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AWARENESS OF PREDIABETES STAGE AMONG PRIMARY CARE PHYSICIANS IN RIYADH

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Abstract:
Background: Early identification of patients with prediabetes stage can help prevent and reverse diabetes mellitus. However, the incidence of diabetes keeps increasing. Physicians' knowledge about prediabetes can influence management of these patients.
Objectives: To assess the knowledge of primary care physicians [PCPs] about the diagnostic criteria, complications, screening criteria, screening age and management of prediabetes.
Methods: A cross sectional study was conducted in primary health care centers in Riyadh city from August 2015 to April 2016. The questionnaire included nine knowledge assessment questions and was distributed to 155 PCPs.
Results: Female doctors represented 58.2% of the sample, and 40.5% of PCPs had experience of 5–10 years duration. The proportion of correct answers varied among different questions, ranging from 43.8% to 95.4%. The mean score of the total knowledge was 6.3±1.6. Female doctors obtained a significantly higher mean score of knowledge than male doctors. There was no significant association between the nationality and years of experience with the total knowledge about prediabetes.
Conclusion: Our study showed that PCPs have a good overall knowledge about prediabetes; however, their knowledge about complications and screening criteria was poor, which could be one of the causes of high diabetes incidence. So PCPs need a focused educational program on these topics.
Key words: *Assessment, Prediabetes, diabetes mellitus, Knowledge, Physician, Screening Criteria, management.*

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INTRODUCTION:

Diabetes mellitus [DM] is a major health problem worldwide and is a major cause of blindness, kidney failure, heart disease, stroke and lower limb amputation [1]. Diabetes type 2 is always preceded by prediabetes stage in which the blood glucose level is higher than normal, but not high enough to be diagnosed as diabetes. The American Diabetes Association has defined prediabetes as impaired fasting glucose level of 100–125 mg/dL, impaired glucose tolerance [2-hour post-glucose load] of 140–199 mg/dL or hemoglobin A1c level of 5.7–6.4% [2].

There is evidence that the prevalence of type 2 DM is high in Saudi Arabia [3, 4]. In the year 2004, a national epidemiological health survey has found the overall prevalence of DM and prediabetes in Saudi Arabia to be 23.7% and 14.1%, respectively [4]. In the year 2013, the overall prevalence of type 2 diabetes in Saudi Arabia was estimated to be 13.4%, while the prevalence of prediabetes was 16.3%[5].

The stage of prediabetes exposes patients to various health risks. It is estimated that 33% and 65% of patients with prediabetes may progress into type 2 DM within 6 years, compared to 5% or less of those with normal blood glucose [6]. Moreover, people with prediabetes have an increased risk for cardiovascular disease [7], vasculopathies [8], retinopathy [9] and distal sensorimotor polyneuropathy [10].

In addition, DM is a burden on the economy of Saudi Arabia as the current cost was estimated to be 17 billion Riyals for Saudis and 25 billion for the whole Saudi Arabia population, accounting for about 13.9% of total health expenditure. If prediabetic patients keep progressing at the same rate to become diabetics, the future cost would reach 43 billion Riyals [11].

Diabetes is an irreversible chronic disease, but prediabetes stage may last for several years during which interventions can delay or prevent its progression into DM [12]. Therefore, early detection of prediabetes and proper management are essential in order to decrease the incidence of type 2 DM [13]. It is necessary to screen people at risk for DM every three years if their initial test results were normal [14]. Screening should be started at the age of 45 years old in asymptomatic individuals, in people having body mass index $\geq$ 25 kg/ m2 and in patients with additional risk factor such as high level of triglycerides, high-density lipoprotein cholesterol level < 35 mg/dl, high blood pressure, polycystic ovarian syndrome, gestational diabetes [GDM] and acanthosis nigricans [2].

Management of patients in the prediabetes stage focuses on achieving good glycemic control through changing lifestyle and pharmacotherapy, in order to prevent the progression of the condition into DM type 2 [15-17]. According to the American diabetes association, patients with prediabetes should be referred to an intensive behavioral counseling program to improve diet and increase physical activity, with the aim of losing 7% of body weight and increasing moderate-intensity physical activity [such as brisk walking] to at least 150 min/week. Also, metformin should be considered for prevention of type 2 diabetes in prediabetics, especially those with BMI >35 kg/m2, aged > 60 years and women with prior GDM. The most important thing is to educate patients and provide support, so they can develop and maintain behaviors that can prevent or delay the onset of DM [18].

Unfortunately, a lot of patients remain undiagnosed until it becomes full blown DM; that is mostly because prediabetes has no symptoms so patients do not seek medical attention. Another possible cause is that primary care physicians [PCPs] in Saudi Arabia do not screen their patients who are at high risk routinely, due to their lack of knowledge about prediabetes. However, no study has been conducted previously in Saudi Arabia to assess knowledge about prediabetes among PCPs.

Therefore, this study was conducted to assess PCPs knowledge about prediabetes as regards its diagnostic criteria, complications, screening criteria and management, and to evaluate the association between the nationality and years of experience with the knowledge level of PCPs. Finding gaps in the awareness and knowledge of PCPs about prediabetes will provide an evidence to act upon and to design the right interventions like setting screening programs for early detection of prediabetes and prevention of DM.

METHODS:

This cross sectional study was conducted in primary health care centers [PHC centers] in Riyadh city from August 2015 to April 2016. The study included PCPs [general practitioners and family physicians] and excluded other specialties. The sample size was calculated using OpenEpi website [19] .The total population size is 675, assuming that 85% of PCPs are knowledgeable about prediabetes with 5 degrees of precision at 95% confidence level. The required sample size was 153.

It was a multistage random sampling technique. In the first stage, Riyadh city was divided into five regions which were east, west, south, north and middle, then all the regions were selected. In the second stage, a list of PHC centers from each region was constructed, and from each the biggest seven PHC centers were chosen. In the third stage, all PCPs in the chosen centers have been enrolled in the study to cover the number wanted from each region which is 31 PCPs.

All PCPs were asked to fill a pre-designed self-administered questionnaire that was pretested with suitable number of PCPs. The pilot study results were not included in this research study.

The questionnaire consisted of two sections: 1] personal information [gender, nationality and years of experience] and 2] nine questions that measure the PCP's knowledge about prediabetes. Eight of the questions were in the form of multiple choice - single response questions and they were designed to test the PCPs knowledge about the diagnosis [questions 1, 2, 3, 4], complications [question 5], screening age [question 7] and management [question 8, 9] of prediabetes. Correct responses were awarded one point and incorrect responses were awarded zero. One question [question 6] was in the form of a check list about the screening criteria; it contained ten conditions, six of them putting the person at high risk for developing DM, while the remaining four have no association with DM. Respondents who answered at least seven of them correctly got one point, and those who answered six or less got zero.

Statistical analysis:
The data were recorded in an MS Excel datasheet and analyzed using IBM-SPSS statistics 21 software for windows. Demographic characteristics [gender, nationality and years of experience] were summarized in the form of frequencies. Two-sample T-test and one-way ANOVA test were used to compare the mean values of the total knowledge score about prediabetes among different categories of demographic data [gender, nationality and years of experience]. A p-value < 0.05 was considered statistically significant.

Ethical consideration:

This study was approved by King Khaled University Hospital institutional review board. A statement from the Saudi Ministry of Health was obtained before the data collection started. All participants were asked to sign an informed consent that was clear and indicated the purpose of the study and the right of the participant to withdraw at any time without any obligation towards the study team. The data of the participants in this study were kept confidential. Participants' anonymity was assured by assigning a code number for each participant for the purpose of analysis only. No incentives or rewards were given to participants. No funding was required.

RESULTS:
The total number of responds in this study was 153. The demographic and practice characteristics of our sample are shown in table 1. The majority of PCPs in our sample were female doctors [n=89, 58.2%], and 126 of the PCPs [82.4%] were non-Saudi.

Table 2 shows the frequencies of correct and incorrect answers of the respondents to the questionnaire. Question 9, about the best drug to be used for obese patients with prediabetes, got the highest number of correct answers [146, 95.4%], followed by question 7, about screening age for diabetes, [n=140, 91.5%]. On the contrary, the questions which got the lowest number of correct answers were question 5 [about the risk for developing ischemic heart disease in prediabetes as compared to the risk in DM] as only 67 [43.8%] PCPs knew the right answer, followed by question 6 [about the screening criteria], as only 70 [45.8%] PCPs knew the right answer.

Figure 1 represents a histogram that shows the frequencies of the values of the total knowledge score. The mean score was 6.3 with a standard deviation of 1.6. Table 3 demonstrates that the mean score of the total knowledge about prediabetes was significantly higher in female PCPS [6.6 ± 1.5] than the males [5.9 ± 1.5, p = 0.004]. There was no significant difference in the mean score of knowledge between Saudi and non-Saudi PCPs [p = 0.472], as well as between the durations of experience [p = 0.292].

DISCUSSION:
This is the first study to assess physicians' knowledge about prediabetes in Saudi Arabia, up to the best of the authors' knowledge. Understanding PCPs' knowledge about screening and diagnosing prediabetes is important for improving rates of identification and referral to effective interventions. We have chosen PCPs because they are the target

group for screening patients about diabetes and, thus, they represent the first step in prevention. We focused in this study on finding the possible gaps in PCPs' knowledge that may contribute to the high incidence of DM; this will allow making recommendations and taking action towards filling these gaps of knowledge.

The main findings of this study revealed that the overall knowledge of PCPs about prediabetes was good: 91.5% of the physicians got the correct answer about the screening age for DM and 95.4% of them preferred metformin to manage an obese patient with prediabetes. Metformin is the drug recommended by both the American diabetic association and the national Saudi guidelines for prediabetes management [18, 20]. This is similar to the result found in other study conducted in India [21]. The importance of good physicians' knowledge about management of prediabetes is emphasized by a study that reported a reduction in DM incidence by 27% with lifestyle intervention and by 18% with metformin over a mean follow-up of 15 years [22]. On the other hand, a previous study in USA has reported that only 3.7% of patients with prediabetes were prescribed metformin over a 3-year duration [23], suggesting unawareness of American doctors about the role of metformin in the management of prediabetes.

In the present study, the PCPs' knowledge about definition and laboratory values of prediabetes was also good. This is in contrast to previous studies that evaluated the knowledge of PCPs [24] and doctors from different medical specialties [25] about prediabetes, as they revealed a much lower rates of correct answers about values of fasting and postprandial that diagnose prediabetes.

However, there is still lack of knowledge in specific areas. Only 43.8% and 45.8% of PCPs were aware about the complications and the screening criteria for prediabetes. These defects in knowledge might suggest a relation between the high incidence of DM and the physicians' knowledge. So, further efforts should take place to improve the doctors' knowledge. A previous study in India has found that only 60-70% of the general practitioners and physicians screened their patients – who fulfilled the criteria for routine screening - for prediabetes [21]. Causes behind this poor knowledge about screening criteria may be due to the unawareness of PCPs with international and national guidelines concerning DM management. Focusing in both undergraduate and postgraduate education on DM and prediabetes should be carried out to increase the doctor's awareness about DM care and prevention in Saudi Arabia.

Our study showed that female physicians' knowledge about prediabetes was higher than male. Interestingly, another study has found also an association between the gender and the knowledge about diabetes where females got higher knowledge than males [26].

Against our expectation, our study shows that no significant association existed between the years of experience and the knowledge. On the other hand, a previous study has found that younger doctors had better knowledge of laboratory values of prediabetes [25]. A possible explanation is that younger doctors have an obligation to revise the literature and get acquainted with new guidelines as a part of their residency training or during taking continued medical education courses. A similar relationship between years of experience and knowledge score was reported in a study investigating knowledge about cardiovascular diseases [27].

Study strengths and limitations:
Although our study has a good response rate and a good cross section all over Riyadh city, the results cannot be generalized to all regions of KSA and the result might be different in other regions.

CONCLUSION / RECOMMENDATIONS:

Overall, this study shows that PCPs in Riyadh had good level of awareness about prediabetes. However, the PCPs have lack of knowledge on important topics like screening criteria and complications of prediabetes, which may contribute to the high incidence of DM in Saudi Arabia. From these findings, we recommend organizing educational and training programs for PCPs, such as a continued medical education [CME] program, that focus on these topics, so that PCPs can update their knowledge. Policies for prevention and control of diabetes and its complications should be implemented and further work is needed to measure how PCPs are adherent to the guidelines of management of diabetes.

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Table 1:

*Demographic characteristics of the participants. Data are presented as n [%].

Characteristics	N [%]
Gender	
Male	64 [41.8]
Female	89 [58.2]
Nationality	
Saudi	27 [17.6]
Non-Saudi	126 [82.4]
Years of experience	
< 5	30 [19.6]
5 – 10	62 [40.5]
> 10	61 [39.9]

Table 2:

*The frequencies of correct and incorrect responses for each of the questions about diagnostic criteria [Q1 to Q4], complications [Q5], screening criteria [Q6], screening age for diabetes [Q7] and management [Q8 and Q9]. Data are presented as n [%].

Questions	Correct answers	Incorrect answers
Diagnostic criteria		
Q1	121 [79.1]	32 [20.9]
Q2	110 [71.9]	43 [28.1]
Q3	95 [62.1]	58 [37.9]
Q4	101 [66.0]	52 [34.0]
Complications		
Q5	67 [43.8]	86 [56.2]
Screening criteria		
Q6	70 [45.8]	83 [54.2]
Screening age for DM		
Q7	140 [91.5]	13 [8.5]
Management		
Q8	116 [75.8]	37 [24.2]
Q9	146 [95.4]	7 [4.6]

Table 3:
The mean score of the total knowledge of PCPs in relation to the characteristics of respondents. Data are presented as mean ± SD.

Variables	Mean Score ± SD	Mean difference [95% CI]	p-value
Gender		-0.72 [-1.21 to -0.23]	0.004*
Female	6.6 ± 1.5		
Male	5.9 ± 1.5		
Nationality		-0.24 [-0.89 to 0.41]	0.472
Saudi	6.1 ± 1.6		
Non-Saudi	6.4 ± 1.6		
Years of experience		**Mean Square [95% CI]**	0.292
< 5	5.8 ± 1.4	2.85 [5.98 to 6.46]	
5 – 10	6.3 ± 1.5		
>10	6.3 ± 1.6		

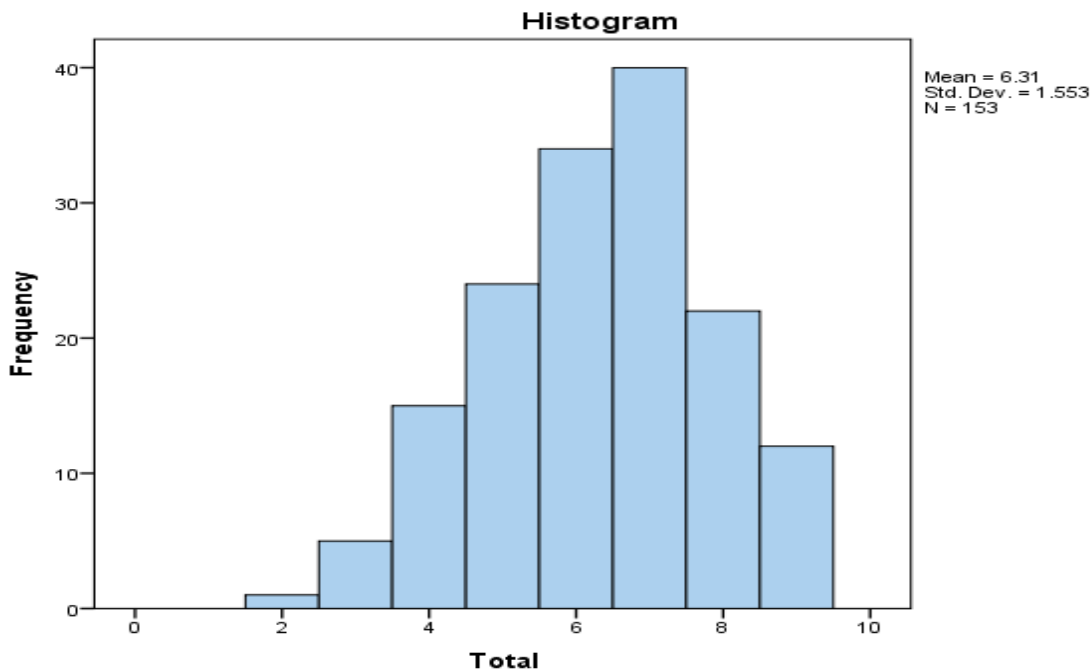SD: standard deviation; * significant at $p < 0.05$.

Figure 1: A histogram of the total knowledge scores of the respondents