

# Assessment of factors influencing the contribution of primary healthcare physicians in prevention of type 2 diabetes in South of Saudi Arabia

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## ABSTRACT

**Background:** This study was aiming to assess factors influencing the contribution of primary healthcare physicians concerning prevention of type 2 diabetes in the Jazan region, south of Saudi Arabia. **Materials and Methods:** A cross-sectional study was conducted to assess physicians' knowledge about evidence-based guidelines concerning diabetes prevention, their attitude towards lifestyle interventions and their practice concerning screening and provision of lifestyle interventions in their clinics. Interviews were conducted to complete a semi-structured questionnaire. Data analysis involved reviewing open-ended responses of physicians followed by quantitative analysis to assess level of knowledge, attitudes, and practice adherence. **Results:** A total of 234 physicians from 127 primary healthcare centres (PHCs) in the region were recruited. Knowledge of evidence-based clinical indicators for the prevention of diabetes was limited (mean level of knowledge 3.14/8 [SD: 1.2]). Recruited physicians did have a positive overall attitude to the influence of lifestyle/behavioural therapy on the prevention of type 2 diabetes. The physicians narrated a variety of factors that might influence the effectiveness of this approach, which were related to the community, the patients and the physicians themselves. Only the association between gender of physicians and their levels of knowledge was statistically significant where odds of greater knowledge were higher among female physicians in comparison to males (odds ratio : 1.8, *P* value = 0.025). **Conclusion:** Most of the physicians in our sample were misinformed about the components of lifestyle/behavioural interventions for diabetes prevention, which mandates designing and implementing lifestyle medicine programmes for the PHC physicians in Jazan region.

**Keywords:** Behavioural, Jazan, lifestyle intervention, primary healthcare, Saudi Arabia, screening, type 2 diabetes

## Introduction

Diabetes mellitus remains one of the leading contributors to morbidity and mortality in the world. In 2019, 463 million adults aged between 20 and 79 years were estimated to have type 2 diabetes, representing 9.3% of the world's population among

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**How to cite this article:** Gosadi IM, Dagheriri KA, Majrashi AA, Ghafiry HS, Moafa RJ, Ghazwani MA, *et al.* Assessment of factors influencing the contribution of primary healthcare physicians in prevention of type 2 diabetes in South of Saudi Arabia. *J Family Med Prim Care* 2021;10:3185-91.

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Received: 24-12-2020

Revised: 19-02-2021

Accepted: 17-03-2021

Published: 30-09-2021

### Access this article online

#### Quick Response Code:



**Website:**  
www.jfmpc.com

**DOI:**  
10.4103/jfmpc.jfmpc\_2543\_20

this age group.<sup>[1]</sup> According to the World Health Organization, diabetes mellitus was one of the top ten global causes of mortality in 2016.<sup>[2]</sup>

According to the International Diabetes Federation, Saudi Arabia has the second highest prevalence of diabetes in the Middle East and North Africa region. In 2019, prevalence of diabetes in Saudi Arabia among adults aged between 20 and 79 years was 18.3%.<sup>[1]</sup> Furthermore, the Saudi Health Information Survey estimated that 2.4 million Saudi citizens had prediabetes in 2013.<sup>[3]</sup>

Risk of developing type 2 diabetes is highly augmented by lifestyle factors. In a review assessing genetic and environmental risk factors related to the increased prevalence of metabolic syndrome, including type 2 diabetes, in Saudi Arabia, the unhealthy eating behaviour and limited physical activity of Saudis were leading contributors to the increased prevalence.<sup>[4]</sup> The high prevalence of Saudis with prediabetes and the risky lifestyle of Saudis mandates proper utilisation of preventive health services to reduce incidence of type 2 diabetes in the country.

Risk of developing type 2 diabetes is modifiable where early detection and modification of lifestyle may prevent or delay incidence of the disease. According to the Diabetes Prevention Programme (DPP), an intensive 3-year lifestyle intervention could reduce the risk of type 2 diabetes by 58%.<sup>[5]</sup> Furthermore, the American Diabetes Association (ADA) prevention guidelines provided several recommendations concerning reducing the risk of developing diabetes, such as screening, goal-oriented nutritional and physical activity behavioural modification, smoking cessation, utilisation of technology-assisted interventions and preventive pharmacological therapy.<sup>[6]</sup>

In Saudi Arabia, preventive health services are mostly provided by the Ministry of Health. Several preventive public health programmes are implemented by regional Public Health Directories overseeing primary healthcare centres (PHCs). These programmes can be related to communicable and noncommunicable diseases.

Several studies have been conducted in Jazan to investigate adherence of PHCs physicians in Jazan with regard to evidence-based guidelines for management,<sup>[7]</sup> or prevention of hypertension.<sup>[8]</sup> Additionally, a recent study indicated that patients diagnosed with chronic noncommunicable disease in the Jazan region has limited awareness of their clinical and laboratory parameters, which indicate a low involvement of the patients with achieving management goals contributing to the control of their conditions and prevention of subsequent ramifications.<sup>[9]</sup> Nonetheless, and despite the cumulative evidence, the contribution of PHCs in the prevention of type 2 diabetes in Saudi Arabia is currently not clear.

In this investigation, we were interested in measuring the factors that may influence the contribution of PHC physicians in Jazan

region concerning prevention of type 2 diabetes. These factors are related to their knowledge concerning the recent clinical guidelines for prevention of type 2 diabetes, their attitude concerning the impact of preventive services on reducing risk of type 2 diabetes among citizens in Jazan region and their reported practice concerning screening and the provision of lifestyle/behavioural interventions for the prevention and control of type 2 diabetes.

## Materials and Methods

### Study Context

This investigation is part of a multistage project to assess the utilisation of preventive services for the prevention and control of chronic noncommunicable diseases in Jazan region. In this stage, a cross-sectional investigation was performed targeting PHC physicians in Jazan region between October 2019 and January 2020. There are 170 PHCs in Jazan region, which are distributed in urban and rural areas. This study was conducted after securing the ethical approval of the Jazan University Research Ethics Board (Approval number REC40/3-090). Ethical approval date by 16/05/2019.

### Data Collection

Data were collected via interviews utilising a questionnaire developed to measure the knowledge of physicians about prevention of type 2 diabetes, their attitude towards lifestyle interventions and their actual practice concerning screening and provision of lifestyle interventions in their clinics. Currently—unlike other guidelines produced for other health conditions, such as the Saudi guidelines for prevention and management of obesity<sup>[10]</sup>—there are no clinical guidelines available for prevention of type 2 diabetes in the Saudi society. Therefore, the Saudi National Reference for Diabetes Mellitus Guidelines in Primary Healthcare,<sup>[11]</sup> the ADA prevention guidelines<sup>[6]</sup> and the DPP guidelines<sup>[5]</sup> were utilised to compose the contents of the questionnaire.

Questionnaire development went through several steps. Firstly, items used to measure knowledge and practice adequacy concerning prevention of type 2 diabetes were extracted from the Saudi National Reference for Diabetes Mellitus Guidelines in Primary Healthcare, ADA and DPP guidelines. Secondly, attitude items were created to measure the attitude of PHCs physicians in Jazan towards the prevention of type 2 diabetes in their clinical settings. Thirdly, the contents of the questionnaire were tested via a panel of experts in epidemiology, preventive medicine and family medicine. Finally, the questionnaire was piloted on a sample of ten PHC physicians to test for the clarity of the questionnaire and the time needed to complete the interviews.

The developed questionnaire had four main components asking about physicians' demographics, knowledge, attitudes and practice concerning prevention of type 2 diabetes. Both

closed-ended and open-ended questions were used. Open-ended questions were used in all the questionnaire components to ensure comprehensive measurement of the study variables. All questionnaires were completed via personal interviews after securing informed consent of the approached physicians. Interviews were conducted via trained medical students after attending a training workshop pertaining to the interviews and how to record notes. To ensure higher generalisability of the sample of physicians, we targeted all PHCs including those located in remote rural areas, such as those located in Farasan island in the Red Sea and the mountain districts near the border with Yemen.

## Data Analysis

Data analysis was performed via the Statistical Package for the Social Sciences (version 25). Data obtained from open-ended questions were screened for similar responses and coded via a single investigator (IG). After coding of open-ended questions, a summary of physicians' demographics, knowledge, attitudes and their practice adequacy concerning the prevention of type 2 diabetes was provided via reporting frequency and the proportion of responses. Similarly, means and standard deviations (SD) were used to report normally distributed data and medians, and minimum and maximum values were used to report nonnormally distributed data.

Scoring of levels of knowledge was made by giving each correct item a score of one and summing all items to produce an overall knowledge score. Assessment of practice adequacy concerning the prevention of type 2 diabetes was based on physicians' reported screening criteria and their reported practice of providing lifestyle interventions. Physicians were asked on what basis they provided screening, including (but not limited to) age, level of Body Mass Index (BMI), the presence of diabetes risk factors and screening intervals. Adequacy of lifestyle intervention was based on reporting goal-based interventions related to recommended levels of physical activity, calorie intake goal assessment, weight loss goal and monitoring of the effects of interventions.

Finally, binary grouping of continuous or categorical data was performed to enable testing factors that might be associated with the level of knowledge or practice adequacy. Grouping of the score of knowledge, score of practice adequacy and other demographic variables was based on means or medians according to the data distribution. Each physician was classified as having a lower level of knowledge if his or her score was below the estimated average score and was classified as having higher level of knowledge if his or her score was higher than the estimated average. To test for the association between demographic factors and level of knowledge and practice adequacy, binary logistic regression was performed to calculate the odds of higher levels of knowledge or odds of adequate practice according to each group. A *P* value of 0.05 was considered a statistically significant value for the applied statistical tests.

## Results

A total of 234 physicians from 127 PHCs in Jazan region were recruited in this investigation, covering urban and rural areas from different geographical locations in Jazan. Table 1 summarises the demographics of the 234 PHCs physicians recruited from 127 PHCs in Jazan region. Table 1 is reproduced from publication by Gosadi *et al.*<sup>[12]</sup> The median age of the physicians was 38 years and the proportions of male and female physicians were similar. The majority of recruited physicians were Sudanese (55%), followed by Saudi physicians (12%). It is worth mentioning that 42 physicians (18%) are nonnative Arabic speakers, as this may indicate a difficulty when it comes to communicating with Saudi patients who are native-Arabic speakers. The majority of the physicians were general physicians (72%), and were holders of Bachelor degrees (68%). The number of years of practice of the recruited physicians varied between less than a year and 43 years, with a median of 10 years. Finally, the average number of patients seen by the physicians on daily basis was 40 patients.

Table 2 summarises the responses of PHC physicians concerning eight knowledge items pertaining to prevention of type 2 diabetes where the mean knowledge score was 3.14/8. Although the majority of physicians (80%) acknowledged the high effectiveness of lifestyle

**Table 1: Demographic data of 234 primary healthcare physicians in Jazan, Saudi Arabia**

Variables	Values
Age: median [minimum-maximum]*	38 years [25-65]
Gender: <i>n</i> [%]	
Male	113 [48.3%]
Females	121 [51.7%]
Nationality: <i>n</i> [%]	
Sudanese	129 [55.1%]
Saudis	28 [12%]
Egyptian	26 [11.1%]
Pakistani	20 [8.5%]
Indian	9 [3.8%]
Syrian	8 [3.4%]
Cuban	8 [3.4%]
Nigerian	5 [2.1%]
Palestinian	1 [0.4%]
Specialty: <i>n</i> [%]	
General practitioners	168 [71.8%]
Family medicine	66 [28.2%]
Highest academic degree: <i>n</i> [%]	
MBBS	159 [67.9%]
High diploma	34 [14.5%]
Masters	27 [11.5%]
Board	10 [4.3%]
Fellowship	4 [1.7%]
Number of years of practice: median [minimum-maximum]	10 years [less than a year to 43]
Average number of patients seen on daily basis*: mean [SD]	40 patients [17.9]

\*1 missing data for age and 2 missing data for average number of patients seen on daily basis.

or behavioural therapy in reducing the risk of diabetes, only five physicians were able to report that the percentage of risk reduction with 3-year-intensive lifestyle intervention was 58%.<sup>[5]</sup> Similarly, only 13 physicians were able to report that 7% was the weight loss percentage recommended to achieve and maintain to lessen the risk of developing type 2 diabetes. The majority of physicians (71%) correctly reported the recommended level of physical activity to reduce the risk of developing type 2 diabetes. Finally, the majority of the physicians correctly named Metformin as evidently suitable for prevention of diabetes among women with a history of gestational diabetes (74%). However, only 47% of physicians indicated that the evidence concerning Metformin use for the prevention of diabetes among individuals older than 60 years was limited.

Table 3 explains the attitudes of the recruited PHCs physicians in Jazan region towards lifestyle/behavioural therapy. The majority of the physicians agreed that lifestyle/behavioural therapy could be beneficial in the prevention of diabetes and 85% of the physicians agreed that knowledge of patients about the complications of raised blood glucose may influence patients' adherence to lifestyle/behavioural interventions. When the

physicians were asked about the reasons they thought might lead individuals at risk to reject lifestyle/behavioural therapy, the majority of responses were related to a lack of community and family support, followed by inadequate awareness about the disease and lack of motivation to accept a change of lifestyle.

Several reasons were reported by the physicians relating to patients' characteristics, while other reasons were related to the physicians themselves, which may lead to a limited ability to ensure effective lifestyle/behavioural interventions. Seventy-four (28%) of the physicians did not agree that the current health service in Jazan region facilitated appropriate provision of preventive services for type 2 diabetes. The inhibiting factors mentioned by physicians were a lack of assistants at PHCs, such as nutritionists and health educationists, unavailability of facilities, the absence of a clear programme for prevention of the disease and the large number of patients seen on a daily basis.

The practice of the recruited PHC physicians in Jazan concerning the prevention of type 2 diabetes is described in Table 4. The majority of the physicians declared they were using

**Table 2: Knowledge of 234 primary healthcare physicians in Jazan, Saudi Arabia about prevention of type 2 diabetes**

Knowledge items*	Frequency of correct answers [percentages]
1 Degree of effectiveness of lifestyle/behavioural therapy with reduced calories meal plan in prevention of type 2 diabetes	187 [80%]
2 Degree of reduction of type 2 diabetes risk with 3-year intensive lifestyle intervention	5 [2%]
3 Weight loss percentage that it is recommended patients achieve and maintain to reduce the risk of developing type 2 diabetes	13 [6%]
4 Recommended level of physical activity for an effective lifestyle intervention	165 [71%]
5 Influence of smoking cessation on reducing the risk of diabetes development	55 [24%]
6 Level of BMI requiring initiation of pharmacotherapy for prevention of diabetes	26 [11%]
7 Safe pharmacological agents for diabetes prevention among women with history of gestational diabetes	172 [74%]
8 Evidence of influence of Metformin on prevention of diabetes development among individuals older than 60 years	109 [47%]

Mean level of knowledge 3.14/8 [SD: 1.2]. Minimum score: 0. Highest score: 7. \*One missing data for item number 1.

**Table 3: Attitudes of 234 primary healthcare physicians in Jazan region toward lifestyle and behavioural therapy**

Attitude Statement	Frequency of agreement [proportion]
Physicians who agree that lifestyle/behavioural therapy can be beneficial in prevention of type 2 diabetes	228 [97%]
Physicians who agree that patients' knowledge about complications of raised blood glucose may influence patients' adherence to lifestyle/behavioural interventions	199 [85%]
<b>Reasons physicians think may lead individuals at risk in Jazan region to reject lifestyle/behavioural therapy</b>	
Reasons related to lack of community and family support	60 [26%]
Reasons related to reduced awareness of patients about the disease	35 [15%]
Reasons related to patients' lack of motivation to accept a change in lifestyle	25 [11%]
Reasons related to patients' characteristics, such as being older, suffering from comorbidities limiting physical activity, lack of time to maintain lifestyle change	25 [11%]
Reasons related to physicians, such as lack of skills to provide lifestyle/behavioural therapy and inability to gain patients' confidence	25 [11%]
Reasons related to the environment which limits lifestyle change, such as unsuitable weather and lack of places facilitating higher levels of physical activity	18 [8%]
Physicians who agree that the current health services in Jazan region are sufficient for prevention of type 2 diabetes	169 [72%]
<b>Reasons that lead some physicians to disagree that the current health services in Jazan region are sufficient for prevention of type 2 diabetes</b>	
Lack of specialised assisting staff at PHCs, such as nutritionists and health educationists	9 [4%]
Large number of patients	4 [2%]
Unavailability of clear programme for prevention of type 2 diabetes	4 [2%]
Lack of facilities at PHCs required for prevention of type 2 diabetes	4 [2%]



the clinical guidelines as a source of knowledge about prevention of type 2 diabetes. Ninety-five percent of the physicians reported that they screened visitors to their clinics for type 2 diabetes. Nonetheless, when physicians were asked about the screening criteria they applied, only 13 physicians (6%) reported adequate adherence to the guidelines concerning screening for type 2 diabetes. Similarly, the majority of the physicians declared they provided lifestyle/behavioural interventions for their patients, although only 16 physicians (7%) were actually adhering to the guidance concerning the provision of lifestyle/behavioural interventions as described in the DDP study and ADA diabetes prevention guidelines. The majority of physicians reported recommending screening for type 2 diabetes among relatives of their patients. Finally, 13 physicians (5%) reported not screening for type 2 diabetes for reasons related to the lack

of a laboratory, believing screening was not required, the lack of a clear nationwide screening programme and lack of staff to assist in screening.

An attempt is made to explain the variation in the levels of knowledge or practice adequacy concerning the prevention of type 2 diabetes in Table 5. Among all the applied logistic regression tests, the odds of greater knowledge were higher among female physicians in comparison to males (odds ratio (OR): 1.8,  $P$  value = 0.025). Odds of a greater level of knowledge were observed among physicians with less than 10 years of experience with marginal statistical significance (OR: 1.6,  $P$  value = 0.088). None of the tests were statistically significant when assessing the odds of practice adherence, which can be explained by the low levels of overall adherence

**Table 4: Practice of 234 primary healthcare physicians in Jazan region concerning prevention of type 2 diabetes**

Practice Statement	Frequency [Percentage]
Physicians who reported using clinical guidelines as a source of knowledge about prevention of type 2 diabetes	174 [74%]
Physicians who reported screening for type 2 diabetes among visitors to their clinics*	221 [95%]
Physicians who reported adhering to the guidelines concerning screening for type 2 diabetes	13 [6%]
Physicians who reported providing lifestyle/behavioural interventions for prevention of type 2 diabetes	225 [96%]
Physicians who reported adhering to the guidelines concerning the provision of lifestyle/behavioural interventions for prevention of type 2 diabetes	16 [7%]
Physicians who reported recommending relatives of their patients to screen for type 2 diabetes	206 [88%]
<b>Reasons that led some physicians to report not screening for type 2 diabetes</b>	
Lack of a laboratory at PHC	5 [2%]
Believing that screening was not required	3 [1%]
Lack of a clear screening programme	2 [<1%]
Lack of staff to assist in screening	2 [<1%]

\*1 missing case.

**Table 5: Factors associated with level of knowledge and adherence to guidelines of 234 primary healthcare physicians in Jazan region concerning prevention of type 2 diabetes**

Variables	Odds of higher Knowledge $n$ [%]	$P$	Odds of practice adherence $n$ [%]	$P$
Age:				
<38 years	1.4	0.209	0.8	0.635
38 years or older*				
Gender: $n$ [%]				
Male*	1.8	0.025	1.1	0.690
Females				
Nationality according to language $n$ [%]				
Native Arabic speakers	1.7	0.136	3.2	0.116
Nonnative Arabic speakers*				
Specialty: $n$ [%]				
General practitioners*	1.2	0.404	1.1	0.718
Family medicine				
Highest academic degree				
MBBS*	1.3	0.277	0.6	0.332
Postgraduate education				
Number of years of practice				
<10 years	1.6	0.088	1.6	0.219
10 years or more*				
Average number of patients seen on daily basis				
<40 patients	1.01	0.955	1.6	0.217
40 patients or more*				

\*Reference group for each test

among the recruited cohort of physicians. Nonetheless, it might be worth indicating that the largest effect was observed when testing the effect of being a native Arabic speaker on the odds of practice adherence, which was larger in comparison to other demographic factors, but with no statistical significance (OR: 3.2,  $P$  value = 0.116).

## Discussion

In this study, we were aiming to assess factors that might influence engagement of PHC physicians in the provision of preventive health services concerning type 2 diabetes in Jazan region. The majority of the recruited physicians did acknowledge the significance of lifestyle and behavioural therapy in prevention of type 2 diabetes. However, the number of physicians who had knowledge of evidence-based clinical indicators for prevention of the disease was limited. Recruited physicians did have a positive overall attitude to the influence of lifestyle/behavioural therapy on prevention of type 2 diabetes. However, several physicians narrated a variety of factors that might influence the effectiveness of this approach, which were related to the community, the patients and the physicians themselves. Physicians declared that they applied preventive services concerning type 2 diabetes. However, only a minority of physicians reported adequate practice. Concerning demographic factors that might be associated with the level of knowledge or practice adequacy, only the association between the gender of physicians and their levels of knowledge was statistically significant.

Studies measuring factors influencing the engagement of PHC physicians in the provision of preventive health services concerning type 2 diabetes in Saudi Arabia are currently lacking. Nonetheless, a study conducted in Riyadh, Saudi Arabia by Al Rasheed and Al Adel to measure the knowledge, attitude and practice of 216 PHC physicians concerning the care of retinopathy among patients with diabetes, revealed that 71% of the physicians were adhering to the screening guidelines for retinopathy among type 2 diabetes patients.<sup>[13]</sup> Despite the difficulty of comparing our findings to those of the study by Al Rasheed and Al Adel given the difference in study scope, the higher level of adherence to screening guidelines for retinopathy among their sample in comparison to overall adherence to type 2 diabetes screening guidelines in our sample can be partially explained by the higher proportion of family physicians in their sample, in comparison to our sample, where the majority were general practitioners. Several studies related to the prevention of diabetes in Saudi Arabia have measured the influence of lifestyle or health education on the prevention of metabolic syndrome,<sup>[14]</sup> diabetes or its complications in hospital settings in Saudi Arabia,<sup>[15,16]</sup> or tried to assess knowledge about the prevention of diabetes among PHC attendees, rather than the physicians.<sup>[17]</sup>

A multinational study by Assaad-Khalil *et al.* assessed the barriers to delivery of diabetes care via surveying 1,082 physicians from different clinical settings in Saudi Arabia, the United Arab Emirates, Egypt, South Africa and Lebanon. This international

investigation asked physicians who belonged to different clinical practices, such as general practitioners, family medicine, internal medicine and diabetology, about their opinions concerning the potential barriers to optimal diabetes control among their patients. The most frequently reported barrier was the lifestyle of patients and a lack of education.<sup>[18]</sup> This notion is similar to our findings concerning physicians' opinions about factors that might limit the effectiveness of lifestyle/behavioural interventions. However, our use of an open-ended approach enabled an in-depth measurement of physicians' opinions concerning the effectiveness of lifestyle/behavioural interventions, while the study by Assaad-Khalil *et al.* utilised a closed-ended approach to measuring physicians' perceptions of the barriers.

The Saudi National Reference for Diabetes Mellitus Guidelines in Primary Healthcare provides guidance for clinical practitioners in Saudi Arabia concerning screening for type 2 diabetes. However, the adherence of physicians to the provided guidelines is limited. Some physicians in our sample explained their inability to adhere to the screening guidelines due to factors related to lack of infrastructure, assisting staff and the lack of a clear national programme for screening of diabetes. This notion is supported by a recent review assessing screening programmes in Saudi Arabia, where the lack of a nationwide policy for screening of risk factors of cardiovascular diseases, including diabetes, was indicated.<sup>[19]</sup> Nonetheless, only a limited number of countries provide nationwide screening programmes for diabetes or its complications, such as the UK<sup>[20]</sup> and Singapore.<sup>[21]</sup>

## Study Strengths and Limitations

This study has multiple areas of strengths and limitations. The strengths of this study can be related to performing face-to-face interviews with the PHC physicians and utilising open-ended questions to measure the perceptions of the physicians, enabling an in-depth assessment of the issues related to attitudes and practice adequacy. An effort was made to recruit physicians working at remote PHCs in Jazan region to increase the generalizability of the findings. The limitation of this investigation could be related to the refusal of some physicians to participate or the limited input of the physicians concerning areas that could be recognised as a critique of their employers, despite assuring the physicians that no identification data would be collected.

## Conclusion

This study was able to highlight areas of weakness concerning knowledge and the practice adequacy of PHC physicians in Jazan region regarding prevention of type 2 diabetes. Most of the physicians in our sample were misinformed about the components of lifestyle/behavioural interventions for diabetes prevention. This mandates designing and implementing lifestyle medicine programmes for the PHC physicians in Jazan region to strengthen their understanding and skills pertaining to lifestyle/behavioural modifications of individuals at risk of developing, or even in the control of, type 2 diabetes. Furthermore, education and training of the physicians is not sufficient without the

provision of staffing and logistical support to apply preventive interventions.

## Financial Support and Sponsorship

Nil.

## Conflicts of Interest

There are no conflicts of interest.

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