Knowledge of Complications of Type 2 Diabetes Mellitus among Patients Visiting the Diabetes Center in Health Care Centers Makkah, KSA, 2021

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Abstract:

Background: To reduce morbidity and mortality, awareness regarding diabetes and its complications is necessary. This study aimed at assessing the level of knowledge, regarding complications of diabetes mellitus among patients with type 2 diabetes in health care centers, Makkah region.**Methods:** A cross-sectional study was carried out recruiting patients with diabetes from the health care centers, Makkah region. Overall, 263 patients with diabetes were enrolled in this study. A pretested questionnaire was filled by the interviewer with face to face interview. Levels of knowledge were determined by calculating the scores. **Results:** On average, the level of knowledge were high, Age and gender, marital status, occupation and education were significant predictors of knowledge. **Conclusions:** High level of knowledge was found in this surveyed community. The current study suggests the need of structured educational programs on diabetes and its complications on a regular basis to assist patients in living a productive life.*Keywords:* Knowledge, complications, Diabetes Mellitus, Type 2 Diabetes.

Introduction:

Diabetes mellitus (DM) appears to be a global epidemic and an increasingly major non-communicable disease threatening both affluent and non-affluent society **(Obirikorang et al., 2016)**. Diabetes is one of the major causes of early illness and death worldwide. Type 2 diabetes affects approximately 13 percent of the United States population, and the worldwide prevalence is estimated at 9.3 percent in adults, equivalent to 463 million people **(Centers for Disease Control and Prevention. 2020; Yuen et al., 2019)** . Type 2 diabetes accounts for over 90 percent of patients with diabetes (Yuen et al., 2019).

The World Health Organization (WHO) has reported that Saudi Arabia ranks the second highest in the Middle East, and is seventh in the world for the rate of diabetes. It is estimated that around 7 million of the population are diabetic and almost around 3 million have pre-diabetes. Even more worrying perhaps, is the increasing pattern of diabetes noted in Saudi Arabia in the recent past. In fact, diabetes has approximately registered a ten-fold increase in the past three eras in Saudi Arabia. Diabetes mellitus (DM) has been found to be related to high mortality, morbidity and vascular complications, accompanied by poor general health and lower quality of life. In Saudi Arabia, DM is quickly reaching disturbing proportions and becoming a significant cause of medical complications and even death **(Abdulaziz Al Dawish et al., 2016)**.

Most diabetics have poor knowledge of their disease and are unaware of its complications in study about knowledge and awareness in patients about type 2 diabetes mellitus (DM) In assessing 120 DM Pakistani Patients **(Habib& Aslam., 2003)**. Several studies confirmed a low level of awareness among the diabetic patients regarding long term and short term complication as ischemic heart disease and stroke **(O'Sullivan et al., 2009; Murugesan et al., 2007)** .

They also supported that many sufferers become aware that they have diabetes, only when they develop one of its life-threatening complications. Based on this issue, healthcare professionals as well as public policy makers are must be well aware of the public health impact of diabetes. Much effort has been devoted to educate the public about diabetes through various forms of media. Therefore, this study aimed to assess the level of knowledge regarding complications of diabetes mellitus and associated factors among type 2 diabetic patients and determine their needs to provide adequate care for patients.

MATERIALS &METHODS

Materials

Study design:a cross-sectional studywas utilized to conduct the study.

Setting: The study was conducted in health care centers, Makkah region.

Study subjects: The study was conducted among all type 2 diabetic patients (263 patients)who were on medication for more than 1 year and ≥ 18 years old visiting health care centers, Makkah region, during the February to April, 2021 .

Tools: The data was collected through interviewquestionnaire that was developed by the researchers after reviewing the related literature**(Sabri et al., 2007; Mohieldein et al., 2011)**. It was translated in a simple Arabic language to suit the understanding level of the entire study subjects.The questionnaire containing four sections.First section: containing items related to demographic data as age, sex, marital status and occupation.Second section compromising questions to assess the general information regarding diabetes mellitus complications as heart diseases and stroke. Third section consisted of questions to assess the knowledge complications of diabetes mellitus that resulting from hyperglycemia.Forth section added questions to assess the knowledge about hypoglycemia complications.

Method:

- An approval to carry out the study was obtained from the responsible authorities after explaining of the purpose of the study and the date and time of data collection.
- The study tool was developed by the researchers after a thorough review of relevant literature **(Sabri et al., 2007; Mohieldein et al., 2011)**and translated into Arabic language.
- The study tool was tested for content validity by five (5) experts in the field of the study. Their opinions elicited regarding the format, layout, consistency, accuracy, and relevancy of the tool.
- The study tool was tested for reliability using Cronbach's coefficient alpha reliability method. The reliability result was = 0.781.
- The pilot study was carried out on 25 participants in order to test the clarity and applicability of the constructed tool and was excluded from the study. The pilot study has also served to estimate the time needed for each subject to fill in the questionnaire.
- Data was collected by the researcher by interviewing each patient to clarify the questions. Each interview lasts from 15-30 minutes
- Data collection started from the mid of Feb to April 2021.

Statistical analysis: The data were coded and introduced to the Statistical Package of Social Sciences (SPSS, version 22).The data were analyzed to present the findings in the descriptive and inferential statistics. The descriptive statistics include frequencies and percentages for categorical variables, while means, median and standard deviations were used to summarize numerical data. The significant associations between demographic and background variables will be detected at < 0.05 significance level.

Ethical considerations: The researcher described the aim and objectives of the study for the residents and asks them to provide a written consent. No names required to assure confidentiality of data and all information were kept confidential only for this study purposes.

Results:

Table I: frequency distribution of the participant's sociodemographic characteristics:

This table showed that near half of participants (494.4%) aged from 50-70 years of age with mean age of 64.673±14.894. Approximately two thirds of them were married (82.5%), illiterate and primary education (60.5%), and unemployed (58.9%) and have a family history of diabetes (65.8%). While a majority of them were married (82.5%), having knowledge about DM complications from their doctors (81.4%) with 6-10 years duration of Diabetes Mellitus (68.8%).

	N	%
Age		
<40	9	3.4
40-50	27	10.3
50-60	59	22.4
60-70	71	27.0
70-80	45	17.1
>80	52	19.8
Range	13-95	
Mean±SD	64.673±14.894	
Gender		
Female	163	62.0
Male	100	38.0
Marital status		

Single	6	2.3
Married	217	82.5
Divorced	5	1.9
Widow	35	13.3
Level of education		
Illiterate	111	42.2
Primary	48	18.3
Intermediate	33	12.5
High School	44	16.7
College and Above	27	10.3
Occupation		
Employee	28	10.6
Retired	80	30.4
Unemployed/Houswife	155	58.9
Duration of Diabetes Mellitus		
<1y	6	2.3
1-5y	76	28.9
6-10y	71	27.0
>10y	110	41.8
Family history		
No	90	34.2
Yes	173	65.8
Has your doctor for your diabetes ever talked to you about Complications of DM?		
No	49	18.6
Yes	214	81.4
Source of knowledge about complication		
Diabetologists	58	22.1
Family Medicine doctors	135	51.3
Other doctors	5	1.9
Relatives	28	10.6
Social media	22	8.4

Books, Papers	1	.4
Others	14	5.3

Table II: frequency distribution of the participants' general knowledge about complications of DM:

This table revealed that majority of study participants has general knowledge about complications of DM, complications due to hyperglycemia, and complications due to hypoglycemia. While a minority of participants (37.3%) having knowledge about Sexual impairment as a complications of DM.

	I Don't know		I know	
	N	%	N	%
General Knowledge about complications of DM				
Do you Know If DM can lead to Stroke?	41	15.6	222	84.4
Do you Know If DM can lead to Heart disease?	29	11.0	234	89.0
Do you Know If DM can lead to loss of vision?	8	3.0	255	97.0
Do you Know If DM can lead to the Renal disease?	12	4.6	251	95.4
Do you Know If DM can lead to Peripheral neuropathy?	52	19.8	211	80.2
Do you Know If DM can lead to Amputation?	11	4.2	252	95.8
Do you Know If DM can lead to Poor wound healing?	8	3.0	255	97.0
Do you Know If DM can lead to Dental Problem?	52	19.8	211	80.2
Do you Know If DM can lead to Sexual impairment?	165	62.7	98	37.3

Knowledge of hyperglycemia and hypoglycemia complications			
The knowledge about complications due to hyperglycemia			
Increase thirst	25	9.5	238	90.5
Increase urination	18	6.8	245	93.2
Blurred vision	25	9.5	238	90.5
Fatigue	24	9.1	239	90.9
Weight loss	82	31.2	181	68.8
The knowledge about complications due to hypoglycemia			
Palpitation	28	10.6	235	89.4
Tremor	23	8.7	240	91.3
Increase sweating	27	10.3	236	89.7
Dizziness	23	8.7	240	91.3
Increase hunger	28	10.6	235	89.4
Loss of consciousness	33	12.5	230	87.5

Table III and figure I: distribution of the level of participants total knowledge about complications of DM:

This table shoed a high level of participants information of general knowledge about DM, complications due to hyperglycemia, and complications due to hypoglycemia with a high Total knowledge (89.7%).

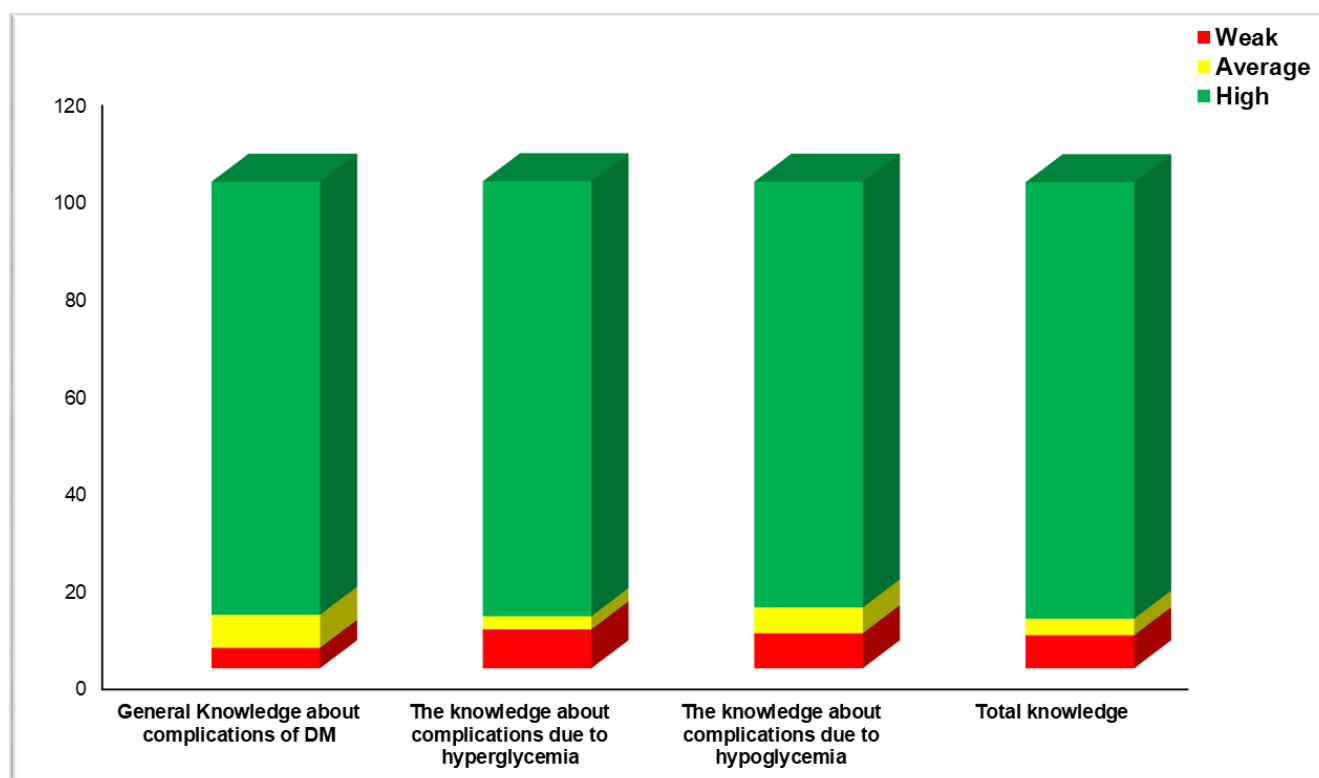|	Weak		Average		High		Total score	
	N	%	N	%	N	%	Range	Mean±SD
General Knowledge about complications of DM	11	4.2	18	6.8	234	89.0	0-9	7.563±1.552
The knowledge about complications due to hyperglycemia	21	8.0	7	2.7	235	89.4	0-5	4.333±1.262
The knowledge about complications due to hypoglycemia	19	7.2	14	5.3	230	87.5	0-6	5.383±1.562
Total knowledge	18	6.8	9	3.4	236	89.7	0-20	17.23±3.822

Table IV: significance difference between general Knowledge about complications of DM and demographic data:

It was noticed that there was a significant difference between level of general Knowledge about complications of DM and participants' level of education.

Demographic data		N	General Knowledge about complications of DM			F or T	ANOVA or T-test	
			Mean	±	SD		Test value	P-value
Age	<40	9	7.889	±	0.782	f	1.923	0.091
	40-50	27	7.926	±	1.299			
	50-60	59	7.932	±	1.015			
	60-70	71	7.282	±	2.126			
	70-80	45	7.244	±	1.836			
	>80	52	7.558	±	0.826			
Gender	Female	163	7.607	±	0.952	t	0.595	0.553
	Male	100	7.490	±	2.209			
Marital status	Single	6	8.167	±	0.408	f	1.328	0.266
	Married	217	7.479	±	1.681			
	Divorced	5	7.600	±	0.894			
	Widow	35	7.971	±	0.453			
Level of education	Illiterate	111	7.459	±	1.432	f	3.252	0.013*
	Primary	48	7.063	±	2.128			
	Intermediate	33	8.212	±	1.111			
	High School	44	7.818	±	1.559			
	College and Above	27	7.667	±	0.832			
Occupation	Employee	28	7.679	±	1.278	f	0.332	0.718
	Retired	80	7.450	±	2.311			
	Unemployed /Houswife	155	7.600	±	1.029			
Duration of Diabetes Mellitus	<1y	6	7.000	±	1.549	f	0.401	0.753
	1-5y	76	7.539	±	1.280			
	6-10y	71	7.507	±	1.788			
	>10y	110	7.645	±	1.571			
Family history	No	90	7.356	±	1.939	t	-1.566	0.118

	Yes	173	7.671	±	1.299		
Has your doctor for your diabetes ever talked to you about Complications of DM?	**No**	49	7.306	±	2.311	t	-1.285	0.200
	Yes	214	7.621	±	1.319		

Table V: significance difference between Knowledge about hypoglycemia and demographic data:

There was statistical significant difference between the patients regarding complications of hyperglycemia, in relation to gender, education, occupation, family history of DM and diabetic knowledge gained from doctors.

Demographic data		**N**	**The knowledge about complications due to hyperglycemia** **Mean ± SD**	**F or T**	**ANOVA or T-test**	
					Test value	**P-value**
Age	**<40**	9	4.778 ± 0.441	f	1.923	0.091
	40-50	27	4.593 ± 0.694			
	50-60	59	4.458 ± 1.056			
	60-70	71	4.070 ± 1.624			
	70-80	45	4.089 ± 1.564			
	>80	52	4.577 ± 0.825			
Gender	**Female**	163	4.656 ± 0.661	t	5.475	0.000*
	Male	100	3.820 ± 1.760			
Marital status	**Single**	6	4.833 ± 0.408	f	2.175	0.091
	Married	217	4.249 ± 1.365			
	Divorced	5	5.000 ± 0.000			
	Widow	35	4.714 ± 0.458			
Level of education	**Illiterate**	111	4.486 ± 1.086	f	2.662	0.033*
	Primary	48	3.854 ± 1.713			

	Intermediate	33	4.333	±	1.451			
	High School	44	4.295	±	1.193			
	College and Above	27	4.667	±	0.555			
Occupation	**Employee**	28	4.571	±	0.690	f	12.956	0.000*
	Retired	80	3.763	±	1.809			
	Unemployed /Houswife	155	4.594	±	0.850			
Duration of Diabetes Mellitus	**<1y**	6	3.833	±	2.041	f	0.713	0.545
	1-5y	76	4.474	±	0.986			
	6-10y	71	4.254	±	1.391			
	>10y	110	4.327	±	1.314			
Family history	**No**	90	3.911	±	1.653	t	-4.058	0.000*
	Yes	173	4.561	±	0.942			
Has your doctor for your diabetes ever talked to you about Complications of DM?	**No**	49	3.857	±	1.803	t	-2.991	0.003*
	Yes	214	4.449	±	1.085			

Table VI: significance difference between Knowledge about hyperglycemia and demographic data:

There was statistical significant difference between the patients regarding complications of hypoglycemia, in relation to age, gender, education, occupation, marital status, family history of DM and diabetic knowledge gained from doctors.

Demographic data		**N**	**The knowledge about complications due to hypoglycemia**	**F or T**	**ANOVA or T-test**	
			Mean ± SD		**Test value**	**P-value**
Age	**<40**	9	5.667 ± 1.000	f	2.657	0.023*
	40-50	27	5.815 ± 0.483			

	50-60	59	5.458	±	1.369		
	60-70	71	4.930	±	2.038		
	70-80	45	5.200	±	1.902		
	>80	52	5.808	±	0.864		
Gender	**Female**	163	5.847	±	0.672	t	6.595	0.000*
	Male	100	4.630	±	2.196			
Marital status	**Single**	6	6.000	±	0.000	f	2.756	0.043*
	Married	217	5.258	±	1.696			
	Divorced	5	5.800	±	0.447			
	Widow	35	6.000	±	0.000			
Level of education	**Illiterate**	111	5.620	±	1.271	f	3.181	0.014*
	Primary	48	4.750	±	2.129			
	Intermediate	33	5.152	±	1.822			
	High School	44	5.455	±	1.405			
	College and Above	27	5.630	±	1.079			
Occupation	**Employee**	28	5.679	±	0.772	f	19.183	0.000*
	Retired	80	4.538	±	2.261			
	Unemployed/Houswife	155	5.768	±	0.952			
Duration of Diabetes Mellitus	**<1y**	6	4.167	±	2.858	f	1.739	0.159
	1-5y	76	5.566	±	1.159			
	6-10y	71	5.254	±	1.730			
	>10y	110	5.409	±	1.599			
Family history	**No**	90	5.000	±	2.093	t	-2.910	0.004*
	Yes	173	5.584	±	1.161			
Has your doctor for your diabetes ever talked to you about Complications of DM?	**No**	49	4.592	±	2.318	t	-4.040	0.000*
	Yes	214	5.565	±	1.276			

Table VII: significance difference between total Knowledge about DM complications

and demographic data:

There was statistical significant difference between the patients regarding complications of DM, in relation to age, gender, education, occupation, marital status, family history of DM and diabetic knowledge gained from doctors.

Demographic data		N	Total knowledge			F or T	ANOVA or T-test	
			Mean	±	SD		Test value	P-value
Age	**<40**	9	18.333	±	1.414	f	2.500	0.031*
	40-50	27	18.333	±	2.166			
	50-60	59	17.847	±	2.833			
	60-70	71	16.282	±	5.172			
	70-80	45	16.533	±	4.869			
	>80	52	17.942	±	1.614			
Gender	**Female**	163	18.110	±	1.975	t	4.641	0.000*
	Male	100	15.940	±	5.418			
Marital status	**Single**	6	19.000	±	0.632	f	2.599	0.05*
	Married	217	16.986	±	4.136			
	Divorced	5	18.400	±	0.894			
	Widow	35	18.686	±	0.718			
Level of education	**Illiterate**	111	17.586	±	3.404	f	2.762	0.028*
	Primary	48	15.667	±	5.216			
	Intermediate	33	17.697	±	3.754			
	High School	44	17.568	±	3.624			
	College and Above	27	17.963	±	1.990			
Occupation	**Employee**	28	17.929	±	2.210	f	9.899	0.000*
	Retired	80	15.750	±	5.556			
	Unemployed/Houswife	155	17.961	±	2.533			
Duration of Diabetes Mellitus	**<1y**	6	15.000	±	4.427	f	1.007	0.390
	1-5y	76	17.579	±	2.886			
	6-10y	71	17.014	±	4.448			
	>10y	110	17.382	±	3.924			

Family history	No	90	16.267 ± 5.061	t	-3.169	0.002*
	Yes	173	17.815 ± 2.861			
Has your doctor for your diabetes ever talked to you about Complications of DM?	No	49	15.755 ± 5.674	t	-3.158	0.002*
	Yes	214	17.636 ± 3.172			

Discussion:

Regarding the sociodemographic characters, the almost study population was within a mean age of 64 years, female, married, illiterate or primary education, unemployed, positive family history of DM, with more than 10 years of duration of DM. this finding is contiguous with (**Almalki et al., 2018; Al Amassi& Al Dakheel et al., 2017**). Although the prevalence of diabetes mellitus (DM) is high among populations in the Middle East and Gulf countries, patients often lack the knowledge and skills to self-manage their condition (**Almalki et al., 2018**).

Almost three decades ago, the population of the Kingdom of Saudi Arabia went huge changes in lifestyle, primarily leading to decreased physical activity and unhealthy eating habits. These changes have had a considerable negative impact on the health of the society. Indeed, this lifestyle transformation is believed to be responsible for the epidemic of non-communicable diseases and their complications in the country. It is thought that effective diabetes education and knowledge can improve self-management skills and glycemic control for patients with type 2 diabetes mellitus (T2DM) and positively affect the health system. However, there is still a lack of studies that have assessed awareness and knowledge among diabetic patients in Saudi Arabic despite the high prevalence. Cross-sectional studies have suggested that the prevalence of T2DM in Saudi ranges from 10% to 30% (**Almalki et al., 2018**).

These governmental efforts are explained in our study finding that showed a high level of general knowledge, knowledge about the complication due to hyperglycemia and hypoglycemia among the study population. These results not in line with **Almalki et al.,**

2018 and **Rahaman et al., 2017**who found that the majority of the screened T2DM patients had poor knowledge about diabetes.

Based on specific diabetic complication as diabetic neuropathy, a study done by**Almalki et al., 2018** and found that almost two-thirds of screened T2D were considered to have good knowledge aboutdiabetic neuropathy. The good knowledge group tends to have a longer duration of T2D, more likely to have a college degree, and tend to have non - significantly better A1c control. These results are supported by our study finding.

It was noticed that a statistically significant difference was found between the participant general knowledge in relation to their educational level. Intermediate education showed a high level of knowledge. This finding is consistent with **Rahaman et al., 2017** who found that educated patients compared to illiterates reported significantly greater knowledge.

Furthermore, a statistically significant difference was found between the participant knowledge about complication due to hyperglycemia, hypoglycemia and total knowledge in relation to theirgender (female), education (college and above), positive family history, previous received information from doctor.

In 2019, a study done by **Bukhsh et al., 2019** toexplore the relationship of disease knowledge with glycemic control and self-care practices in adult Pakistani people diabetes. The study results found that disease knowledge was significantly associated with patient's gender, level of education, family history of diabetes. These finding are in harmonious with our study findings.

Another study done by **Amankwah-Poku., 2019** and conclude that Knowledge and awareness were higher about diabetes, with females having more knowledge and awareness than males. Significant differences were also found in the level of knowledge and awareness of students based on their discipline of study but not the number of years of study in the university. Also, students who engaged in physical exercise showed a higher level of general knowledge and awareness of type 2 diabetes. Finally, a family history of diabetes resulted in more knowledge and awareness of type 2 diabetes. These results are in line and positivity with or study results

Conclusion:

In conclusion, almost majority of screened T2D were considered to have good level of knowledge about general knowledge, complications due to hyperglycemia, hypoglycemia and overall knowledge. The good knowledge group tends to be females, single, highly educated,

has a longer duration of T2D, more likely to have a positive family history of DM, and have previous knowledge from doctor.

Recommendations:

Further educational programs to be established in order to increase public awareness and diabetic patient information in order to enhance positive attitude and maximize the level of compliance.

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