Knowledge, Attitude and Practices of Primary Care Physicians towards Diabetes diagnosis and management in Damietta District –Egypt

Sherehan Abdelsalam[1]; Eman Abd-Elrahman[2]; Ragaa El-Masry[1] ; Basem El-Deek [1]; Doaa Al Emam[1]

[1] Community Medicine Department, Faculty of Medicine, Mansoura University, Egypt
[2] Family Medicine, Ministry of Health and Population, Egypt

A B S T R A C T

Background: Despite the significant advances in the diabetes diagnosis and treatment, there is a wide gap between optimum management goals and outcomes. Lack of up-to-date knowledge, inappropriate attitudes, and malpractice of primary care physicians (PCPs) as regards diabetes control might have a significant role in the failure to achieve management goals. **Objectives:** The current work was conducted to assess the knowledge, attitudes and practices of PCPs towards Diabetes in Egypt and to highlight the PCPs opinions or recommendations to improve diabetic care. **Methods**: A descriptive cross-sectional study was carried out including all PHC centers and units in Damietta district in Damietta governorate. A predesigned pre-tested interview questionnaire was basically divided into five sections. The first one included socio-demographic and professional characteristics of the participating physicians, the second, third and fourth sections were utilized to evaluate their knowledge, attitude and practice and the last one inquired about physicians' opinions to improve diabetic care. **Results**: Data showed that 57.2, 58.2, and 62.6 %, of PCPs had lack of knowledge, inappropriate attitudes and poor practices towards Diabetes diagnosis and management, respectively. The most significant predictive factors for inappropriate KAP were having Bachelor or Master degrees only and working experience less than 5 years. There is a need for educational programs targeting PCPs in order to combat such a problem. **Conclusion**: PHC physicians' knowledge, attitude, and practice scores towards diabetes are poor. There is necessity for improving KAP among PHC physicians regarding screening, effective treatment, prevention of diabetic complications and educating diabetics.

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disease characterized by chronic abnormal high blood glucose level hyperglycaemia with disturbed carbohydrate, lipid and protein metabolism. It is linked to defective insulin release, insulin action (resistance), or both.[1] In 2021, Approximately 537 million adults (20-79 years)

are living with diabetes. The total number of people living with diabetes is projected to rise to 643 million by 2030 and 783 million by 2045. Three in four adults with diabetes live in low- and middle-income countries. Moreover, Diabetes is responsible for 6.7 million deaths in 2021 - 1 every 5 seconds. There are 1 in 6 adults (73 million) are living with diabetes in in the Middle East and North Africa (MENA) and it is

Corresponding Author: Doaa Al emam , Department of. Public Health, lecturer of Public Health and Preventive Medicine, Faculty of Medicine, Mansoura University, Egypt. Email: dr_doaashokry@hotmail.com, dr_doaashokry@mans.edu.eg

expected to reach 95 million by 2030 and 136 million by 2045.[2]

Egypt was listed among the world highest ten countries in the number of individuals with DM. The prevalence of DM in Egypt is about 15.56% in adult individuals aged 20-79 years, with an annual mortality of 86,478. In 2013, Egypt was estimated to have 8.222.600 million diabetic patients and about 2.2 million with pre-diabetes. Unfortunately, it is expected that such number will be increased to 13.1 million by the year 2035. Moreover, reports indicated that 43% of Egyptian diabetic cases and most pre-diabetes cases are likely undiagnosed [3]. In 2019, IDF estimated that Egypt is the 9th country worldwide with about 8,850,400 cases and a prevalence of 15.2% in adults. By 2045, Egypt expected to be the 7th country worldwide.[4]

Besides the increasing numbers of subjects diagnosed with DM, it remains undiagnosed in numerous other subjects. Diabetes or prediabetes may occur in the near future. Recognition of subjects at risk of diabetes, along with subjects who might already be diabetics but in whom diagnosis has not yet been established, has a significant role in decreasing diabetes burden. Thus, rapid diagnosis and therapy could prevent or delay progression of DM and decrease the risk of associated adverse events.[5]

Primary care physician (PCP) is at the forefront of DM care as the majority of diabetic cases attend primary care service, particularly in developing countries with poor health services and also with an extreme shortage of specialist.[6] They have a significant role in both care and educating diabetics. PCPs have the capability of augmenting the knowledge and motivating diabetic patients to attain a healthy lifestyle for a good metabolic control and thus protecting against adverse events.[7] They should know about all aspects of DM care, such as the screening for detection of individuals at an enhanced risk of DM, counseling at-risk patient regarding physical exercise and joining them in a healthy diet program. Another important aspect is to tailor a treatment plan for an individual patient and to discuss the treatment targets with the patient. It is the physician responsibility to early detect and treat DM complications.[8] They also plays a vital role in fostering a lasting change in patient behaviors, motivating patients toward adherence to diabetes-related regimens and helping them to make proper decisions leading to favorable health outcomes.[9]

There is evidence that PCPs' negative and misguided attitudes toward diabetes screening and management have a negative impact on adherence of patients to diabetes-related regimens. Misconceptions of PHPs about diabetes especially with regards to patient autonomy, the seriousness of diabetes, and the value of tight glycemic control; contribute to poor quality of care provided to patients with diabetes.[10] PCPs should offer optimum care of diabetic patients to avoid complications and to improve life quality. The poor knowledge and improper practice regarding diagnosis, assessment, and treatment among health-care workers, long interval between patient's visit and short consultation time because of high patient load are the main obstacles the management goals of DM. So, the continuous medical education that addresses the importance of healthcare professionals' attitudes and increases their diabetes care knowledge will be translated into the improvement of the quality of care for diabetes patients.[11]

With increasing prevalence of diabetes mellitus worldwide, primary health care physicians are the main providers of diabetes care and their knowledge, attitudes and practices are important to achieve goals in diabetes management. The current work was conducted to assess the knowledge, attitudes, and practices of PCPs towards Diabetes in Egypt and to highlight the PCPs opinions or recommendations to improve diabetic care.

METHOD

A descriptive cross-sectional study was performed in the period from January 2019 to December 2019 in primary health-care centers (PHCs) and units at Damietta district, Damietta Governorate, Egypt. Damietta district has 9 PHCs and 13 primary health care units and the total numbers of PCPs in it about 584 physicians.

The study group included all PCPs (584) on duty. They were informed about study aim and were encouraged to express their experiences. A total 500 completed the questionnaire All PCPs on duty (general practitioners, resident physicians, family physicians, specialist physicians.

Table (1): Association of socio-demographic and professional characteristics of studied PCPs with lack of knowledge, inappropriate attitudes and practices.

Factors	Total N=500	Lack of knowledge N (%)	Inappropriate attitudes N (%)	Inappropriate practices N (%)
Age/years				
<32	260	184 (70.8) *	160 (61.5)	188 (72.3) *
≥32 (r)	240	102 (42.5)	131 (54.6)	125 (52.1)
Gender				
Male	190	105 (55.3)	105 (55.3)	118 (62.1)
Female	310	181 (58.4)	186 (60)	195 (62.9)
Marital status				
Married (r)	350	182 (52)	185(52.9)	211 (60.3)
Unmarried	150	104 (69.3) *	106 (70.7) *	102 (68)
Residence				
Rural	224	162(72.3) *	131 (58.5)	155 (69.2) *
Urban (r)	276	124(44.9)	160 (58)	158 (57.2)
Qualification				
Bachelor	304	211 (69.4) *	155 (50.9) *	235 (77.3) *
Master	102	32 (31.4)	82 (80.4) *	40 (39.2)
MD	7	4 (57.1)	2 (28.6)	5 (71.4) *
Diploma	73	35 (47.9)	49 (67.1)	32 (43.8) *
Fellowship (r)	14	4 (28.6)	3 (21.4)	1 (7.1)
Personal history of diabetes				
-VE	430	242 (56.3)	258 (60) *	268 (62.3)
+VE (r)	70	44 (62.9)	33 (47.1)	45 (64.3)
Family history of diabetes				
-VE	221	151(68.3) *	151 (68.3) *	131 (59.3)
+VE (r)	279	135 (48.4)	140 (50.2)	182 (65.2)
Working area				
Urban (r)	289	162(56.1)	173 (59.9)	155 (53.6)
Rural	211	124(58.8)	118 (55.9)	158 (74.9) *
Working experience				
<5 years	136	99 (72.8) *	116 (85.3) *	92 (67.6) *
5-10 years	192	100 (52.1)	96 (50)	135 (70.3) *
>10 years (r)	172	87 (50.6)	79 (51.7)	86 (50)
Job title				
G-P	263	179 (68.1) *	184 (69.96) *	203 (77.2) *
Resident	89	55 (61.8) *	51 (57.3) *	64 (71.9) *
Family physician (r)	45	6 (13.3)	25 (55.6)	6 (13.3)
Other specialists	103	46 (44.7)	31 (30.1)	40 (38.8)
Attending any diabetic training course				
No(r)		180 (53.4)	205 (60.8)	212 (62.9)
Yes		106 (65) *	86 (52.8)	101 (62)

* Statistically significant, median age (32) was taken as an arbitrary cut off point, (r): reference group

Table (2): predictors of lack of knowledge, inappropriate attitudes and practices in studied PCPs.

Predictors	Lack of knowledge		Inappropriate attitudes		Inappropriate practices	
	p	**AOR (95% CI)**	**p**	**AOR (95% CI)**	**p**	**AOR (95% CI)**
Age/years						
<32	0.001*	3.21 (1.59-6.47)			0.87	1.06 (0.53-2.10)
≥32 (r)						
Marital Status						
Unmarried	0.66	1.14 (0.64-2.05)	<0.001*	3.00 (1.74-5.19)		
Married (r)						
Residence						
Rural	<0.001*	2.48 (1.60-3.85)				1.19 (0.77-1.84)
Urban (r)						
Qualification						
Bachelor	0.548	1.59 (0.35-7.28)		3.8 (1.04-13.94)		10.1 (1.07-94.85)
Master	0.706	0.76 (0.18-3.2)	<0.001*	15.03 (3.83-58.98)		5.12 (0.56-47.05)
MD	0.504	2.11 (0.24-18.94)		1.47 (0.18-11.72)	0.030*	22.8 (1.3-382.7)
Diploma	0.606	1.46 (0.35-6.16)		4.16 (0.41-42.26)	0.073	7.7 (0.83-72.07)
Fellowship (r)						
Personal history of diabetes						
-VE				1.13 (0.62-2.06)		
+VE(r)						
Working area						
Urban (r)						
Rural						1.57 (0.99-2.49)
Family history of diabetes						
-VE	<0.001*	2.30 (1.59-3.32)	0.14	1		
+VE (r)		1		1.41 (0.89-2.20)		
Working experience						
<5 years		2.65 (1.61-4.25)	0.001*	2.61 (1.57-4.3)		2.63 (1.39-4.96)
5-10 years		1.06 (0.81-1.63)		1.18 (0.78-1.78)		2.33 (1.004-5.40)
>10 years (r)						
Job title						
General practitioner	<0.001*	2.64(1.66-4.22)		3.86(2.32-5.76)	0.001*	4.49 (1.81-11.15)
Resident physician	0.4	2.01(0.82-3.57)	0.18	1.14(0.93-4.44)	0.003*	3.05 (1.46-6.35)
Family physician	0.002*	0.19(0.07-0.48)		2.05(0.81-4.396)	0.008*	0.27 (0.10-0.72)
Other specialists (r)						
Attending any diabetic training course						
-VE (r)	<0.001*	1.62 (1.11-2.39)				
+VE						
Percent predicted=	75.8%		72.2%			
Model χ²=	155.2		131.81			

r:reference group

Data was collected through an anonymous self-administered questionnaire.[12] The questionnaire was basically divided into 5 sections:

Section 1: included socio-demographic and professional characteristics of the participating physicians such as sex, age, practice location (urban, rural), personal and family history of DM, qualifications (GP, family physicians or specialist), duration of practice, duration of experiences in family medicine and DM training courses.

Table (3): Recommendations of PCPs to improve diabetic care:

Recommendation of PCPs *	N=500	%
Increase number of diabetes mellitus training courses for primary health care providers	300	60
General diabetes and nutritional education programs has to be conducted at health care	200	40
Provide all medicines and vaccines that diabetic patient need (insulin- vitamin B12 tab or Amp – simvastatin, aspirin; pneumococcal vaccine- hemophilus influenza vaccines ....) in primary health care	120	24
Provide in primary health care all investigations that diabetic patient need	120	24
Registration of all diabetes mellitus cases	80	16
Diabetes care should be aligned with components of the Chronic Care Model	80	16
Increase the income of primary health-care providers	70	14
Screening programs for high-risk people, particularly overweight and obese adult persons with a family history of DM.	60	12
Relay information sharing between DM patient and the primary health care providers team for coordinated care and timely management alterations	57	11.4
The concept of the DM management team must be introduced in primary health care	47	9.4
Diabetes care should be patient-centered care	45	9
Education programs should incorporate DM self-management plans	40	8
Health authorities must create regular follow-up programs in health-care facilities	40	8
Guidelines must be published for DM treatment which are culturally suitable for Egyptian patients. Egyptian guidelines help standardize clinical practice for improvement of the care	30	6
Primary health care providers should seek evidence-based approaches	30	6
Increase number of studies about prevalence and risk factors of diabetes in Damietta governorate	30	6
Improving physicians motivational counseling skills	30	6

* Categories are not mutually exclusive

Section 2: assessed physicians' knowledge about risk factors of diabetes and diagnostic criteria of DM, monitoring of glycemia, assessment of diabetic patients at diagnosis, therapy, and follow-up, etc.

Section 3: assessed physicians' attitudes toward screening, diagnosis, therapy, patient's education, and self-evaluations of competencies as regards DM treatment, etc.

Section 4: assessed the self-reported physicians' practice regarding diagnosis, treatment, and health education of the diabetic patient, etc.

Section 5: inquired about physicians' recommendations to improve diabetic care.

Tool validation: The questionnaire underwent content validation by three public health experts and two experts in internal medicine. It was pre-tested for content, design, readability, and understanding among 40 PCPs (20 general practitioners, 12 family physicians, and 8 specialist physicians). Essential modifications were done so that this questionnaire became easily answered and provided correct data. These pre-test data were not used in final analysis. Cronbach's α was utilized to evaluate the internal consistency of questionnaire. The α coefficients of knowledge, attitude and practices were 0.80, 0.78 and 0.76, respectively, and thus confirmed adequate internal consistencies of the questions. Correctly answered questions were scored one whereas incorrectly answered questions or didn't know were scored zero. For the quantitative analysis median was taken as an arbitrary cutoff point for knowledge 16, attitude 6 and practice 18 so the studied group whose results equal or less than median was considered poor and those whose results more than the median were considered good.

Data analysis was performed using Statistical Package for Social Science (SPSS) version 21. The one-sample Kolmogorov-Smirnov test was applied to test the normality of data. Qualitative data were represented as numbers and percentages. Association between categorical variables was assessed by Chi-square test or Fisher exact test as appropriate. Significant predictors in the bivariate analysis were entered into regression model utilizing the forward Wald method.
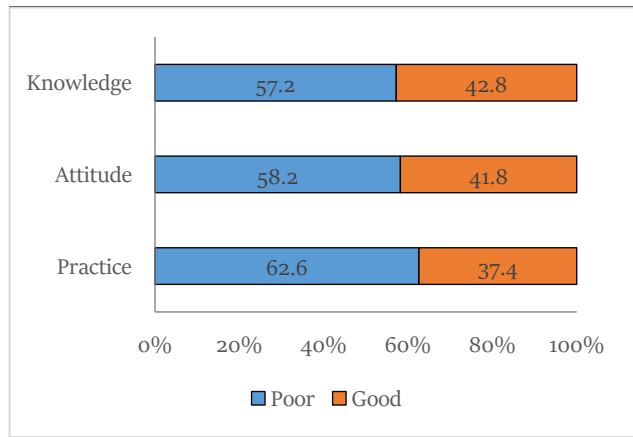
Figure (1): knowledge, attitude and practice frequencies among studied PCPs

Binary stepwise logistic regression analysis was used in predicting independent variables for lack of knowledge, poor attitudes, and poor practices. Significant predictors in the bivariate analysis were entered into regression model utilizing the forward Wald method. Adjusted odds ratios and their 95% confidence interval underwent calculation. P-value ≤ 0.05 was considered to be statistically significant.

RESULTS

The study included 500 PCPs with their mean age of 34.6 years; 62% of them were females. Seventy percent of the studied group were married, 55.2% live in urban residences. About 61% of them were Bachelor graduates, only 1.4% had an MD degree and 2.8% fellowship. Nearly 14% and 55.5 % had positive personal and family history of DM, respectively. Lack of knowledge, inappropriate attitudes and practices were reported in 57.2, 58.2 and 62.6 %, of the studied PCPs; respectively as shown in figure 1. In table 1, age below 32 years, being unmarried, rural residency, having Bachelor or Master degrees only, negative family history of diabetes, working experience for less than 5 years and being in the general practitioner position were significantly correlated with lack of knowledge. Similarly, being unmarried physicians, negative personal and family history of diabetes and having Bachelor or Master degrees only, working experience < 5 years and being in general practitioner position were significantly associated with a higher frequency of poor attitude. Poor practices were significantly linked to age below 32 years, rural residence, and having Bachelor or master's degrees only. Table (2) demonstrated logistic regression

results. Age below 32 years, rural residency family history of diabetes, working experience less than 5 years and being a general practitioner were significant predictors of lack of knowledge with a percent of 75.8%. While being unmarried, having Bachelor or master's degrees only, working experience less than 5 years, and being a general practitioner significantly predicted inappropriate attitude with a percent of 72.2%. Having bachelor's degree only, working experience from < 5 years and from 5-10 year and being a general practitioner or resident physicians were significant predictors of inappropriate practices with a percent of 71%. Table 3 shows that increasing number of training courses for primary care and provision of general diabetic and nutritional education messages to diabetic patients are the most important recommendation provided by studied physicians (60% and 40%, respectively). The availability of DM investigations, vaccines and treatment in primary care are recommended by one-quarter of the studied group.

DISCUSSION

The current study demonstrated that poor knowledge, attitudes and practices toward DM diagnosis and management were found among 57.2, 58.2, and 62.6 %, of the studied PCPs; respectively which is in agreement with a study in Suez, Egypt that demonstrated that about 51.7% and 56.7% of the enrolled FPs had inappropriate knowledge and practice scores, respectively in terms of diabetes treatment.[13] A study in Jazan region in KSA reported that more than 25% of PCPs showed inadequate knowledge grades while > 50% of them had suboptimal practice grades.[14] Poor knowledge about diabetes was also revealed between doctors[15] in Switzerland and in Nigeria who revealed that Nigerian physicians showed poor knowledge and poor practice grades as regards diabetes.[16]

In the present study, a family history of DM seems to affect levels of knowledge and attitude of diabetes (p-value<0.001). So, practitioners with a family history of DM had a better diabetic knowledge and attitude, and those with a positive personal history of DM had a better diabetic attitude in the present study; as subjects with family history might develop a personal sense of vulnerability which, consequently, might enhance their awareness.[17] Such results are supported

by a study[18] which concluded that family history was the most factor considerably linked to the perceived risk of DM development. However, stated that family members of patients having type 2 DM underestimate their own risk to develop DM.[19]

Being unmarried PCP is significantly linked to poor knowledge and attitude (p-value <0.001) among the studied group; that may be explained as marriage usually associated with re-evaluation of attitudes about health: As partners adopt to new lifestyles, they re-evaluate their current attitudes about health. During this important phase, couples are more likely to integrate new knowledge and skills toward healthy lifestyles as reported by Burke et al.[20]

The current study also reported that working experience years of PCPs significantly affected their KAP result as decreased experience years (less than 5 years) was found to increase risk of poor KAP with p-value (0.005, 0.001, 0.003; respectively). This could be due to the fact that in Egypt, we have a system of certification of practicing doctors so, senior physicians conversant with recent approaches regarding DM diagnosis and management. So, that there is need of continuous education and assessment of newly graduated doctors for DM care. Age less than 32 years was found to increase risk of poor knowledge and practice (p-value <0.001). Qualification also affected results of PHCPs knowledge and practice scores (p-value <0.001) in which bachelor's degree physicians significantly associated with higher frequency of poor knowledge and practice scores and physicians having fellowship degree are significantly associated with good attitude.[9] A study in Suez, Egypt showed that qualification of FPs was a major factor considerably affected their knowledge, whereas qualification as well as years of experience in family medicine significantly affected their practices ($P < 0.05$).[13] FPs who had experience ≥5 years significantly has a higher scored in practice compared with FPs with < 5 years (P = 0.035), however no statistically significant correlations existed in knowledge and attitudes (P = 0.313 and 0.844, respectively).

Also, Al Saleem et al.[14] in Saudi Arabia showed that the grades of knowledge and practice of participant PCPs were significantly higher in older, more experienced and highly qualified PCPs. As well as in a study[21] in Aseer region, KSA reported that there was a significantly positive association between PCPs' age

and experience years with scored of knowledge and practice. In contrast, Niroomand et al.[22] in Iran found that the physicians' KAP showed inverse relationships with the age. Though time since graduation in medicine and specialty showed inverse relationship with knowledge and practice, such relationships were along with the individuals' age. Khan et al.[23] in Saudi Arabia showed that the overall scores were significantly greater in doctors with 1-5 years of experience compared with doctors >5 years of practice ($P < 0.05$).

The current work showed that KAP grades of PCPs did not differ as regards gender. These results were consistent with other studies[21, 22] in Kingdom of Saudi Arabia but inconsistent with findings in other study[23] who revealed that knowledge and practice scores among female GPs were significantly lower compared with scores in males.

After regression analysis, Age less than 32 years, rural residence family history of diabetes, working experience < 5 years and being a general practitioner significantly predicted the lack of knowledge with a percent of 75.8%. Whereas being unmarried, having bachelor or master's degrees only, working experience less than 5 years, and being a general practitioner significantly predicted the inappropriate attitude among with a percent of 72.2%. Having bachelor's degree only, working experience from < 5 years and from 5-10 year and being a general practitioner or resident physicians significantly predicted the inappropriate practices with a percent of 71%.

Shifting to the physicians' recommendations to improve diabetic care, the increasing number of training courses for primary care and the provision of general diabetic and nutritional education messages to diabetic patients were the most important recommendation provided by studied physicians (60% and 40%, respectively). In a study in Suez, Egypt, the recommendations for better diabetic neuropathy management in health care facilities were providing practitioners with standardized guidelines (81.7%) and focusing on continuous medical education seminars and training (76.7%).[13]

CONCLUSION

In the light of the current results, it was clear that PHC physicians' knowledge, attitude, and practice grades towards diabetes in Damietta district are poor. The

current work had explored many aspects of DM-related KAP of PCPs and recognized the necessity for improving KAP among PHC physicians regarding screening, effective treatment, prevention of diabetic complications and educating diabetics.

Recommendations: Lack of up-to-date knowledge, inappropriate attitude, and poor practice between health-care providers as regards DM control may have a significant role in the failure to accomplish management goals. Suggested solutions to that include the following approaches (i) continuous medical education programs must be enforced for all PCPs (particularly those age less than 32 years, unmarried, rural residence; rural work and low working experience years especially those less than 5 years and Bachelor degree, GP) with an obligation to revise the previous supplied educational material. (ii) Interventional studies and evaluating the physicians KAP prior to and after educational programs are required. (iii) Provide studies that compare KAP of PCPs towards diabetes in PHC centers and units with those in the governmental hospitals. (iv) Further wide-scale and multicenter studies are warranted with a larger sample size to investigate KAP of physicians towards diabetes. (v) Providing PHPs with standardized protocols and algorithms (both handwritten and computerized) should be designed for the management of inpatient hyperglycaemia based on the up-to-date published guidelines for the guidance of the physicians.

Study limitations: This was across-sectional study, and thus causal associations cannot be assessed in such type of studies; so, interventional studies and evaluating KAP prior to and following educational programs are required. The utilization of our survey grid might be another limitation as there is no known evaluation grid of KAP towards diabetes. (The study tool was not validated on our population, but content validity and agreement were performed between individuals using Cronbach alpha that demonstrated better internal consistency). Another limitation of the study that it only included PCPs in PHC centers and units without including PCPs in governmental hospitals. Thus, we are unable to compare the PCPs in those two different health care settings. We should also be cautious in generalizing our study outcome to PCPs of Egypt, as the study only reflects KAP of PCPs in Damietta district in Damietta governorate.

Ethical approval
This research obtained its approval from IRB (Institutional Research Board) of Faculty of medicine with number MS/18.03.84. Written consent was obtained from all subjects. All obtained information was kept confidential.

Author contributions: Sherehan Abdelsalam, concept, design, drafting the manuscript, critical revision, and statistical analysis; Eman Abd-Elrahman, collection of data and drafting the manuscript; Ragaa El-Masry, concept, design, drafting the manuscript, and critical revision; Basem El-Deek, concept, design, drafting manuscript, and critical revision; Doaa Al emam, concept, design, drafting manuscript, critical revision, and statistical analysis.

Availability of data and material: The datasets collected during and/or underwent analysis during this work are available from the corresponding author on reasonable request

REFERENCES

1. Karamanou, M., Protogerou, A., Tsoucalas, G., Androutsos, G. and Poulakou-Rebelakou, E. Milestones in the history of diabetes mellitus: the main contributors. World J Diabetes 2016, 10(7): 1.
2. International Diabetes Federation. The global burden. In: IDF Diabetes Atlas, 2021, 10th ed. Brussels: Available from http://www.idf.org/diabetesatlas/10e/the-global-burden.
3. Hegazi, R., El-Gamal, M., Abdel-Hady, N. and Hamdy, O. Epidemiology of and risk factors for type 2 diabetes in Egypt. Annals of global health, 2015, 81(6), 814-820.
4. International Diabetes Federation. The global burden. In: IDF Diabetes Atlas, 2019, 9th ed. Brussels. Available from http://www.idf.org/diabetesatlas/10e/the-global-burden.

5. Herman, W.H., Ye, W., Griffin, S.J., Simmons, R.K., Davies, M.J., Khunti, K., Rutten, G.E., Sandbaek, A., Lauritzen, T., Borch-Johnsen, K. and Brown, M.B. Early detection and treatment of type 2 diabetes reduce cardiovascular morbidity and mortality: a simulation of the results of the Anglo-Danish-Dutch Study of Intensive Treatment in People With Screen-Detected Diabetes in Primary Care (ADDITION-Europe). Diabetes care, 2015, 38(8): 1449-1455.

6. Willens, D., Cripps, R.,Wilson, A., Wolff, K. and Rothman, R. Interdisciplinary team care for diabetic patients by primary care physicians, advanced practice nurses, and clinical pharmacists. Clinical Diabetes, 2011 29(2): 60-68.

7. Shrivastava, S.R., Shrivastava, P.S. and Ramasamy, J. Role of self-care in management of diabetes mellitus. Journal of diabetes & Metabolic disorders, 2013, 12(1), 14.

8. Amin, H.S., Alkadhaib, A.A., Modahi, N.H., Alharbi, A.M. and Alkhelaif, A.A. Physicians' awareness of guidelines concerning diabetes mellitus in primary health care setting in Riyadh KSA. Journal of Taibah University Medical Sciences, 2016, 11(4): 380-387

9. Bani-issa, W., Eldeirawi, K. and Al Tawil, H. Perspectives on the attitudes of healthcare professionals toward diabetes in community health settings in United Arab Emirates. Journal of Diabetes Mellitus, 2014, 5(01): 1.

10. Babelgaith. S., Alfadly, S. and Baidi, M. Assessment of the Attitude of Health Care Professionals towards Diabetes Care in Mukalla, Yemen. International Journal of Public Health Science, 2013, 2, 159-164.

11. Jingi, A.M., Nansseu, J.R.N. and Noubiap, J.J.N. Primary care physicians' practice regarding diabetes mellitus diagnosis, evaluation and management in the West region of Cameroon. BMC endocrine disorders, 2015, 15(1): 18.

12. Sales, I., Babelghaith, S.D., Wajid, S., Mahmoud, M.A., Alsaleh, S.S., Alfadly, S., Mancy, W.H., Al-Arifi, M.N. and Anaam, M.S. Impact of diabetes continuing education on health care professionals' attitudes towards diabetes care in a Yemeni city. Tropical Journal of Pharmaceutical Research, 2018, 17(1): 143-149

13. Mabrouk, N., Abdou, M., Nour-Eldin, H., El-Foly, A.A.S., Omar, S.A. and Sliem, H.A. Knowledge, attitude, and practice of family physicians regarding diabetic neuropathy in family practice centers: Suez Canal University. International Journal of Medicine and Public Health, 2013, 3(4).

14. Alsaleem, M. A., Aldarbi, M. A., Alsaleem, S. A. and Alsamghan, A. S. The variance of knowledge and practices about diabetes mellitus in primary health care physicians of Jazan region, Kingdom of Saudi Arabia. Biomedical Research, 2018, 29(10), 2083-2089.

15. Trepp, R., Wille, T. and Wieland, T. Diabetes-related knowledge among medical and nursing house staff. Swiss medical weekly, 2010, 140(2526).

16. Onyiriuka, A. N., Oluwayemi, I. O., Achonwa, C. J., Abdullahi, M., Oduwole, A. O., Oyenusi, E. E. and Fakeye-Udeogu, O. B. Nigerian physicians' knowledge, attitude and practices regarding diabetes mellitus in the pediatric age group. Journal of Community Medicine and Primary Health Care, 2016, 28(1), 52-58.

17. Walter, F. M. and Emery, J. Perceptions of family history across common diseases: a qualitative study in primary care. Family practice, 2006, 23(4), 472-480.

18. Harwell, T. S., Dettori, N., Flook, B. N., Priest, L., Williamson, D. F., Helgerson, S. D. and Gohdes, D. Preventing type 2 diabetes: perceptions about risk and prevention in a population-based sample of adults≥ 45 years of age. Diabetes Care, 2001, 24(11), 2007-2008.

19. Pierce, M., Ridout, D., Harding, D., Keen, H. and Bradley, C. More good than harm: a randomized controlled trial of the effect of education about familial risk of diabetes on psychological outcomes. Br J Gen Pract, 2000, 50(460), 867-871.

20. Burke, V., Giangiulio, N., Gillam, H. F., Beilin, L. J., Houghton, S. and Milligan, R. A. K. . Health promotion in couples adapting to a shared lifestyle. In Health Education Research, Theory and Practice. 1999, 14(2).

21. Alsaleem, M. A. S. Assessment of primary health care physicians' knowledge and practices about diabetes mellitus in Aseer Region, Kingdom of Saudi Arabia. King Khalid University Journal of Health Sciences, 2017, 2(1), 1.

22. Niroomand, M., Ghasemi, S. N., Karimi-Sari, H. and Khosravi, M. H. Knowledge, Attitude, and Practice of Iranian Internists Regarding Diabetes: A Cross Sectional Study. Diabetes and metabolism journal, 2017, 41(3), 179-186.

23. Khan, A. T., Lateef, N. A., Khamseen, M. A. B., Alithan, M. A. A., Khan, S. A., and Ibrahim, I. Knowledge, attitude and practice of ministry of health primary health care physicians in the management of type 2 diabetes mellitus: A cross sectional study in the Al Hasa District of Saudi Arabia, 2010. Nigerian journal of clinical practice, 2011, 14(1).