RESEARCH ARTICLE

FACTORS INFLUENCING DIABETIC DIET KNOWLEDGE AMONG DIABETIC PATIENTS ATTENDING PRIMARY HEALTH CARE CENTERS IN CENTRAL SECTOR IN JAZAN REGION, SAUDI ARABIA 1438H

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ABSTRACT

Background: Diabetes is a major worldwide health problem, that needs to comprehensive medical care and patient self-management, education and support. **Objectives:** The aim of this study was to study the factors influencing the diabetic diet knowledge among diabetic patients attending Primary Health Care Centers in Central Sector in Jazan Region, Saudi Arabia. **Methods:** This is a cross-sectional study carried out primary health care centers in central sector in Jazan region including 400 diabetic patients. The validated self-administered questionnaire was distributed for the patients. Data was collected and coded, then analyzed and tabulated using the Statistical Package for Social Science (SPS*S version 20)*. Descriptive statistics was applied in the form of frequencies and percentages for categorical variables and mean with standard deviation (SD) for normally distributed continuous variables. The chi-squared test was used to compare categorical data and Group t-test was conducted to assess the significance of differences for continuous variables. $P \leq 0.05$ was used as indictors of statistically significant differences. **Results:** The present study included 216 (54%) males and 184 (46%) females with a total number of 400 diabetics. The majority of diabetic patients had poor dietary knowledge as shown by the low percentage of correct answers for most questions. More than half of patients gave wrong answers for foods that should be used with hypoglycemia (50.5%), suitable time to drink juice (50.5%), symptoms of hypoglycemia (57.2%), and drinks permitted with unlimited amounts (65.5%). Also, More than half of patients gave Incomplete answer for recommended type of snacks (78.5%), role of snacks in diabetic diet (70%) and Foods rich in fat (58.5%). The results show that patients' educational leveland income were the only significant predictors of the dietary knowledge. Also, the participants dietary knowledge score (p-value= 0.000) and the educational level of diabetes (p-value= 0.006) were the factors most influencing attitudes (beliefs). **Conclusion:** The results conclude that, the majority of diabetic had poor dietary knowledge, and patients' educational level and income were the only significant predictors of the dietary knowledge which justify the need for an educational program to improve the knowledge of diabetic diet.

INTRODUCTION

Diabetes is a major worldwide health problem, that needs to comprehensive medical care and patient self-management, education and support (Ahmad *et al.,* 2014). Globally, the prevalence of diabetes is very high an estimated 422 million of adults people are living with diabetes mellitus in 2016, the Arab gulf countries have a higher prevalence rates of disease due to the increase growth, rapid development, changes in the lifestyles pattern in addition to other factors (World Health Organization, 2016). Diabetes play the main role in the cause of morbidity and mortality (Al-Hamdan *et al.,* 2012). Effective management of the disease, control of risk factors, diagnosis and prevention awareness are associated with knowledge, attitude and practice of diabetic patients (Demaio *et al.,* 2013).

International, Kingdom of Saudi Arabia is considered as one of the top ten countries highest rate for prevalence of diabetes, in 2015 its estimated to be 3.4 million people having been diagnosed with diabetes in Saudi Arabia (El-Mouzan *et al.,* 2007). Based on a recent study conducted in Jazan region suggested the overall prevalence of diabetes estimated was 12.3% (Bani *et al.,* 2000). In Kingdome of Saudi Arabia, the prevalence of diabetes was estimated with 20.5% among people aged between 20 and 79 years in 2014 (Alqurashi *et al.,* 2011). The disease and its complications place a representative burden, not only on patients and their families, but also on health care resources (Haastert *et al.,* 2009). The yearly cost of management patients with diabetes in Saudi Arabia is about $9.6 billion. It is estimated that each Saudi with diabetes costs

the government about $800 per month (Zhang *et al.,* 2010). Recently, study done in Jazan region was documented the percentage of patients with poor glycemic control and noncompliance to self-care managements was high (Mohammed *et al.,* 2016). Appropriate diabetic diet management considered as crucial part of glycemic control that reduce the development of disease complications and improve the self-care management (Alajlan, 2007). This study aims to determine the factors influencing diabetic diet knowledge among diabetic patients attending primary health care centers in Central Sector in Jazan Region, Saudi Arabia.

METHODS

This is Analytic cross sectional design facility based study. Conducted in Central Sector, Jazan Region which is located in south-western of Saudi Arabia. It is bounded by Asir region in the north, the State of Yemen in the south, and the Red Sea in the west. The target population of the study included diabetic patients of Central Sector in Jazan Region. Study include all Diabetic for atleast for 6 months since diagnosis above 18 years, Have a clinical file in the PHC center. And agree to participate in the study. Patients who refuse to participate in the study was excluded.

Sample size and sampling technique

Sample size: A sample size of 400 was calculated from the study population with an estimated probability of 50% for diabetes to maximize the sample size, 95% confidence coefficient, 5% confidence interval and 5% non-response rate. The diabetic patients in Central Sector were 4157. The following sample size equation was used for calculating sample size

$$n = p(1-p)\left(\frac{Z}{E}\right)^2$$

Where:

Z is the value from the standard normal distribution reflecting the confidence level that will be used (Z = 1.96 for 95%)

E is the desired margin of error (0.05).

P is the proportion of DM in the population. (p=0.5 i.e. 50% was used to generate the largest sample size.

Sampling technique: The stratified random sampling technique with proportional allocation from all provinces (strata) was used. The study sample, 400, was randomly selected by using the simple random sampling method from the different strata (19 PHC centers) and was invited to participate in the study. Proportional sampling was used from different strata by using sample fraction.

Tools of the study: Self-administered valid questionnaire was used for data collection. It was adopted from a questionnaire used in a study conducted in Jordan, 2017 (Khattab *et al.,* 1999). Permission to utilize the questionnaire was requested through an email communication with the corresponding author. The Statistical Package for Social Sciences (SPSS) software program version 20.0 was used for data analysis. Descriptive statistics were computed to explore the data.

Written consent from every participant was obtained and Every participant has a right to withdraw from the study at any phase. Permission from taken from Ministry of health, Gazan Region and Joint Program of Family Medicine

RESULTS

The present study included 216 (54%) males and 184 (46%) females with a total number of 400 diabetics. They were categorized into 3 age groups: ≤40 (25%), 41-50 (35%), and >50 years (40%). Most of the participants were married (83.0%) and educated (where 24.8 %, 25.0% and 31.0 % were certified with 1ry±, 2ry and university degrees, respectively). More than on half (52%) of the study group were resident in rural areas and working (53%). The majority had an income ≥5000 SR (Table-1).

Table 1 Socioeconomic characteristics of the study group, (N,400)

Characteristic	Number	%
Gender:-		
Male	216	54.0
Female	184	46.0
Age:-		
Lessthan or equal 40	100	25.0
41-50	140	35.0
More than 50	160	40.0
Marital status:-		
Married	332	83.0
Single	68	17.0
Occupational status:-		
Working	211	52.8
Not Working	189	47.2
Residency:-		
Urban	207	51.8
Rural	193	48.2
Educational Level:-		
Illiterate	77	19.2
1ry or intermediate school	99	24.8
2ry school	100	25.0
University or post graduate	124	31.0
Income: -		
Less than 5000	112	28.0
5000-10000	178	44.5
10000-15000	86	21.5
More than 15000	24	6.0

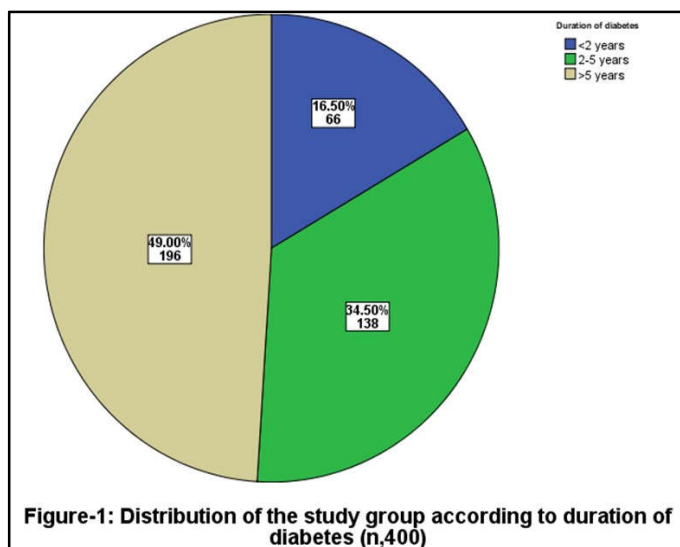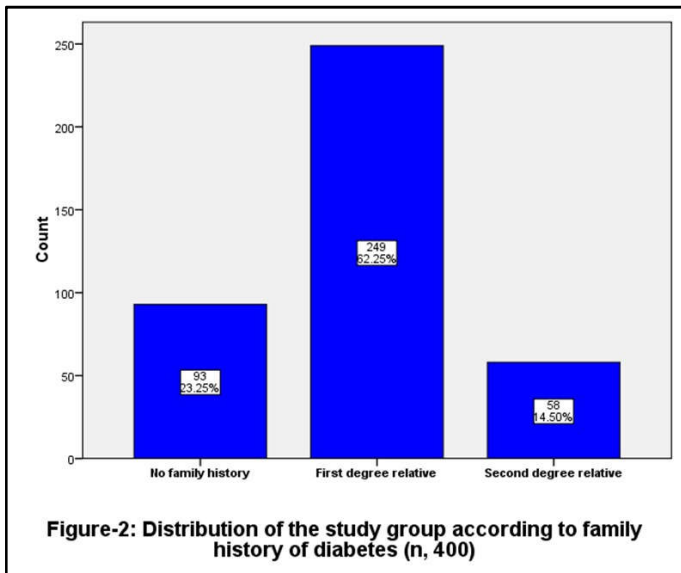**Figure-1: Distribution of the study group according to duration of diabetes (n,400)**

Figure-1 illustrates that the 16.5% of the study group had diabetes 2 years ago. On the other hand 35% and 49% had diabetes for 2-5 years and >5 years respectively.

Figure-2: Distribution of the study group according to family history of diabetes (n, 400)

There were no family history of diabetes mellitus (DM) among 23.25% of the study group and Positive family history was detected in 76.75% of the participants (Figure 2).

Table 2. Distribution of the study group by comorbidities (N,400)

Characteristic	Number	%
Heart disease: -		
Present	62	15.5
Absent	338	84.5
Eye disease: -		
Present	171	42.8
Absent	229	57.2
Stroke: -		
Present	18	4.5
Absent	382	95.5
Neuropathy: -		
Present	24	6.0
Absent	376	94.0
Renal disease: -		
Present	47	11.8
Absent	353	88.2
Coagulopathy: -		
Present	10	2.5
Absent	390	97.5
Obesity disease: -		
Present	172	43.0
Absent	228	57.0

Table-2 illustrates that the most common comorbidity among the study group were obesity (43.0%), diabetic eye complications (42.8%) and heart disease (16%). As displayed in Table 3, the majority of diabetic had poor dietary knowledge as shown. More than half of patients gave wrong answers for foods that should be used with hypoglycemia (50.5%), suitable time to drink juice (50.5%), symptoms of hypoglycemia (57.2%), and drinks permitted with unlimited amounts (65.5%). Also, more than half of patients gave Incomplete answer for recommended type of snacks (78.5%), role of snacks in diabetic diet (70%) and Foods rich in fat (58.5%). Table-5 illustrates the mean and standard deviation for the individual knowledge variables (n, 14) and the total knowledge score. As can be concluded from the table the study group mean was 14.85±4.33 (poor), a result that is consistent with that of Table-3. Table-6 illustrates the range, mean and standard deviation of Likert total score and individual Likert items. Most statements of the Likert scale had high scores >2 (out of 3) except 3 items. The following statements had high

scores: "Adherence of dieting regime improves sugar" (2.98±0. 19); "It is importance to regulate time and quantities of meals (2.84±0. 46);"Honey will not affect blood sugar" (2.60±0.69); "Dates will not affect blood sugar" (2.55±0.76); "Drinking tea after meals will prevent blood sugar absorption" (2.01±0.641); "Diabetics should avoid all starches" (2.05±0.89); "Regular exercise may benefit diabetes" (2.96±0. 25); and "It is importance to maintain or reduce your weight" (2.06±0). Table-7 illustrated the relationship between the total knowledge scores and socio-demographic factors. As can be concluded from the table there were, only, significant differences between the categories of Educational Level and income as detected by one way analysis of variance (ANOVA) regarding the total knowledge score. Scheffe Multiple Comparisons Post Hoc test detected the groups that were significantly different within each category. Illiterates had significantly lower Knowledge and attitude scores on comparison with educated diabetics (secondary or university certified). Also, there were significant differences between illiterates and those who had 1ry certificates. Diabetics who had income less than 5000 SR/M had significantly lower knowledge scores than those who had higher income (income of 5000-10000 and 10000-15000 SR/M).
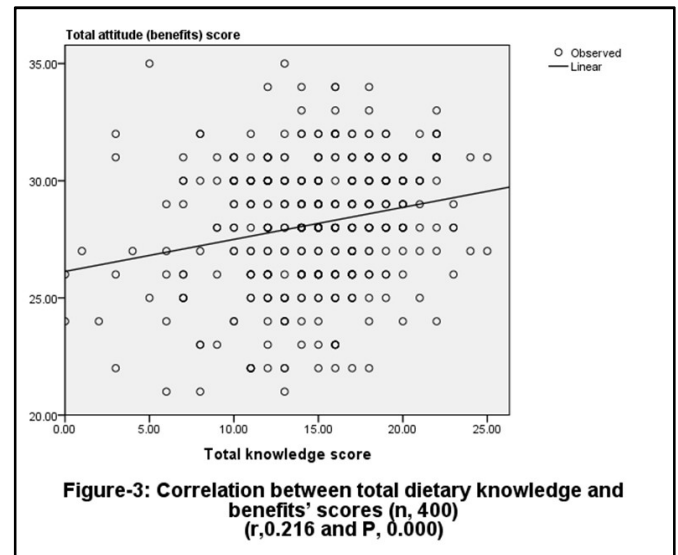

Figure-3: Correlation between total dietary knowledge and benefits' scores (n, 400)
(r,0.216 and P, 0.000)

Figure-3 illustrates that there was a significant positive linear association between the total knowledge scores as detected by Pearson's correlation analysis (r, 0.216, and P, 0.000). Multiple Linear regressions was conducted between the participants' knowledge scores as dependent variable and the independent variables that were significantly associated variables with knowledge as detected by bivariate analysis (Table-7). The results show that Education and Income were the only significant predictors of the knowledge (Table 8).

DISCUSSION

The aim of the present cross sectional study was to study dietary knowledge and attitude among diabetic patients attending Primary Health Care Centers in Central Sector of Jazan Region, Saudi Arabia. The present study included 216 (54%) males and 184 (46%) females with a total number of 400 diabetics. They were categorized into 3 age groups: ≤40 (25%), 41-50 (35%), and >50 years (40%). Most of the participants were married (83.0%) and educated (where 24.8 %, 25.0% and 31.0 % were certified with 1ry±, 2ry and university degrees, respectively).

Table 3. Dietary Knowledge of diabetic patients (N, 400)

		Correct answer▲	Incomplete answer▲	Wrong or don't know▲
1.	Foods that increase the blood sugar level	164 (41.0)	176 (44.0)	60 (15.0)
2.	Foods rich in fat	67(16.8)	234 (58.5)	99 (24.8)
3.	foods that is categorized as protein	241(60.2)	27 (6.8)	132(33.0)
4.	Food rich with cholesterol	194(48.5)	159 (39.8)	47(11.8)
5.	Foods that help in controlling the blood sugar	239 (59.8)	29 (7.2)	132 (33.0)
6.	Food that is high in fiber	199 (49.8)	168 (42.0)	33 (8.2)
7.	Number of meals that are recommendedfor diabetics/day	339(84.8)	1 (0.2)	60 (15.0)
8.	Number of snacks that diabetics should take/day	236 (59.0)	3 (0.8)	161(40.2)
9.	Type of snacks recommended	45 (11.2)	314 (78.5)	41 (10.2)
10.	Role of snack in diabetic diet	42 (10.5)	280 (70.0)	78 (19.5)
11.	Drinks permitted with unlimited amounts	95 (23.8)	43 (10.8)	262(65.5)
12.	Suitable time to drink juice	21 (5.2)	177(44.2)	202 (50.5)
13.	What are the symptoms of hypoglycemia	147 (36.8)	24 (6.0)	229(57.2)
14.	Which food should be used with hypoglycemia	49 (12.2)	149 (37.2)	202(50.5)

▲, number and percent in parenthesis

Table 5. Dietary knowledge score of the study group (n, 400)

	Mean	SD
Foods that increase the blood sugar level	1.2600	0.70259
Foods rich in fat	0.9200	0.64002
foods that is categorized as protein	1.2725	0.92757
Food rich with cholesterol	1.3675	0.68455
Foods that help in controlling the blood sugar	1.2675	0.92633
Food that is high in fiber	1.4150	0.63937
Number of meals that are recommendedfor diabetics/day	1.6975	0.71573
Number of snacks that diabetics should take/day	1.1875	0.97966
Type of snacks recommended	1.0100	0.46415
Role of snack in diabetic diet	0.9100	0.54095
Drinks permitted with unlimited amounts	0.5825	0.84852
Suitable time to drink juice	0.5475	0.59467
What are the symptoms of hypoglycemia	0.7950	0.94880
Which food should be used with hypoglycemia	0.6175	0.69455
Total knowledge score	14.8500	4.32716

Table 6. Scores of dietary perceived benefits of diabetic patients in the study group (n, 400)

|	Range		Mean	SD
	Minimum	Maximum		
Adherence of dieting regime improves sugar	1.00	3.00	2.977	0.1925
It is importance to regulate time and quantities of meals	1.00	3.00	2.842	0.4563
Use brown bread will not increase blood sugar	1.00	3.00	1.382	0.69815
Dates will not affect blood sugar	1.00	3.00	2.552	0.76072
Honey will not affect blood sugar	1.00	3.00	2.602	0.69332
Drinking tea after meals will prevent blood sugar absorption	1.00	3.00	2.005	0.64109
Diabetics should avoid all starches	1.00	3.00	2.047	0.8872
Diabetic should avoid all fruits as it raises blood sugar	1.00	3.00	1.942	0.92267
Foods that have bitter and sour taste may benefit diabetes	1.00	3.00	1.8200	0.70629
Regular exercise may benefit diabetes	1.00	3.00	2.957	0.24667
It is importance to maintain or reduce your weight	1.00	3.00	2.055	0.70939
Herbals & traditional prescriptions may benefit diabetic management	1.00	3.00	2.9775	0.19258
Total attitude score	12.00	36.00	28.160	2.73461
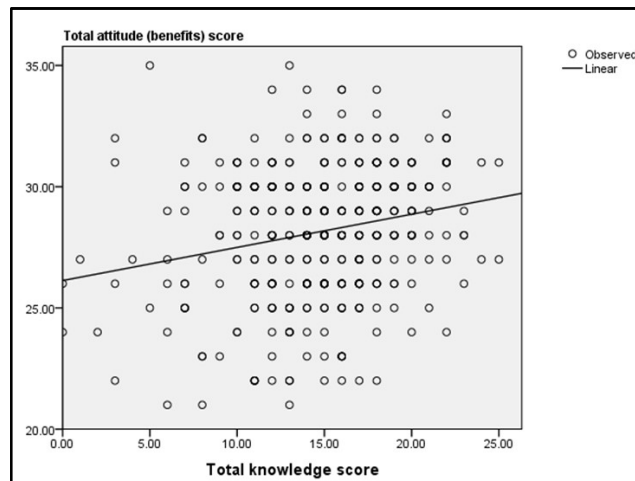
Figure 3. Correlation between total dietary knowledge and benefits scores (n, 400) (r,0,216 and P, 0.000)

Table 7. Relationship between the total knowledge and attitude scores and socio-demographic factors (n, 400)

| | N | Knowledge score | | |
		Mean	SD	P
Gender:-				
Male	216	15.2	4.4	0.969
Female	184	14.5	4.3	
Marital Status:-				
Married	332	14.9	4.3	0.355
Unmarried	68	14.3	4.6	
Residency:-				
Urban	207	15.2	4.1	0.362
Rural	193	14.5	4.5	
Occupation:-				
Working	211	15.6	4.1	0.215
Not working	189	14.0	4.4	
Age:-				
Lessthan or equal 40	100	15.14	4.1	0.731
41-50	140	14.8	4.7	
More than 50	160	14.7	4.2	
Educational Level:-				
Illiterate	77	12.8 [2 and 4]	4.5	0.000
1ry or intermediate school	99	14.9 [1]	4.2	
2ry school	100	14.6 [4]	4.5	
University or post graduate	124	16.2 [1 and 3]	3.6	
Income:-				
Less than 5000	112	13.4 [2 and 3]	4.6	0.000
5000-10000	178	15.4 [1]	3.9	
10000-15000	86	15.6 [1]	4.6	
More than 15000	24	15.2	3.6	
Duration of Disease:-				
Less than 2 years	66	14.5	4.3	0.136
2-5	138	14.4	4.4	
More than 5 years	196	15.3	4.3	

▲, group t-test; ♥, one way analysis of variance (ANOVA)

Table 8. Predictors of Knowledge among the study group

| | B | Std. Error | t-value | P | 95% CI for B | |
					From	To
Constant	12.447	0.503	24.758	0.000	11.459	13.436
Education level (illiterate VS educated)	1.791	0.598	2.995	0.003	0.615	2.967
Income (<5000 VS ≥5000)	1.328	0.525	2.529	0.012	0.296	2.360

More than on half (52%) of the study group were resident in rural areas and working (53%). The majority had an income ≥5000 SR. about 17 % of the study group had diabetes for 2 years. On the other hand (35%) and (49%) had diabetes for 2-5 years and >5 years respectively. The majority of diabetic had poor dietary knowledge as shown by the low percentage of correct answers for most questions. More than half of patients gave wrong answers for foods that should be used with hypoglycemia (50.5%), suitable time to drink juice (50.5%), symptoms of hypoglycemia (57.2%), and drinks permitted with unlimited amounts (65.5%). Also, More than half of patients gave Incomplete answer for recommended type of snacks (78.5%), role of snacks in diabetic diet (70%) and Foods rich in fat (58.5%). However, The highest frequency of correct answers were reported in response to a question regarding the appropriate number of meals that are recommended for diabetics/day (84.8%) followed with the type of foods that are categorized as proteins (60.2%), and number of snacks that diabetics should take/day (59.0%). These results are consistent with the results of a study conducted in Saudi Arabia by Z. Saadia *et al.* (2010) who reported that 90% of patients answered 50% of the knowledge questions correctly. In another study, it was reported that only 40% of diabetic patients had good compliance with their diet (Khattab *et al.,* 1999). Also a similar study was conducted in Jordan and the authors reported that more than half of patients gave wrong answers for number of meals recommended for diabetes/day

(56.1%) and that should be used with hypoglycemia (44.5%), food rich in protein (47.6%), number of snacks (50.6%) and their role (43.1%), drinks permitted with unlimited amounts (61.4%) and suitable time to drink juice (78.1%) (El-Qudah *et al.,* 2016). The low dietary knowledge of diabetics was, also, reported in in Iran (Mansour-Ghanaei *et al.,* 2013), United Arab Emirates (Al-Maskari *et al.,* 2013), Kuwait (Al-Adsani *et al.,* 2009) and in Nigeria (Yusuff *et al.,* 2008). On the other hand, a good level of knowledge was found among patients in Pakistan (Hawthorne *et al.,* 1999), Malaysia (Ng *et al.,* 2012) and in Qatar (Mesmar *et al.,* 2011). The results of the present study and others reveal poor dietary knowledge of the diabetic patients. In the past years many countries, have been experiencing a nutritional transition in food choices from the typical Mediterranean diet to the fast food pattern (Musaiger *et al.,* 2003). The rapid change in physical activity and food habits has led to the coexistence of many nutritional problems that underlies many chronic diseases. As populations become more urbanized, and as lifestyles shift towards reduced physical activity and increased food consumption, the prevalence of obesity is expected to rise (Musaiger *et al.,* 2003). It should be noted here that the most common comorbidities among the study group of the present study was obesity (43.0%) and overweight (35%). The overweight and obesity lead to poor glycemic control that may increase the microvascular and macrovascular complication of DM. So the management of Diabetes Mellitus not only requires the prescription of appropriate nutritional and pharmacological regimen by the physician but also intensive education and counseling of the patient (Musaiger *et al.,* 2003). Improving the Knowledge of the diabetics in our society is urgently needed because it was found that a good level of knowledge regarding DM, affect patients' adherence to pharmacological therapy (Salas-Salvado, 2011; Montonen *et al.,* 2003), self-care activities and good glycemic control (Defronzo *et al.,* 2009; Lee *et al.,* 2012; Group *et al.,* 2016). Despite the importance of education as a means of improving diet, some studies in adults gave conflicting results regarding associations between nutritional knowledge and dietary behavior (Wardle *et al.,* 2000; Dallongeville *et al.,* 2001). However the importance of patients' knowledge was reported in a study that was conducted in England among adults in general practice where Knowledge was significantly associated with healthy eating. The authors concluded that their results support the likely value of including nutrition knowledge as a target for health education campaigns aimed at promoting healthy eating (Wardle *et al.,* 2000).

Conclusion

The results show, also, that the majority of diabetic had poor dietary knowledge as shown by the low percentage of correct answers for most questions. The total knowledge scores were significantly related to socio-demographic factors (educational level and income). Illiterates had significantly lower Knowledge scores on comparison with educated diabetics (secondary or university certified). Diabetics who had income less than 5000 SR/M had significantly lower knowledge scores than those who had higher income (income of 5000-10000 and 10000-15000 SR/M). The patients' educational level and income were the only significant predictors of the dietary knowledge. Health education and Dietary counselling were recommended during DM consultation. Special attention should be given for illiterates and low income patient because they have poor dietary knowledge**.**

Abbreviation

AAFP	American Academy of Family Physicians
ADA	American Diabetes Association
BMI	Body Mass Index
HA1C	Hemoglobin A1C
FBG	Fasting Plasma Glucose
DM	Diabetes Mellitus
KSA	Kingdom Saudi Arabia
PHC	Primary health care
PHCCs	Primary health care centers
WHO	World Health Organization

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