Knowledge About Diabetes and Its Effect on Quality of Life among Diabetic Patients in King Abdulaziz University Hospital, Jeddah

Abstract:

Background

Quality of life (QOL) is an essential part in Diabetic patients since low QOL can decrease self-care which can lead to increased mortality and complications. The purpose of this study is to determine the effects of diabetes on QOL in Saudi Arabia, and to assess the knowledge about diabetes among these patients in order to know if there is a relation between diabetes knowledge and patient's QOL.

Method

Cross sectional study done in king Abdul-Aziz university hospital in Jeddah. The sample was on type 2 diabetic patients (N=300), they were recruited from hospital wards and outpatient clinics during 2016. The questionnaire consisted of 3 sections: demographic and medical characteristic, knowledge of diabetes and QOL by 4 dimensions.

Result

The mean age of the study population was 55.6±10.1 years and 189 (63%) were female. The median duration of having diabetes was 10 years. The mean score of diabetes knowledge was 8.57±1.8 out of 12 indicating good level of knowledge. The worst score was for alcohol's effect on blood glucose, only 21.7% answered correctly. The mean score QOL was 34.1±7.7 out of 50 which indicates average level of lifestyle. Regrading effect of the knowledge on QOL, there was positive correlation with no significant association.

Conclusion

Diabetes impairs QOL of patients, and the knowledge about diabetes affects QOL. We recommend the engagement of health professionals in educational settings in order to enhance health-related knowledge. Seminars, counseling sessions and workshop should be arranged periodically for diabetic patients to increase their awareness.

Key words:

Knowledge, Quality of Life, Diabetic Patients.

1.Introduction

Diabetes is a common chronic illness that have been increasing throughout the years, million people have diabetes in the world and more than 35.4 million people in the MENA Region (middle east, north African region), by 2040 this will rise to 72.1 million. There were 3.4 million cases of diabetes in Saudi Arabia in 2015(1).

 Diabetic patients are usually older, overweight, less likely to exercise, and more likely to have comorbidities and complications. The increasing number of diabetes has harmful effects on quality of life outcomes. Quality-of-life issues are of absolute importance, because they may strongly predict an individual's capability to manage his disease and maintain long-term health and well-being (2). Diabetes mellitus imposes a heavy burden on individuals and health care systems (3). Quality of life is an essential part in Diabetic patients since low quality of life can decrease self-care which can prompt to increase mortality and complications (e.g. chronic renal failure, blindness, and lower limb amputations) which influence wellbeing and productivity (4). Evidence shows that people affected by diabetes often have inadequate knowledge about the nature of the disease, its risk factors and the associated complications (5). Poor motivation from the patient's side to maintain optimum glycemic control, their negligent attitude toward infection, injury, and other symptoms related to the feet leads to a delay in timely consultation to their physician (6).

Knowledge about diabetes is fundamental for the management, since it requires day-to-day knowledge about nutrition, exercise, monitoring, and medications (7).

The purpose of this study is to assessing the knowledge about diabetes among diabetic patients in order to know if there is a relation between diabetes knowledge and patient's quality of life. Education about diabetes is important to change the behavior of the patients and encouraging the patients in active management of their condition.

We chose patients in king Abdul-Aziz University Hospital; assessing knowledge about DM and measuring different dimensions of quality of life, including (general health, physical health, psychological health, social relationships, environment).

A lot of other studies came to the importance of health education because it is the theoretical and methodological basis for health promotion actions, as it can support both diseases prevention and rehabilitation and promote citizenship, personal and social responsibility related to health and contribute in the training of multipliers and caregivers (8).

2.Methods

This is cross sectional, interview- based study design conducted at King Abdul-Aziz University Hospital in Jeddah, the target population was diabetic patients who were admitted in the hospital wards or attending outpatient clinics. The data was collected from April 2016 to May 2016.Sample size was calculated using raosoft site, it was 300 diabetic patients measured by adding 10%. (based on total DM patients number per month 1200 patients, an error of 5%, the confidence interval of 95% and a prevalence of 50%). Out of the 300 patients enrolled in the study, 200 were from outpatient clinic and 100 from hospital ward. Patients were chosen randomly, and they were included in the study if they had diagnosis of type 2 DM, were at between 18-70 years old, Saudi or non-Saudi lived more than 3 years in Saudi Arabia, and excluded if they were currently pregnant and were non- Saudi living less than 3

years in Saudi Arabia. face to face structured interview questionnaire, was pre-tested on 10 diabetic patients a likely similar population to the study participants. The questionnaire was based on three major dimension: demographic data (consisting of 18 items), knowledge (general knowledge consists of 2 items, monitoring blood glucose consist of 2 items, factors affecting on blood glucose level consist of 2 items, complication of DM consist of 3 items) and QOL (physical health consist of 4 items, psychological health consist of 3 items, social relationship consist of 2 items, environment consist of 1 item). The questionnaire was based on thorough search of relevant literature and discussion with experienced Faculty members. The

Scoring of Participants' Responses

Regarding knowledge questions (12), a score of (1) was given to the right answer. Summation of scores computed and the total score was 12, and the range was (0 -12). Then the score was transformed to a percentage. Which was categorized into high, who will get >80, the moderate, who will get between 50 to 80, and poor, who will get <50. (100)

Data Entry and Statistical Analysis

All collected data were coded and entered into a personal computer. Data entry and statistical analysis performed by using the Statistical Product and Service Solutions (SPSS, version 22.0) and appropriate statistical tests were applied.

Descriptive statistics (i.e., frequency, percentage, mean and standard deviation) calculated. Chi-square test, One way ANOVA, and independent t test were applied to compare participants' knowledge grades knowledge dimension & total score of lifestyle dimension and different demographic variables. Pearson test was used for the correlation between knowledge dimension & total score of lifestyle dimension P-value of <0.05 was considered as statistically significant.

Ethical Considerations

The protocol for the study was approved by the Ethics committee for Health at King Abdul-Aziz University Hospital

Moreover, before the interview, the researchers used to explain the purpose of the study to all participants briefly and deal with collected data confidentially and used only for the purpose of research. Participants were informed that their participation in the study was completely optional and they had the full right to refuse to participate. Their consent to participate in the interview was then obtained verbally and the ethical consideration was observed through all research steps.

Pilot Study:

Face to face structured interview questionnaire, was pre-tested on 10 diabetic patients a likely similar population to the study participants.

Validity

The questionnaire developed by the researchers after reviewing the relevant literature to collect the necessary data which has been revised and validated by three expert consultants from medicine department.

Reliability

The researchers evaluated the reliability of variables included in the study questionnaire. It was assessed using the Cronbach's alpha coefficient. The questionnaire proved an acceptable reliability which was equal 0.719.

3.Results

119   Three hundred diabetes patients who attend outpatient clinics in KAUH were involved in this

120   study, of which 189 (63%) were female & 111 (37%)were male, with mean age score

121   55.6±10.1, 144 (48%) were Saudi, and the majority (250-83.3%) were married. Only 56

122   (18.6%) had university degree & more than half (180- 60%) reported no job. three quarter

123   (265- 89%) reported no smoking. (Table 1)

124   **Table (1) Demographic data:**

Variables	N (300)	%
Gender		
Female	189	63.0
Male	111	37.0
Nationality		
Saudi	144	48.0
Non-Saudi	156	52.0
Marital status		
Single	16	5.3
Married	250	83.3
Divorced	11	3.7
Widow	23	7.7
Employee		
Employed	68	22.7
Not employed	180	60.0
Retired	52	17.3
Education		
University and above	56	18.6
High school	60	20.0
Intermediate school	41	13.8
elementary school	58	19.3
Illiterate	85	28.3
Smoking		
No	265	89.0
Yes	35	11.0
Smoking type		
Cigarettes	21	60%
Shisha	14	40%
Variables	**Mean± SD**	**Rang (min-max)**
Age	55.6±10.1	(27-70)

125   Table 2 showed the medical characteristic of the participants, the median score of duration of

126   being diabetes patients was 10 years, 255 (85%) reported taking medication on regular base ,

127   122 (40%) stated checking blood sugar 1-2 times per day ,the majority (249-83%) reported

128 hyperglycemia experience , where two third (200- 66.7% reported hypoglycemia experience

129 with main symptoms   sweating (34.3%) followed by shacking (33.7%) then (32.7%)

130 confusion. More than half (177-59%) stated seeing dietitian. The main source of knowledge

131 was doctors (64.7%). (Table 2)

132

133 **Table (2) Medical characteristic:**

Variables	N (300)	%
Medications regularly		
Yes	255	85.0
No	45	15.0
Checking blood sugar		
Never	76	26.0
1-2 times per day	122	40.0
3-5 times per day	30	10.0
3 times or less per week	72	24.0
Experienced hypoglycemia		
Yes	200	66.7
No	100	33.3
If yes, list symptoms (Multiple symptoms)		
Not applicable	95	31.7
Shaking	101	33.7
Rapid heart beat	88	29.3
Sweating	103	34.3
Blurred vision	84	28.0
Confusion	98	32.7
No symptoms, only low reading	12	4.0
Experienced hyperglycemia		
Yes	249	83.0
No	51	17.0
Complain of other illness		
Yes	208	69.4
No	92	30.6
Saw dietitian		
Yes	177	59.0
No	123	41.0
Source of knowledge (Multiple sources)		
Doctors	194	64.7
Social media	62	20.7
Friends	30	10.0
Other	31	10.3
Nothing	34	11.3
Variables	**Median**	**Quartile (25-75)**

| Duration of diabetes by years | **10** | **(5-15)** |

134

135 Table 3 showed the rate of choosing right information about DM, the higher rate was for

136 (Exercise: Decrease DM) 92%, followed by (Carbohydrates & stress : Increase DM) 91.3%

137 equally , (Home Monitoring: Blood testing) 89.3%, then (Hypoglycemia Correction: Drink

138 juice) 87.3% , then (Complication of diabetes: Eye diseases) 79.3% , (Diet: low fat, high

139 fiber, and low added sugar diet) 70.3% , (Infection : increase DM) 66.7% , then (Controlling

140 DM: Glycosylated HB (HbA1c) & Diabetic foot: Check the feet and wash) 58.3%,

141 followed by (Hyperglycemia signs: Numbness) 53.3%, and lastly (Alcohol: Increase DM)

142 21.7%. (Table 3)

143

144 **Table (3) Participants' knowledge of DM:**

Variables	N (300)	%
Exercise: Decrease blood sugar	**276**	**92.0**
Carbohydrates: Increase blood sugar	**274**	**91.3**
Stress: Increase blood sugar	**274**	**91.3**
Home Monitoring of Blood Sugar: Blood testing	**268**	**89.3**
Hypoglycemia Correction: Drink juice	**262**	**87.3**
Complication of Diabetes: Eye diseases	**238**	**79.3**
Healthy Diabetic Diet: low fat, high fiber, and low added sugar diet	**211**	**70.3**
Infection: Increase blood sugar	**200**	**66.7**
Assessing Control of Diabetes: Glycosylated HB (HbA1c)	**175**	**58.3**
Diabetic Foot Care: Check the feet and wash	**175**	**58.3**
Hyperglycemia signs: Numbness	**160**	**53.3**
Alcohol: Increase blood sugar	**65**	**21.7**

145

146 Regarding participants' knowledge & relation with gender, martial statue & educational

147 level , there was significant association between gender & stress increasing DM item (94.2%

148 female vs 86.5%male, p=0.01),there was significant association between martial statue &

149 Controlling DM: Glycosylated HB (HbA1c) item (p=0.03) , also there was significant

150 association between educational level and two items (Hypoglycemia Correction: Drink juice)

151 (p=0.03) & (Alcohol: Increase DM) (p=0.004), while all other items showed no significant

152 difference.

153 Table 4 showed the mean scores of individual domains for knowledge dimension & lifestyle

154 dimension and also the total score for each dimension, the mean score of total knowledge

155 dimension was 8.57±1.8 which indicate good level of knowledge. While the mean score of

156 total lifestyle dimension was 34.1±7.7 which indicate average level of lifestyle. (Table 4)

157

158 **Table (4) Participants' knowledge of DM and life style scores:**

Variables	Mean ± SD	RANG (Min-Max)
General knowledge	1.56±0.6	(0-2)
Monitoring Blood glucose	1.47±0.6	(0-2)
Factors affecting on blood glucose level	3.64±0.9	(0-5)
Complication of DM	1.91±0.9	(0-3)
Total score 1 (knowledge of DM)	8.57±1.8	(0-12)
Physical health	12.8±3.9	(4-20)
Psychological health	10.7±3.1	(3-15)
Social relationship	8.02±1.7	(2-10)
Environment	3.8 ±1.1	(1-5)
Total score 2 (quality of life)	34.1±7.7	(10-50)

159

160 Regarding Knowledge & lifestyle dimensions & relation with gender, marital status &

161 educational level , there was significant association between gender & physical activity

162 domain where male are more interesting in physical activity than female (12.33±3.69 for

163 female vs 13.57±4.14 for male , p=0.008) , also there was significant association between

164 educational level & two domains Environment domain (p=0.001) & Monitoring Blood

165 glucose domain (p=0.002) & significant association between educational level & total mean

166 scores for Knowledge dimension was found (p=0.008) in all the domain there is increasing in

167 lifestyle domains with high level of education, while all other domains showed no significant

168 difference .

169

170 Regarding the domain of quality of life. The mean scores of individual items are shown in

171 Table (5). One item (10.0%) (Item 4) its mean scores was (2.6) indicating poor quality of life,

172 scores on 3 out of 10 (30.0%) (Items 1,2 & 5) were between (3.0-3.5), and 5 items(50.0%)

173 (Items 3,6,7,9 &10) were between (3.6-4.0) which indicate average satisfaction, one item

174 (10.0%) (Item 8) was (4.2) indicating good quality of life with positive trend. On the other

175 each item of the domains was divided to three categories (poor, moderate and good) and

176 percentage was calculate for each category, half of the participants reported poor level of

177 practicing exercises, more than third reported moderate impact on their sleep, emotions and

178 moderate level of physical pains, more than half stated moderate level of family supports and

179 safety environments, more than half reported that diabetes condition didn't affect their social

180 life , daily activities, working performance and that they don't have any worries about their

181 blood sugar changes. Regarding the association between level of knowledge and of quality of

182 life, the results showed significant association between good level of knowledge and all items

183 of good physical health, physiological conditions, social relationship, and environment.

184 (Table 5)

185 **Table (5) Dimensions of Quality of life:**

Variables	Poor	Moderate	Good	P value	Mean± SD	Range
Physical Health						
1-Physical pain	98 (32.6%)	126 (42.1%)	76 (25.3%)	**0.002***	**3.3±1.2**	**(1-5)**
2-Sleep	100 (33.3%)	101 (33.6%)	99 (33.0%)	**0.0001****	**3.3±1.5**	**(1-5)**
3-Performance at work	80 (26.6%)	92 (30.7%)	128 (42.7%)	**0.0001****	**3.6±1.4**	**(1-5)**

4-Exercise	150 (50.0%)	112 (37.3%)	38 (12.7%)	**0.0001****	**2.6±1.3**	**(1-5)**
Psychological						
5-Emotions	101 (33.7%)	130 (43.3%)	69 (23.0%)	**0.0001****	**3.2±1.3**	**(1-5)**
6-Diabetes affect daily activities	74 (24.6%)	105 (35.1%)	121 (40.3%)	**0.0001****	**3.7±1.3**	**(1-5)**
7-Blood sugar changes worries	65 (21.6%)	89 (29.6%)	146 (48.8%)	**0.0001****	**3.8±1.4**	**(1-5)**
Social relationships						
8-Diabetes affect social life	35 (11.7%)	64 (21.3%)	201 (67.0%)	**0.0001****	**4.2±1.2**	**(1-5)**
9-Family support	50 (16.7%)	163 (54.3%)	87 (29.0%)	**0.0001****	**3.7±1.2**	**(1-5)**
Environment						
10-Home safety environment	32 (10.6%)	184 (61.4%)	84 (28.0%)	**0.0001****	**3.8±1.1**	**(1-5)**

186 <mark>Chi square test was used to detect the association</mark> Regarding the relation between level of

187 knowledge and of quality of life, the results showed significant association between good

188 level of knowledge and safety environment (p=0.02), while in all other quality of life

189 domains no significant difference was found. (Table 6)

190 **Table (6) Relation between level of knowledge and of quality of life:**

Variables	Level of knowledge			P value
	Poor N=5 (1.6%)	Moderate N=143 (47.7%)	Good N= 152 (50.7%)	
Physical health	12.4±3.6	12.9±3.8	12.4±4.0	0.9
Psychological health	12.4±3.4	10.8±2.9	10.7±3.3	0.4
Social relationship	7.0± 2.5	7.9±1.7	8.0±1.7	0.4
Environment	1.2±0.4	2.5±1.4	2.7±1.3	0.02*
Total score	33.2±6.1	34.2±7.1	34.2±8.3	0.9

191 <mark>One way ANOVA test was used to detect the association</mark>

192 Concerning the correlation between total score of knowledge dimension & total score of

193 lifestyle dimension there was a positive correlation but with no significant difference (r=

194 0.014, p=0.82), while the correlation between total score of lifestyle dimension and age and

195   duration of diabetes were negative correlation without significant difference (r= -0.103,

196   p=0.07) and (r= -0.063, p=0.28) respectively.

197   **4.Discussion**

198   The current study shows prevalence of T2DM in female (63%) is significantly higher than

199   men (37%).similar result found in studies made in brazil and Saudi Arabia (8,11). On the

200   contrary, studies show the opposite result with minimal differences (9,10,12). It is maybe due

201   to larger number of females involve in the study compared to men.

202   Our result show significant increases of DM in married people compare to other patient with

203   different marital status and maybe due to higher number of married patient (N= 250- 83.3%)

204   compare to single patients (N=16 -5.3%), divorced (N=11- 3.7%), and widow (N=23 -7.7%).

205   Studies from Brazil and Poland show the same result. (8,14)

206   Also, the study found increase prevalence of DM2 in not employed patients (60%). The same

207   result in study made in Saudi Arabia (11).

208   The current study found illiterate diabetic patient have higher prevalence of diabetes than

209   educated patients with minimal differences (28.3 %)This result agrees with other studies from

210   Saudi Arabia (11) and Canada (13).

211   Study also show increase prevalence of DM 2 in non-smoker patients (89%). It may be due to

212   a higher number of females compared to men in the study and smoking is less common in

213   female in Saudi culture. The same result from study from Canada (13).

214   **Medical characteristic:**

215   Although the most of diabetic patients are taking their medication regularly (85%) and more

216   than the half   had saw dietitian (59%), it shows increase prevalence of experienced

217   hypoglycemia (66.7%) and (83%) experienced hypoglycemia. May be due to poor sources of

218   knowledge about this chronic disease as current study shows most of them have information

219   from their doctors (64.7%),followed by Social media (20.7%), then (11.3%) had No source

220 of knowledge (18) .As study from USA(15) and Thailand (16) found strong opposite

221 relationship between patient education and glycemic control .The other reason that may

222 contribute to having poor glycemic control is having other illness as the current study show

223 highly prevalence (69.4%) of diabetic patient with other diseases .

224 The results of the current study found (40%) of DM2 patient are checking blood sugar at

225 home and (26%) are never which may increase risk of diabetes complication (17).

226 **Knowledge of DM:**

227 The mean score of total knowledge dimension was 8.57±1.8 which indicate good level of

228 knowledge, similar to other researches done in Saudi Arabia Riyadh in 2016 (22). Unlike 2

229 studies done in Vietnam with different regions (23,24) show insufficient knowledge of T2D

230 in different geographical regions indicate the importance of education especially in rural

231 areas.

232 Our study shows No differences in knowledge were observed between men and women, and

233 between different martial statues (single, married, divorced and widow). The same result

234 regarding relation between sex and knowledge found in study conducted in Greece (19).

235   Patients with higher education demonstrated greater diabetes knowledge comparing to

236 Illiterate people as better education attainment is indicative of better understanding of the

237 disease. The same result in studies conducted in Greece (19) and Ohio (20), and Pakistan

238 (21).

239 The knowledge percentage of questions about treat hypoglycemia by different (drink juice)

240 was 87.3% which is a good percentage comparing to incorrect answering in the studies

241 (22,26,27).

242 Knowledge scores were high regarding questions about factors affecting the glucose level in

243 blood which are (Exercise: Decrease DM), as study done at 2016(22) and (Carbohydrates:

244 Increase DM). This finding disagrees with those of other studies (25,26,27.). Also, high

245   scores in answering the question (Home Monitoring: Blood testing) 89.3% with relatively

246   same result in study done in Emirate (28).

247   Patients' awareness about complications was relatively average; 79.3% with same finding in

248   a study (22). Other study shows satisfaction result (28).

249   Knowledge scores were low regarding the both questions (Controlling DM: by (HbA1c) and

250   diabetic foot: check the feet and wash) 58.3% as in the in Riyadh (25) show poor knowledge

251   about Hba1c test but good knowledge about foot caring.

252   lastly, knowledge about (Alcohol: Increase DM) was significant low 21.7% maybe as

253   Alcohol drinking is not allowed in Islam and is not socially accepted.

254   **Quality of Life**:

255   Diabetes affects negatively all quality dimensions, the quality of life score 34.1±7.7 out of 50.

256   Many studies found similar results (4,29). In Saudi Arabia, the quality of life of diabetic

257   patients was studied by multiple researchers using deferent questioners such as SF36 and

258   EQ5d, they also reached the same result (11,22).

259   The main age of the sample was 55 years and most of the sample had diabetes for 10 years.

260   The effect of age on quality of life showed negative correlation without significant difference

261   (r= -0.103, p=0.07), while the correlation between duration of diabetes and quality of life also

262   showed negative correlation without significant difference (r= -0.063, p=0.28). These results

263   were similar a research done in Portuguese (12).

264

265   Women had worse quality of life than men regarding physical health dimension only and

266   similar results as men in other dimensions. The physical health score for female 12.33±3.69

267   out of 20, and as for male 13.57±4.14 and the P-Value is 0.008. This is similar to a research

268   done India and Saudi Arabia in 2014 (4,11) This might be due to higher HbA1c and anxiety

269   level and increased cardiovascular risk in female (12).

The safety of home and neighborhood conditions such as availability of stairs at home and places for exercise affects quality of life, the score for environment is 3.8 ±1.1 out of 5. In Saudi Arabia, a research was done to assess environment effect in lifestyle of diabetic patients and it shows a close relation between the environment setting, life style and health statutes (30).

The association between quality of life and level of knowledge about diabetes was studied. There was significant association between good level of knowledge about diabetes and a safe environment, P-Value is 0.02. Regarding effect of the knowledge on other dimensions of quality of life, there was positive correlation with no significant association. In contrast to a pilot study done in Saudi by Hana R. Al-Ban nay, et al (31), which showed education program has increased all dimension of the quality of life not only environment dimension, this result is similar to another research done in Thai (16).

5.Conclusion

The knowledge of diabetic patient in KAUH is average, which indicate patient need for more education during their hospital stay or while following up diabetes especially about factors affecting blood glucose level. The quality of life for the sample was also average, which require further assessment of the patients' conditions to know the risk factors affecting their quality of life and how to improve it. Similar to other researches, the knowledge of diabetes didn't significantly increase quality of life which might be due attitude and practice issues of already established knowledge. We recommend the engagement of health professionals in educational settings in order to enhance health-related knowledge. Seminars, counseling sessions and workshop should be arranged periodically for diabetic patients to increase their awareness.

6.Limitation of the study

<mark>The study was done in one center only in Jeddah and the result can't be generalized to Kingdom of Saudi Arabia.</mark> The research consisted of two parts, knowledge about diabetes and quality of life, which compromised the number of questions that can be asked to patients. In kingdom of Saudi Arabia, the assessment of quality of life was done by different methods which made the comparison of the results between researches not accurate.

7.References

1. Anonymous. Saudi Arabia diabetes journal list. 2015. Accessed 14 December 2017. Available: https://www.omicsonline.org/diabetes-journals-saudi-arabia/

2. Richard R. Rubin, PhD, CDE. Diabetes and Quality of Life. Diabetes Spectrum. 2000. Accessed 14 December 2017. Available: http://journal.diabetes.org/diabetesspectrum/00v13n1/pg21.htm

3. Yang, Chi-Hsuan Asphodel; Ting, Hung-Wen. Health-Related Quality of Life and Its Related Factors in Patients with Diabetes. 2016;17:3 Accessed 1 December 2017 .Available:http://www.nursinglibrary.org/vhl/bitstream/10755/601677/1/Chi Hsuan_Yang_2015.pdf

4. Jain V, Shivkumar S, Gupta O.. Health-Related Quality of Life (Hr-Qol) in Patients with Type 2 Diabetes Mellitus. N Am J Med Sci. 2014 Feb;6(2):96-101. doi: 10.4103/1947-2714.127752.

5. Alanazi AM, Abo El-Fetoh NM, Alotaibi HK, Alanazi KA, Alotaibi BK, Alshammari SM, et all. Survey of awareness of diabetes mellitus among the Arar population, Northern Border Region of Saudi Arabia. Electron Physician. 2017 Sep 25;9(9):5369-5374. doi: 10.19082/5369. eCollection 2017 Sep.

6. Taksande BA, Thote M, Jajoo UN. Knowledge, attitude, and practice of foot care in patients with diabetes at central rural India. J Family Med Prim Care. 2017 Apr-Jun;6(2):284-287. doi: 10.4103/2249-4863.219994.

319   7. Anonymous. Diabetes Education: Why It Is so Crucial to Care. Accessed 19 march 2018.

320   Available:

321   http://www.joslin.org/info/diabetes_education_why_its_so_crucial_to_care.html

322   8. Imazu MF, Faria BN, de Arruda GO, Sales CA, Marcon SS. Effectiveness of individual

323   and group interventions for people with type 2 diabetes. Rev Lat Am Enfermagem. 2015

324   Feb-Apr;23(2):200-7. doi: 10.1590/0104-1169.0247.2543.

325   9. Singh A, Shenoy S, Sandhu JS. Prevalence of Type 2 Diabetes Mellitus among Urban

326   Sikh Population of Amritsar. Indian J Community Med. 2016 Oct-Dec;41(4):263-267.

327   10. Meo SA, Zia I, Bukhari IA, Arain SA. Type 2 diabetes mellitus in Pakistan:

328   Current prevalence and future forecast. J Pak Med Assoc. 2016 Dec;66(12):1637-1642.

329   11. Al Hayek AA, Robert AA, Al Saeed A, Alzaid AA, Al Sabaan FS. Factors Associated

330   with Health-Related Quality of Life among Saudi Patients with Type 2 Diabetes

331   Mellitus:A Cross-Sectional Survey. Diabetes Metab J. 2014 Jun;38(3):220-9. doi:

332   10.4093/dmj.2014.38.3.220. Epub 2014 Jun 17.

333   12. Sepúlveda E, Poínhos R, Constante M, Pais-Ribeiro J, Freitas P, Carvalho D. health-

334   related quality of life in type 1 and type 2 diabetic patients in a Portuguese central public

335   hospital. Diabetes Metab Syndr Obes. 2015 Apr 29;8:219-26. doi:

336   10.2147/DMSO.S80472. eCollection 2015.

337   13. Imayama I, Plotnikoff RC, Courneya KS, Johnson JA. Determinants of quality of life in

338   adults with type1 and type 2 diabetes. Health Qual Life Outcomes. 2011 Dec 19;9:115.

339   doi: 10.1186/1477-7525-9-115.

340   14. Golicki D, Dudzińska M, Zwolak A, Tarach JS. Quality of Life in Patients with Type

341   2 Diabetes in Poland – Comparison with the General Population Using the EQ-5D

342   Questionnaire. Adv Clin Exp Med. 2015 Jan-Feb;24(1):139-46. doi:

343   10.17219/acem/38137.

344   15. Chrvala CA, Sherr D, Lipman RD. Diabetes self-management education for adults with

345   type 2 diabetes mellitus: A systematic review of the effect on glycemic control. Patient

346   Educ Couns. 2016 Jun;99(6):926-43. doi: 10.1016/j.pec.2015.11.003. Epub 2015 Nov 22.

347   16. Wichit N, Mnatzaganian G, Courtney M, Schulz P, Johnson M. Randomized controlled

348   trial of a family-oriented self-management program to improve self-efficacy, glycemic

349   control and quality of life among Thai individuals with Type 2 diabetes. Diabetes Res

350   Clin Pract. 2017 Jan;123:37-48. doi: 10.1016/j.diabres.2016.11.013. Epub 2016 Nov 19.

351   17. Younis BB, Shahid A, Arshad R, Khurshid S, Masood J. Charcot osteoarthropathy in type

352   2 diabetes persons presenting to specialist diabetes clinic at a tertiary care hospital. BMC

353   Endocr Disord. 2015 Jun 12;15:28. doi: 10.1186/s12902-015-0023-4.

354   18. Jamal A, Khan SA, AlHumud A, Al-Duhyyim A, Alrashed M, Bin Shabr F, et al.

355   Association of Online Health Information–Seeking Behavior and Self-Care Activities

356   Among Type 2 Diabetic Patients in Saudi Arabia. J Med Internet Res. 2015 Aug

357   12;17(8):e196. doi: 10.2196/jmir.4312.

358   19. Poulimeneas   D, Grammatikopoulou   MG, Bougioukli   V, Iosifidou   P, Vasiloglou

359   MF, Gerama MA, et al. Diabetes knowledge among Greek Type 2 Diabetes Mellitus

360   patients.   Endocrinol   Nutr. 2016   Aug-Sep;63(7):320-6.   doi:

361   10.1016/j.endonu.2016.04.008. Epub 2016 Jun 3.

362   20. Jeppesen KM, Hull BP, Raines M and Miser WF. A Validation Study of the Spoken

363   Knowledge in Low Literacy in Diabetes Scale (SKILLD). J Gen Intern Med. 2012

364   Feb;27(2):207-12. doi: 10.1007/s11606-011-1900-9. Epub 2011 Oct 18.

365   21. Masood I, Saleem A, Hassan A, Umm-E-Kalsoom, Zia A, Khan AT. Evaluation of

366   diabetes awareness among general population of Bahawalpur, Pakistan. Prim

367   Care Diabetes. 2016 Feb;10(1):3-9. doi: 10.1016/j.pcd.2015.06.004. Epub 2015 Jun 29.

368   22. Al-Aboudi IS, Hassali MA, Shafie AA. Knowledge, attitudes, and quality of life of type 2

369   diabetes patients in Riyadh, Saudi Arabia. J Pharm Bioallied Sci. 2016 Jul-Sep;8(3):195-

370   202. doi: 10.4103/0975-7406.171683.

371   23. Binh T, Phuong P, Nhung. Knowledge and associated factors towards type 2 diabetes

372   among a rural population in the Red River Delta region, Vietnam. Rural Remote

373   Health. 2015 Jul-Sep;15(3):3275. Epub 2015 Sep 26.

374   24. Quang LN, Ha NT, Viet NQ. Study on knowledge, attitude and practices about control of

375   diabetes in ThaiBinh population, 2011. Vietnam Journal of Practical

376   Medicine2012; 7(834): 127-132.

377   25. Murata GH, Shah JH, Adam KD, Wendel CS, Bokhari SU, Solvas PA, et L. Factors

378   affecting diabetes knowledge in Type 2 diabetic veterans. Diabetologia. 2003

379   Aug;46(8):1170-8. Epub 2003 Jul 11.

380   26. Al-Maskari F, El-Sadig M, Al-Kaabi JM, Afandi B, Nagelkerke N, Yeatts KB.

381   Knowledge, attitude and practices of diabetic patients in the United Arab Emirates. PLoS

382   One. 2013;8(1):e52857. doi: 10.1371/journal.pone.0052857. Epub 2013 Jan 14.

383   27. Al-Adsani AM, Moussa MA, Al-Jasem LI, Abdella NA, Al-Hamad NM. The level and

384   determinants of diabetes knowledge in Kuwaiti adults with type 2

385   diabetes. Diabetes Metab. 2009 Apr;35(2):121-8. doi: 10.1016/j.diabet.2008.09.005. Epub

386   2009 Feb 27.

387   28. Hashim MJ, Mustafa H, Ali H . Knowledge of diabetes among patients in the United

388   Arab Emirates and trends since 2001: a study using the Michigan Diabetes Knowledge

389   Test. East Mediterr Health J. 2017 Jan 23;22(10):742-748.

390   29. Manjunath K, Christopher P, Gopichandran V, Rakesh PS, George K, Prasad JH. Quality

391   of Life of a Patient with Type 2 Diabetes: A Cross-Sectional Study in Rural South India. J

392   Family Med Prim Care. 2014 Oct-Dec;3(4):396-9. doi: 10.4103/2249-4863.148124.

393   30. Sidawi B, Al-Hariri MT. The Impact of Built Environment on Diabetic Patients: The

394   Case of Eastern Province, Kingdom of Saudi Arabia. Glob J Health Sci. 2012 Jun

395   13;4(4):126-38. doi: 10.5539/gjhs.v4n4p126.

396   31. Al-Bannay HR, Jongbloed LE, Jarus T, Alabdulwahab SS, Khoja TA, Dean E. Outcomes

397   of a type 2 diabetes education program adapted to the cultural contexts of Saudi women.

398   A   Pilot   Study.   Saudi   Medical   Journal.   2015   Jul;36(7):869-73.   doi:

399   10.15537/smj.2015.7.11681.

400