceived severity of diabetes and perceived benefits of dietary regimens among diabetic patients. The mean score of perceived benefits was moderately high (2.43 ± 0.51), while the mean total score for perceived severity was 1.81 ± 0.83.

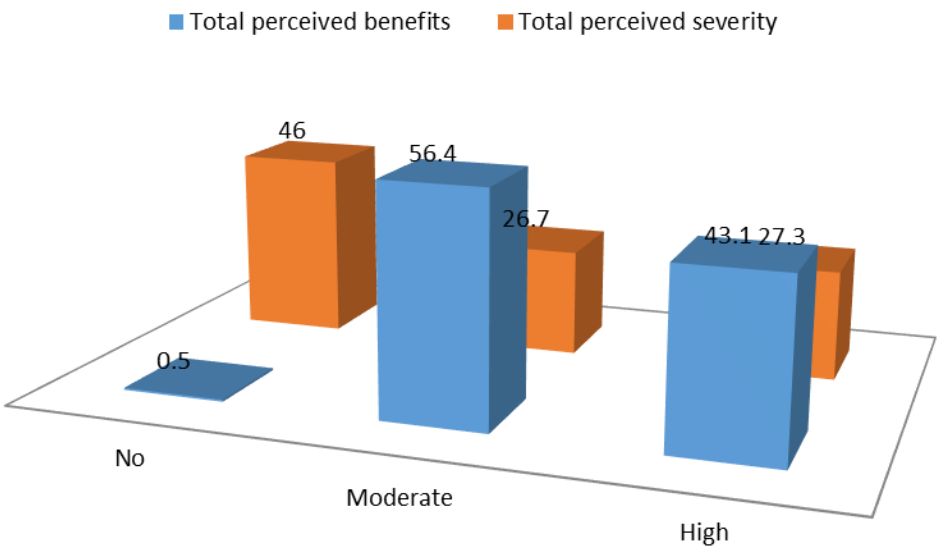

Figure 1:Levels of perceived severity of diabetes and perceived benefits of dietary regimen among diabetics patients

The dietary perceived benefits of diabetic patients showed that about 96% and 92% of the patients agreed that regular exercise and dieting improved their condition. A greater percentage

 online ISSN 1858-6279 ISSN 1858-6155

of the patient (78.2%) believed that dates raised their blood sugar and about 73% did not agree that all fruits should be avoided. About two-thirds (66%) of the sample perceived the benefits of maintaining or reducing weight. 65% had dietary misconceptions such as the use of brown bread in any amount will not affect their blood sugar. About 45% of the diabetics believed that they should avoid all starchy foods and 37% believed that bitter and sour foods might benefit diabetics. Also, 24.8% believed in herbal and traditional prescriptions in the management of diabetics.

About 28% believed in the benefits of other types of herbals and traditional food in managing diabetes such as Black Cumin (Habat Al-Barakah), Salvia (Al-Maramia), Leguminous (Al-termus), wormseeds (Al-sheeh), green tea, zaatar, herbals and special mixing like bile + cumin (Kamoon) + Anisum (Yanassoon) + Fenugreek (Helba).

47% of the participants did not perceive the severity of the impact of diabetes on their family and social roles and the effect of diabetes and its management on their life while 34.2% and 32.2% highly perceived the impact of diabetes on the previously mentioned items.

Figure (2): demonstrates the levels of perceived barriers to dietary management and physical activity among diabetic patients. It is clear from the figure that about 76% of the patient had high and moderate perceived barriers toward dietary management and about 85% of the patient scored high and moderate perceived barriers to physical exercise.

 online ISSN 1858-6279 ISSN 1858-6155

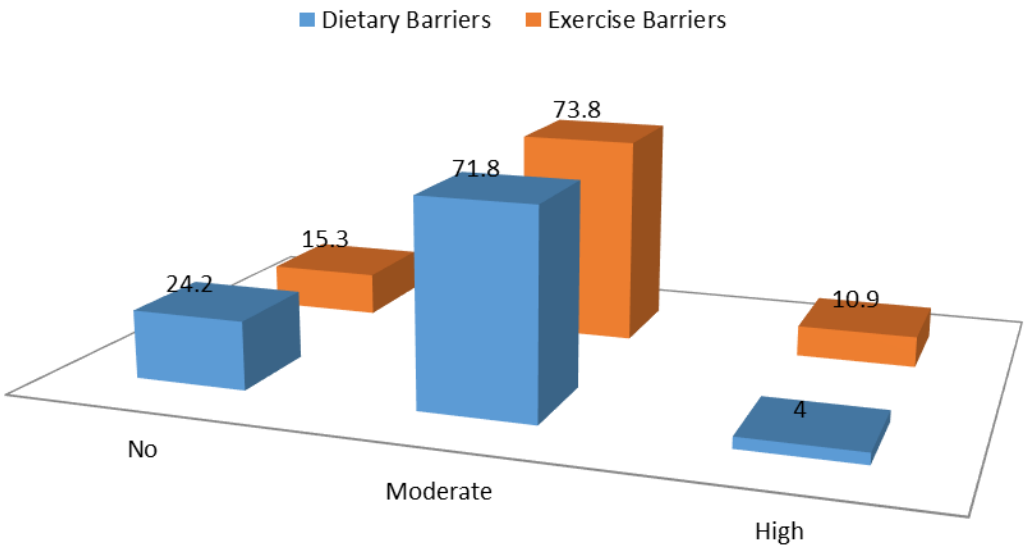

Figure 2: Levels of perceived barriers about dietary management and physical activity among diabetic patients

The expressed barriers to dietary management were lack of will (55.4%), cost of diet (16.3%), difficulties in preparing special foods (3%), and 1% reported lack of knowledge of the right diet. The most frequent barrier cited for exercises were lack of will (54.5%), bad weather (19.3%), lack of family support (7.4%), and non-availability of a suitable place (2%).

Discussion

The main aim of this study is to design dietary guidance with clear goals and comprehensive information to satisfy type two diabetics' needs.

Baseline assessments of dietary practices in the present study showed that only less than one-quarter of the patients got good dietary practices meanwhile, most of the patients had got fair dietary practices. More than half of the participants had three regular meals daily and the majority were not eating snacks before physical activity and skipped dinner meals usually or sometimes. This reflects that Saudis are adherent to their traditional main lunch meal. Findings showed that most of the participants are less adherent to the diet which is not in favor and also less adherent to traditional prescriptions and artificial sweeteners, which we think is in favor of

 online ISSN 1858-6279 ISSN 1858-6155

well diabetic control. These findings are consistence with previous studies that revealed that patients appear to adhere to some aspects of the diabetes regimen more than others and they are most adherent about taking medications and less adherent about diet and exercise prescriptions (Glasgow et al 1987 & Roadbent et al. 2011). Studies indicate that spreading the nutrient load over a longer period by increasing meal frequency may be beneficial in the treatment of non-insulin-dependent diabetes mellitus (Jenkins et al, 1992). Frequent meals tend to reduce post-prandial insulin secretion and enhance insulin sensitivity in healthy and diabetic people (Jenkins et al, 1989; Jackson et al, 2007). Such dietary recommendations should be highlighted in any structured nutrition education program.

One study found that 23.7% of Egyptian diabetics use a combination of unknown herbs. A survey of different regions of KSA revealed that a large number of herbal drugs are used for the treatment of diabetes (Mossa, 1985). Worldwide, more than 400 herbal remedies are available for use by diabetics (Wadkar et al, 2008)). The use of herbals and traditional prescriptions can be attributed to patients' strong beliefs in the efficacy of herbals in the treatment of diabetes as indicated in our findings were 24.8% of the patients perceived benefits of herbals. The use of herbals in diabetes may be harmful about its possible side effects, the high probability of non-compliance with medical instruction, and might be toxic and endanger health. This should be highlighted in a well-structured education program.

The mean energy intake for the participants was 1890.1±860 Kcal /day. The macronutrient intake for protein and fat was slightly higher than the recommendations according to ADA, while carbohydrate intake was lower than the recommendations (52.4% of total calories). This can be explained by non-adherence to healthy dietary practices and lack of nutritional knowledge among diabetic patients as indicated by our findings. Much concern has been expressed about the validity of self-reports of dietary behavior, due to both difficulties in accurately measuring and calculating the nutrient content of foods and problems with clients' willingness and ability to record or recall what they eat (Garica et al, 2007).

Advances in health psychology have demonstrated the importance of cognition in understanding how individuals cope with medical problems. One of these cognitive variables that are often related to treatment's success or failure is knowledge (Bruce et al, 2003). The findings in our study revealed a shortage of nutritional knowledge and medical awareness in the studied sample.

 online ISSN 1858-6279 ISSN 1858-6155

Only a few attained good knowledge scores and most of the study sample had a fair level of total knowledge score.

The level of participants' knowledge concerning diabetes varied greatly among the studied items. Only one of 14 of the studied items had a correct and satisfactory answer by the majority of the participants (knowledge regarding types of snacks recommended). 10 out of 14 studied items had the correct and satisfactory answers with a proportion of the sample ranging from 41% - 59%. These findings could be explained by the unavailability of structured educational programs provided to all diabetic patients.

In practice, some health professionals give trivial, diluted information, usually as 'one shot encounter" about the "dos" and "don'ts" in diabetes management while ignoring educating patient's skills necessary for changes in their routine lifestyles such as diet regimen, body weight, and physical activities (Martha et al, 2009).

Standards of medical care published by the American Diabetes Association state that instruction should be provided, preferably by a registered dietician, to all diabetic patients. Adults are advised to see a dietician every 6 to 12 months for follow-up care (Arnold et al, 1993, ADA, 2014). Similar to the study findings, the study of Michigan Diabetes Research and Training center on adults reported that 77% were not seen by a dietician (Marilynn et al, 1993). More participants mentioned physicians than dieticians as the source of their information, because in the health care system in Saudi Arabia, there are more doctors than dieticians. However, the percentage of patients who attained a good level of knowledge was equal among the two groups. Many of the participants cannot differentiate between dieticians, nurses, or diabetes educators. Again, the higher percentage of good knowledge scorers among those cited media, and medical pamphlets might be due to their exposure to educational messages from multiple sources of information i.e. health care workers in addition to media, and leaflets. Multiple sources of information can enhance learning. Written educational materials can fortify spoken messages and they have several advantages: allow clients self-pacing and self-teaching, can give more details and information can be revised many times and shared with others (Bedworth et al, 1992).

 online ISSN 1858-6279 ISSN 1858-6155

In other words, the engagement of an individual in health behaviour is based on the health knowledge acquired and health attitudes formed thereof. Acquisition of health knowledge leads to a better understanding of oneself, others, and the world around.

Diabetic patient's beliefs, attitudes, and perceptions before the program:

Beliefs, attitudes, and perceptions are important predisposing factors in addition to the knowledge that can motivate health behavior. Many patients accept beliefs without trying to change them or prove them and these beliefs are acquired through personal or other's experiences through the process of socialization (Shelley et al, 2012). Misconceptions and false beliefs can lead to a sizable gap between what is recommended and what is practiced by the patients. (Glanz et al, 1997; Johansson et al 1998; Ronette et al, 2012). Broader social and cultural factors also play an important role in shaping food choices (Glanz et al, 1998).

The health belief model in this study showed that the participants hold several myths, misconceptions, and dietary false beliefs, which reflect their psychological, social, cultural, and religious background, which goes with Ayele's study findings (Ayele et al, 2012). Despite the presence of false beliefs, the majority of the sample hold some true beliefs such as the benefits of adherence to a dietary regimen, practicing physical activities, and maintaining ideal body weight. The results showed that about half of the participants had low perceived severity of diabetes. Lorig 2001 in his study, stated that if the person believes his or her severity to be low, then the likelihood of behavior change will be reduced.

Behavior change should consider the person’s beliefs about the effectiveness of targeted behaviors in reducing the disease threat. That is, the patient will subjectively evaluate the benefit and barriers involved in performing particular health actions (Lorig, 2001). In the present study about a quarter of participants perceived no barriers to dietary management, meanwhile, more than three-quarters of them had different barriers to diet. Lack of willpower is found to be the major barrier that affects more than half of the participants in this study. Such perceived barriers might explain the gap existing between diabetic patients' beliefs and practices in the present study. These results highlight the important role played by dieticians to teach their patients how to cope with these barriers and to understand patients’ attitudes toward diabetes and its

 online ISSN 1858-6279 ISSN 1858-6155

management (Emilio et all, 2013). Social support, continuity of care, self-management education, and having a personal source of care all had a positive association with adherence (Rosenstok, 1995 & Mensing et al., 2007).

Conclusion

Nutrition education programs for diabetics, particularly for the elderly, should be very clearly designed according to their needs. Patients should be part of the program construction. The involvement of dietitians, clinicians, educationists, and program designer is the first step to plan for such a program.

Planning should include setting priorities (patient needs), stating objectives, contents, learning outcomes, strategies, implementation plan, and resources (Lorig, 2001).

Learning objectives program must include the cognitive domain to assess the acquisition of knowledge and change of beliefs; the affective domain to assess emotions, feelings, and dietary behaviors; and the psychomotor domain to measure skills, and behavior change in food habits. This categorization helps to prepare for the selection of teaching and learning formats, methods, and media best suited to patient education needs.

The program should be designed according to the target population's needs, the main goal of which is to improve the health status and quality of life of diabetic patients through nutrition education.

Limitations of the study

Because our study took place in two different settings (A diabetic center and two primary health centers), there were some limitations in controlling all variables. One limitation is that we do not have control over the level of information provided by the participants, since a large portion of the participants had other people to fill the questionnaire for them, particularly the females.

For a better effect on nutritional program needs, further studies should consider the accuracy of the information and the level and interest of participants.

Recommendations

- Diabetic patients require considerable knowledge, skills, and strong guidance for adapting prescribed dietary, therapeutic, and lifestyle changes to daily self-care diabetes management. This could be achieved by effective, carefully planned, and structured

 online ISSN 1858-6279 ISSN 1858-6155

nutrition education programs. Periodic review and evaluation of such programs ensure that their content, formulated objectives, and strategies used are directed towards diabetic patient needs and priorities.

- Nutrition education programs need to focus on behavior change by handling all factors affecting dietary and physical activity practices collectively which include the predisposing factors (knowledge, attitude, beliefs, and values), enabling factors (skills, and resources) and reinforcing factors (reinforcement, motivation, social pressure, social norms).

References

American Diabetes Association. (2014). Standards of Medical Care in Diabetes. Diabetes Care. 37(Supplement 1): S14-S80

American Diabetes Association. (ADA). (2010). Diagnosis and classification of diabetes mellitus (Position Statement). Diabetes Care. 33(Suppl. 1): S62–S69

America Diabetic Association. (2008). Nutrition Recommendations and Interventions for Diabetes. Diabetes Care, Volume 31, 61 – 78

American Diabetes Association. (2002). Standards of Medical Care for Patients with Diabetes Mellitus. Diabetes Care. 25(Suppl. l): S33-S49.

Arnold MS, Stepien CJ, Hess GE, Hiss RG. (1993). Guidelines vs practice in the delivery of diabetes nutrition care. J Am Diet Assoc. 93: 34-39.

Ayele K, Tesfa B, Abebe L, Tilahun T, Girma E (2012) Self Care Behavior among Patients with Diabetes in Harari, Eastern Ethiopia: The Health Belief Model Perspective. PLoS ONE 7(4)

Bedworth AE, Bedworth DA. (1992). The profession and practice of health education. Wm. C. Brown publishers 209-228.

Bernstein A, Nelson ME, Tucker KL, Layne J, Johnson E, Nuernberger A, Castaneda C, Judge JO, Buchner D, Singh MF. A. (2002). Home-based nutrition intervention to increase consumption of fruits, vegetables, and calcium-rich foods in community-dwelling elders. J American Diet Association. 102:1421-1427.

Bruce De, Davis Wa, Cull Ca, Davis TME. (2003). Diabetes education and knowledge of type 2 diabetes from the community. Journal of Diabetes. 17(2):322-327.

Duncan I, Birkmeyer C, Coughlin S, Li QE, Sherr D, Boren S. (2009). Assessing the value of diabetes education. Diabetes Education. 35: 752–760

 online ISSN 1858-6279 ISSN 1858-6155

Emilio Luis, Garcı´a-Pe´rez , Marı´a A´lvarez , & Tatiana Dilla . (2013). Adherence to Therapies in Patients with Type 2 Diabetes. Diabetes Therapy 4:175–194
Federal Interagency Forum on Aging-Related Statistics (2000). Older Americans. Key Indicators of Well-Being. Washington, DC: Sauls Lithograph Company, Inc.
Franz MJ, Bantle JP, Beebe CA, Brunzell JD, Chiasson J-L, Garg A, Holzmeister LA, Hoogwerf B, Mayer-Davis E, Mooradian AD, Purnell JQ, Wheeler M. (2002). Evidence-based nutrition principles and recommendations for the treatment and prevention of diabetes and related complications (Technical Review). Diabetes Care 25: S136–S138,
Garica MJ, McNamara PM, Gordon T, Kannell WB. (2007). Morbidity and mortality in diabetic in the Framingham population. Diabetes. 23:105-111.
Glanz K, Lewis FM, Rimer P. (1998). Health behavior and health education: theory research and practice. J American Diet Association. 98: 1118-1126.
Glanz K, Brug J, van Assema P. (1997). Are Awareness of dietary fat intake and actual fat consumption associated? A Dutch-American Comparison, European Journal Clinical Nutrition. 51 542-547
Glasgow RE, McCaul KD, Schafer LC. (1987). Self-care behaviors and glycemic control type I diabetes, Journal Chronic Diseases. 40: 399-412
Health, United States, 1999, with Health and Aging Chartbook. Hyattsville, MD: National Center for Health Statistics.
Hochbaum GM. (1958). Public Participation in Medical Screening Programs: A Socio-psychological Study. Washington, DC: US Government Printing Office; PHS publication No. 572
Jackson S.J. Leahy F.E. 1; S Jebb.A. b. Prentice A.M. Coward W.A. L.J.& Coward C. Block, (2007). Frequent feeding delays the gastric emptying of a subsequent meal. Appetite 48 199–205
Jenkins DJA, Anthony 0, Alexandra LJ, Thomas MSW, et al. (1992). Metabolic advantages of spreading the nutrient load: Effects of increased meal frequency in non-insulin-dependent diabetes. American Journal Clinical Nutrition. 55:461-7.
Jenkins DJA, Wolever TMS, Vuksan V, et al. (1989). Nibbling versus gorging: metabolic advantages of increased meal frequency. New England Journal of Medicine. 321:929-34.
Johansson L, Andersen LF. (1998;). Who eats 5 a day? Intake of fruits and vegetables among Norwegians in relation to gender and lifestyle. J American Diet Association. 98:689-691.
Lorig K. (2001). Patient education: a practical guide. 3rd edition. California: editor Seawell M, Sage Publications, Inc.
Marilynin SA, Cathie JS, George EH, Roland GH. (1993). Guidelines vs. practice in the delivery of diabetes nutrition care. J American Diet Association. 93(1):34-39.

 online ISSN 1858-6279 ISSN 1858-6155

Martha M. Funnell, MS, RN, CDE1 Tammy L. Brown. (2009). National Standards for Diabetes Self-Management Education. DIABETES CARE, VOLUME 32, SUPPLEMENT 1

Mensing C, Boucher J, Cypress M, et al. (2007). National standards for diabetes self-management education. Diabetes Care; 30 (Suppl. 1): S96–S103

Miller CK, Edwards L, Kissling G, Sanville L. (2002). Evaluation of theory-based nutrition intervention for older adults with diabetes mellitus. American Diet Association. 102: 1069-1074, 1079-1081.

Mossa JS. (1985). A study on the crude antidiabetic drugs used in Arabian folk medicine. International Journal of Crude Drugs Research. 23:137-145.

Roadbent E, Donkin L, Stroh J. C. (2011). Illness and Treatment Perceptions Are Associated With Adherence to Medications, Diet, and Exercise in Diabetic Patients. Diabetes Care, Vol 34, 338 -340

Roesnstock IM. (1995). Understanding & Enhancing Patient Compliance with diabetic Regimens. Diabetes Care, 8: 610 - 615

Ronette R. Briefel, and Margaret A. McDowell. (2012). Nutrition Monitoring in the United States. International Life Sciences Institute. Published by John Wiley & Sons, Inc.

Sahyoun NR. (. 2002) Targeting nutrition education for the healthy elderly: Isn't it time? J Nutr. Educ. Behav. 34 (suppl 1): S42-S47.

Shelley D. Golden, and Jo Anne L. Earp (2012) Social Ecological Approaches to Individuals and Their Contexts: Twenty Years of Health Education & Behavior Health Promotion Interventions. Health Education & Behavior 39(3) 364–372

Susan B, Elizabeth AS, Martha MF, Holly P, David LR. (1997). Predictors of Adherence to Nutrition Recommendations in people with Non-Insulin-Dependent Diabetes Mellitus. Diabetes Educator. 23 2):157-165.

Taylor-Davis S, Smiciklas-Wright H, Warland R, Achterberg C, Jensen GL, Sayer A, Shannon B. (2000). Responses of older adults to theory-based nutrition newsletters. J Ameican Diet Association. 100:656-664.

Wadkar K.A, Magdum C.S, Patil S.S and Naikwade N.S. (2008). ANTI-DIABETIC POTENTIAL AND INDIAN MEDICINAL PLANTS. Journal of Herbal Medicine and Toxicology 2 (1) 45-50

Wing R, Koeske R Epstein LH et al. (1987). Long-term effects of modest weight loss in type II diabetic patients. Arch Internal Medicine. 147; 749-1753.

 online ISSN 1858-6279 ISSN 1858-6155