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PREVALENCE OF RISKY BEHAVIORS AMONG PATIENTS ATTENDING DIABETES AND ENDOCRINOLOGY CLINICS IN KFAFH 2022

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ABSTRACT

As a major killer, diabetes places a significant financial strain on healthcare systems across the globe. This research aims to determine the prevalence of smoking and physical inactivity among diabetics attending Diabetes Clinics in King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia. We used a cross-sectional study design. Data was collected during the clinical appointments at the Diabetes and Endocrinology clinics. All diabetic patients attending the Diabetes and Endocrinology clinics in KFAFH, aged 18 and above. Using the Raosoft calculator, the sample size was 243 diabetic patients. The sampling technique is non-probability convenient sampling. The study included 100 participants. The mean age of study participants was 50.07 ± 18.8 years. Age ranged from 16 to 90 years. There were 66 male participants and 34 female participants. Type of diabetes was statistical significance with regular exercise, especially among type 2 diabetes patients (P= 0.041). The use of insulin was statistical significance with blood glucose monitoring (P= 0.004). Male participants were smokers more than female participants (P= 0.003). Patients with current complications were more smokers than others (P= 0.042). Patients with a family history of diabetes were more smokers than others (P=0.016). Participants in this study exhibited some risky behaviors with regard to their diabetes condition. Lack of exercise, smoking, less frequent blood glucose monitoring and not following up with a dietician were the most risky behaviors. This is reflected by the high prevalence of diabetes complications among study participants.

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Introduction

Worldwide, type 2 diabetes is a common health concern [1, 2]. The numerous microvascular (retinopathy, nephropathy, and peripheral neuropathy) and macrovascular (Transient ischemic attacks, stroke, myocardial infarction, and peripheral arterial disease) microvascular and macrovascular (Transient ischemic attacks, stroke, myocardial infarction, and peripheral arterial disease) complications it can cause are hallmarks of this disease [3]. Tobacco use and a lack of physical activity are two important reasons for its prevalence.

It is considered that cardiovascular disease, cancer, stroke, and diabetes mellitus (DM) are the primary causes of mortality and disability on a global scale [4]. The vast majority of the worldwide burden of non-communicable diseases is related to fast socio-demographic and epidemiological trends driven by risky lifestyles in developing countries [5]. Both the development and progression of the disease may be linked back to preventable behavioral risk factors, such as a poor diet, lack of physical activity, smoking, and excessive alcohol use [6, 7].

Type 2 diabetes mellitus is one of the four most prevalent non-communicable diseases (NCDs) and is a metabolic disorder characterized by abnormally elevated blood glucose levels due to alterations in carbohydrate, lipid, and protein metabolism. The underlying causes of type 2 diabetes [7] include changes in insulin production, insulin action, or both. Type 1, type 2, and gestational diabetes are the three most common kinds of diabetes. Diabetes today affects 1 in 11 individuals globally; nevertheless, over half of the 451 million people living with the illness are ignorant of their condition, and 5% of all yearly deaths may be related to diabetes [8].

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Consequently, diabetes has significant financial, social, and health repercussions, and this burden has increased and been considerably exacerbated in settings and countries with few resources [9]. In 2017, the globe spent $850 billion on diabetes treatment as one example [8]. The region continues to hold a considerable proportion of the world's DM, placing a disproportionate strain on specific states [10].

Even though there is presently no cure for diabetes, it is possible to delay the development of symptoms and improve general health [11]. These may be the consequence of a mix of factors, including the fact that the emphasis has switched from treating illnesses to concentrating on the complete person and pursuing preventive measures. However, the outcomes are not even close to satisfactory [12]. Moreover, insufficient healthcare and weak prevention measures [13] aggravate poverty and early death in the country. Patients with diabetes whose clinical results are improved by active treatment and good lifestyle choices [11].

Moreover, even without additional cutting-edge technology and/or medications, the optimal levels of diabetes management objectives may be obtained [14]. Self-monitoring of blood glucose (SMBG), nutritional control, regular physical activity, medication adherence, and foot care by diabetes patients might all contribute [15].

Therefore, it may be able to obtain the desired outcomes in terms of diabetes management by engaging patients, offering comprehensive care, and establishing objectives from the viewpoint of the person with diabetes. For instance, maintaining a balanced blood sugar level is critical for treating diabetes and reducing the risk of significant complications, hospitalization, and mortality [16]. Instead of concentrating only on the health of the patient, diabetes therapy must take a more systemic approach [10]. Therefore, it is of the utmost importance to empower individuals to make effective decisions about their health and to become essential actors in their health, as opposed to just collecting and receiving their prescription refills [17]. This research aims to determine the prevalence of smoking and physical inactivity among diabetics attending Diabetes Clinics in King Fahd Armed Forces Hospital, Jeddah, Saudi Arabia.

Materials and Methods

Study Design

We used a cross-sectional study design. Data was collected during the clinical appointments at the Diabetes and Endocrinology clinics.

The data was collected by the researchers.

Eligibility Criteria

All diabetic patients attending the Diabetes and Endocrinology clinics in KFAFH, aged 18 and above.

Sample Size

Using the Raosoft calculator, the sample size was 243 diabetic patients. The sampling technique is non-probability convenient sampling.

Data Collection Tool

The data was collected by researchers during the clinic appointment. The clinical data collection is adopted from two validated questionnaires: The International Physical Inactivity Questionnaire IPAQ, and The Global Tobacco Surveillance System Questionnaire GTSSQ.

The Data Collection Was Composed of Three Main Parts

1. Socio-demographic and personal characteristics including age, gender, educational level, occupation, and monthly income.
2. Medical characteristics include diabetes type, duration, medications, complications, smoking history, and other chronic conditions.
3. The third part will contain detailed information about smoking type, duration, and family history.

Data Analysis

This study was analyzed using IBM SPSS version 23 (IBM Corp., Armonk, N.Y., USA) and visually presented by using GraphPad Prism version 8 (GraphPad Software, Inc., San Diego, CA, USA). Simple descriptive statistics were used to define the characteristics of the study variables through the form of counts and percentages for the categorical and nominal variables while continuous variables are presented by mean and standard deviations. To establish a relationship between categorical variables, this study used a chi-square test. While comparing two group means and more than two groups, an independent *t*-test and One-way ANOVA Test respectively were used. These tests were done with the assumption of normal distribution. Lastly, a conventional p-value <0.05 was the criteria to reject the null hypothesis.

Ethical Consideration

A conditional approval was granted by the Research and Ethics Committee, King Fahd Armed Forces Hospital.

Results and Discussion

Characteristics of the 100 Study Samples

The study included 100 participants. The mean age of study participants was 50.07 ± 18.8 years. Age ranged from 16 to 90 years. There were 66 male participants and 34 female participants. The mean body mass index was 25.35 kg/m^2, which indicates an overweight. Most of the study participants were married (n= 77, 77%). Most of the study participants had a bachelor's degree (n= 75). More than half of the study participants were employed (n= 56).

The mean duration of diabetes since diagnosis was 13.47 ± 9 years. The most frequent type of diabetes was type 2 diabetes (n= 65). Most of the study participants were managed by insulin (n= 94). The most common diabetes complications observed was retinopathy, then nephropathy, then neuropathy, and the other complications are (sexual dysfunction, strke, diabetic foot, myocardial infarction, and gastroparesis).

Besides medications used to manage diabetes among study participants, they were prescribed other medications for concurrent conditions. The most commonly prescribed was Perindopril (n= 59), and atorvastatin (n=43).

Most of the study participants had comorbid conditions besides diabetes. The most frequent comorbid conditions were hypertension (n= 63), dyslipidemia, and hypothyroidism. and this explains the most frequently prescribed medication which was antihypertensive treatment.

Some of the study participants practiced regular exercise (n= 18). The majority of study participants check their blood glucose daily (n= 94) and the same is used to follow up with a dietitian (n= 93). Family history of diabetes was prevalent among 62 participants.

About the source of information among patients regarding diabetes: the most frequent sources were a physician, diabetes educator, friends, and social media. (arranged from the most frequent to the least frequent)

Most of the study participants are non-smokers (n= 74). Results related to smoking status among study participants are presented in **Table 1**.

Table 1. Risky behavior among study participants

Variables		**Count**	**%**
Total		100	100.0
Smoking status	Non-smoker	74	74.0
	Smoker	15	15.0
	Ex-smoker	11	11.0
Type of smoking	Cigarettes	15	100.0
Number cigarettes	Less than 10 per day	1	6.7
	10 -20 per day	6	40.0
	More than 20 per day	8	53.3
Number of smoking cessation attempts	0	14	58.3
	1	7	29.2
	2	2	8.3
	3	1	4.2
Seen a physician in the past year?	Yes	100	100.0
Offered smoking cessation advice?	Non-smoker	74	74.0
	Yes	26	26.0

Exercise practice was a good behavior prevalent among 21 participants. Results related to exercise practice among study participants are summarized in **Table 2**.

Table 2. Exercise practice among study participants

Variables		**Count**	**%**
Total		100	100.0
Exercised in the past week?	No	79	79.0
	Yes	21	21.0
		Count	**%**
Total		21	100.0
Minutes of exercise per week	Less than 150	15	71.4
	More than 150	6	28.6

Minutes of exercise per day	Less than 150	20	95.2
	More than 150	1	4.8

Statistically Significant Results

Participants' characteristics were tested for statistically significant relationships with regular exercise practice as illustrated in **Table 3**. Type of diabetes was statistical significance, especially among type 2 diabetes patients (P= 0.041).

Table 3. Statistical relationships between participants' characteristics and regular exercise

Variables		Total	Regular exercise		p-value
			No	Yes	
Total		100	82(82.0%)	18(18.0%)	-
Age		100	51.23 ± 18.4	44.78 ± 20.3	0.188
Years since diagnosis		99	13.39 ± 8.8	13.85 ± 10.2	0.846
Gender	Male	66	51(77.3%)	15(22.7%)	0.086
	Female	34	31(91.2%)	3(8.8%)	
Marital status	Single	22	17(77.3%)	5(22.7%)	0.513
	Married at least once	78	65(83.3%)	13(16.7%)	
Educational level	High school and below	25	21(84.0%)	4(16.0%)	0.764
	Bachelor	75	61(81.3%)	14(18.7%)	
Occupational status	Employed	56	44(78.6%)	12(21.4%)	0.664
	Housewife	9	8(88.9%)	1(11.1%)	
	Student	9	7(77.8%)	2(22.2%)	
	Retired	26	23(88.5%)	3(11.5%)	
BMI	Underweight	3	3(100.0%)	0(0.0%)	0.218
	Normal weight	45	33(73.3%)	12(26.7%)	
	Overweight	42	37(88.1%)	5(11.9%)	
	Obese	10	9(90.0%)	1(10.0%)	
Diabetes type	Gestational diabetes	4	3(75.0%)	1(25.0%)	0.041[a]
	Type 1	27	19(70.4%)	8(29.6%)	
	Type 2	65	58(89.2%)	7(10.8%)	
	LADA	3	1(33.3%)	2(66.7%)	
	MODY	1	1(100.0%)	0(0.0%)	
On Insulin?	No	6	6(100.0%)	0(0.0%)	0.237
	Yes	94	76(80.9%)	18(19.1%)	
On oral hypoglycaemic agents?	No	36	26(72.2%)	10(27.8%)	0.056
	Yes	64	56(87.5%)	8(12.5%)	
Compliant with medications?	No	22	20(90.9%)	2(9.1%)	0.218
	Yes	78	62(79.5%)	16(20.5%)	
Existing DM complications?	No	33	26(78.8%)	7(21.2%)	0.557
	Yes	67	56(83.6%)	11(16.4%)	
Comorbidities	None	16	11(68.8%)	5(31.3%)	0.132
	Yes	84	71(84.5%)	13(15.5%)	
Family history of diabetes	No	38	29(76.3%)	9(23.7%)	0.247
	Yes	62	53(85.5%)	9(14.5%)	

[a]-significant using Chi-Square Test at <0.05 level.

Participants' characteristics were tested for statistically significant relationships with blood glucose monitoring as illustrated in **Table 4**. The use of insulin was statistical significance (P= 0.004).

Table 4. Statistical relationships between participants' characteristics and blood glucose monitoring

Variables	Total	Frequency of blood glucose monitoring		p-value
		Daily	Weekly	
Total	100	94(94.0%)	6(6.0%)	-
Age	100	49.55 ± 18.7	58.17 ± 19.9	0.278

Years since diagnosis		99	13.31 ± 9.0	16.00 ± 10.0	0.482
Gender	Male	66	61(92.4%)	5(7.6%)	0.355
	Female	34	33(97.1%)	1(2.9%)	
Marital status	Single	22	21(95.5%)	1(4.5%)	0.745
	Married at least once	78	73(93.6%)	5(6.4%)	
Educational level	High school and below	25	24(96.0%)	1(4.0%)	0.627
	Bachelor	75	70(93.3%)	5(6.7%)	
Occupational status	Employed	56	53(94.6%)	3(5.4%)	0.762
	Housewife	9	8(88.9%)	1(11.1%)	
	Student	9	9(100.0%)	0(0.0%)	
	Retired	26	24(92.3%)	2(7.7%)	
BMI	Underweight	3	3(100.0%)	0(0.0%)	0.179
	Normal weight	45	44(97.8%)	1(2.2%)	
	Overweight	42	39(92.9%)	3(7.1%)	
	Obese	10	8(80.0%)	2(20.0%)	
Diabetes type	Gestational diabetes	4	4(100.0%)	0(0.0%)	0.895
	Type 1	27	26(96.3%)	1(3.7%)	
	Type 2	65	60(92.3%)	5(7.7%)	
	LADA	3	3(100.0%)	0(0.0%)	
	MODY	1	1(100.0%)	0(0.0%)	
On Insulin?	No	6	4(66.7%)	2(33.3%)	0.004[a]
	Yes	94	90(95.7%)	4(4.3%)	
On oral hypoglycaemic agents?	No	36	35(97.2%)	1(2.8%)	0.309
	Yes	64	59(92.2%)	5(7.8%)	
Compliant with medications?	No	22	20(90.9%)	2(9.1%)	0.489
	Yes	78	74(94.9%)	4(5.1%)	
Existing DM complications?	No	33	32(97.0%)	1(3.0%)	0.380
	Yes	67	62(92.5%)	5(7.5%)	
Comorbidities	None	16	16(100.0%)	0(0.0%)	0.270
	Yes	84	78(92.9%)	6(7.1%)	
Family history of diabetes	No	38	36(94.7%)	2(5.3%)	0.808
	Yes	62	58(93.5%)	4(6.5%)	

[a]-significant using Chi-Square Test at <0.05 level.

Participants' characteristics were tested for statistically significant relationships with dietician follow-up as illustrated in **Table 5**. However, none of the characteristics seemed to be statistically significant.

Table 5. Statistical relationships between participants' characteristics and dietician follow up

Variables		**Total**	**Seen a dietician?**		**p-value**
			No	**Yes**	
Total		100	7(7.0%)	93(93.0%)	-
Age		100	55.29 ± 16.5	49.68 ± 19.0	0.449
Years since diagnosis		99	12.43 ± 9.6	13.55 ± 9.0	0.754
Gender	Male	66	6(9.1%)	60(90.9%)	0.254
	Female	34	1(2.9%)	33(97.1%)	
Marital status	Single	22	1(4.5%)	21(95.5%)	0.609
	Married at least once	78	6(7.7%)	72(92.3%)	
Educational level	High school and below	25	3(12.0%)	22(88.0%)	0.258
	Bachelor	75	4(5.3%)	71(94.7%)	
Occupational status	Employed	56	4(7.1%)	52(92.9%)	0.818
	Housewife	9	1(11.1%)	8(88.9%)	
	Student	9	0(0.0%)	9(100.0%)	
	Retired	26	2(7.7%)	24(92.3%)	

BMI	Underweight	3	0(0.0%)	3(100.0%)	0.369
	Normal weight	45	3(6.7%)	42(93.3%)	
	Overweight	42	2(4.8%)	40(95.2%)	
	Obese	10	2(20.0%)	8(80.0%)	
Diabetes type	Gestational diabetes	4	0(0.0%)	4(100.0%)	0.818
	Type 1	27	1(3.7%)	26(96.3%)	
	Type 2	65	6(9.2%)	59(90.8%)	
	LADA	3	0(0.0%)	3(100.0%)	
	MODY	1	0(0.0%)	1(100.0%)	
On Insulin?	No	6	1(16.7%)	5(83.3%)	0.338
	Yes	94	6(6.4%)	88(93.6%)	
On oral hypoglycaemic agents?	No	36	1(2.8%)	35(97.2%)	0.215
	Yes	64	6(9.4%)	58(90.6%)	
Compliant with medications?	No	22	2(9.1%)	20(90.9%)	0.663
	Yes	78	5(6.4%)	73(93.6%)	
Existing DM complications?	No	33	2(6.1%)	31(93.9%)	0.796
	Yes	67	5(7.5%)	62(92.5%)	
Comorbidities	None	16	1(6.3%)	15(93.8%)	0.898
	Yes	84	6(7.1%)	78(92.9%)	
Family history of diabetes	No	38	2(5.3%)	36(94.7%)	0.594
	Yes	62	5(8.1%)	57(91.9%)	

Participants' characteristics were tested for statistically significant relationships with smoking status as illustrated in **Table 6**. Male participants were smokers more than female participants (P= 0.003). Patients with current complications were more smokers than others (P= 0.042). Patients with a family history of diabetes were more smokers than others (P=0.016).

Table 6. Statistical relationships between participants' characteristics and smoking status

Variables		**Total**	**Smoking status**			**p-value**
			Non-smoker	**Smoker**	**Ex-smoker**	
Total		100	74(74.0%)	15(15.0%)	11(11.0%)	-
Age		100	48.32 ± 19.7	49.33 ± 16.5	62.82 ± 8.3	0.056
Years since diagnosis		99	13.58 ± 9.6	10.87 ± 6.2	16.27 ± 8.4	0.318
Gender	Male	66	42(63.6%)	15(22.7%)	9(13.6%)	0.003[a]
	Female	34	32(94.1%)	0(0.0%)	2(5.9%)	
Marital status	Single	22	20(90.9%)	2(9.1%)	0(0.0%)	0.089
	Married at least once	78	54(69.2%)	13(16.7%)	11(14.1%)	
Educational level	High school and below	25	21(84.0%)	2(8.0%)	2(8.0%)	0.404
	Bachelor	75	53(70.7%)	13(17.3%)	9(12.0%)	
Occupational status	Employed	56	39(69.6%)	12(21.4%)	5(8.9%)	0.062
	Housewife	9	9(100.0%)	0(0.0%)	0(0.0%)	
	Student	9	7(77.8%)	2(22.2%)	0(0.0%)	
	Retired	26	19(73.1%)	1(3.8%)	6(23.1%)	
BMI	Underweight	3	3(100.0%)	0(0.0%)	0(0.0%)	0.750
	Normal weight	45	34(75.6%)	8(17.8%)	3(6.7%)	
	Overweight	42	30(71.4%)	6(14.3%)	6(14.3%)	
	Obese	10	7(70.0%)	1(10.0%)	2(20.0%)	
Diabetes type	Gestational diabetes	4	4(100.0%)	0(0.0%)	0(0.0%)	0.294
	Type 1	27	24(88.9%)	3(11.1%)	0(0.0%)	
	Type 2	65	43(66.2%)	11(16.9%)	11(16.9%)	
	LADA	3	2(66.7%)	1(33.3%)	0(0.0%)	
	MODY	1	1(100.0%)	0(0.0%)	0(0.0%)	
On Insulin?	No	6	4(66.7%)	2(33.3%)	0(0.0%)	0.336

	Yes	94	70(74.5%)	13(13.8%)	11(11.7%)	
On oral hypoglycaemic agents?	No	36	31(86.1%)	4(11.1%)	1(2.8%)	0.077
	Yes	64	43(67.2%)	11(17.2%)	10(15.6%)	
Compliant with medications?	No	22	10(45.5%)	6(27.3%)	6(27.3%)	0.002[a]
	Yes	78	64(82.1%)	9(11.5%)	5(6.4%)	
Existing DM complications?	No	33	28(84.8%)	5(15.2%)	0(0.0%)	0.042[a]
	Yes	67	46(68.7%)	10(14.9%)	11(16.4%)	
Comorbidities	None	16	14(87.5%)	2(12.5%)	0(0.0%)	0.267
	Yes	84	60(71.4%)	13(15.5%)	11(13.1%)	
Family history of diabetes	No	38	33(86.8%)	5(13.2%)	0(0.0%)	0.016[a]
	Yes	62	41(66.1%)	10(16.1%)	11(17.7%)	
[a]-significant using Chi-Square Test at <0.05 level.						

Participants' characteristics were tested for statistically significant relationships with exercise during the past week as illustrated in **Table 7**. However, none of the participants' characteristics seemed to be statistically significant.

Table 7. Statistical relationships between participants' characteristics and exercise during the past week

Variables		**Total**	**Exercised in the past week?**		**p-value**
			No	**Yes**	
Total		100	79(79.0%)	21(21.0%)	-
Age		100	51.53 ± 18.6	44.57 ± 19.0	0.132
Years since diagnosis		99	13.74 ± 8.7	12.45 ± 10.3	0.564
Gender	Male	66	50(75.8%)	16(24.2%)	0.267
	Female	34	29(85.3%)	5(14.7%)	
Marital status	Single	22	17(77.3%)	5(22.7%)	0.822
	Married at least once	78	62(79.5%)	16(20.5%)	
Educational level	High school and below	25	22(88.0%)	3(12.0%)	0.202
	Bachelor	75	57(76.0%)	18(24.0%)	
Occupational status	Employed	56	42(75.0%)	14(25.0%)	0.581
	Housewife	9	7(77.8%)	2(22.2%)	
	Student	9	7(77.8%)	2(22.2%)	
	Retired	26	23(88.5%)	3(11.5%)	
BMI	Underweight	3	3(100.0%)	0(0.0%)	0.476
	Normal weight	45	33(73.3%)	12(26.7%)	
	Overweight	42	34(81.0%)	8(19.0%)	
	Obese	10	9(90.0%)	1(10.0%)	
Diabetes type	Gestational diabetes	4	2(50.0%)	2(50.0%)	0.054
	Type 1	27	19(70.4%)	8(29.6%)	
	Type 2	65	56(86.2%)	9(13.8%)	
	LADA	3	1(33.3%)	2(66.7%)	
	MODY	1	1(100.0%)	0(0.0%)	
On Insulin?	No	6	6(100.0%)	0(0.0%)	0.193
	Yes	94	73(77.7%)	21(22.3%)	
On oral hypoglycaemic agents?	No	36	25(69.4%)	11(30.6%)	0.078
	Yes	64	54(84.4%)	10(15.6%)	
Compliant with medications?	No	22	19(86.4%)	3(13.6%)	0.337
	Yes	78	60(76.9%)	18(23.1%)	
Existing DM complications?	No	33	25(75.8%)	8(24.2%)	0.576
	Yes	67	54(80.6%)	13(19.4%)	

Comorbidities	None	16	11(68.8%)	5(31.3%)	0.272
	Yes	84	68(81.0%)	16(19.0%)	
Family history of diabetes	No	38	28(73.7%)	10(26.3%)	0.307
	Yes	62	51(82.3%)	11(17.7%)	

Diabetes is a significant cause of morbidity and mortality, as well as a strain on healthcare resources, particularly in developing countries [6, 10, 18]. Using nationally representative data, this study assessed the prevalence, awareness, treatment, and glycemic control of diabetes. The literature revealed that the prevalence of diabetes and public awareness of the condition increased over time, but that despite advancements, neither medication nor glycemic control was optimum.

The literature revealed that the prevalence of diabetes has increased worldwide, including in urban and rural areas. While the worldwide average is anticipated to be 8.4% in 2017, the United States has a higher prevalence of diabetes among individuals aged 25-65 than in 2004 (8.4%) [19]. Several factors, including genetics, obesity, inactivity, urbanization, and poor eating habits, have contributed to an increased trend in recent years across the Middle East and North Africa (MENA), including Saudi Arabia [20, 21]. Consistent with the findings of this study, other national studies [22-25] have shown that the prevalence of diabetes is rising, with estimates ranging from 7.4 to 24.5%. Variations in methodology, including variances in age distribution, sample size, time, focus on the region, and lack of standard diagnostic criteria, likely contribute to inconsistencies in reported diabetes prevalence. Regardless of the approach used to evaluate the prevalence of diabetes in Saudi Arabia — self-reported data or clinical indicators such as fasting blood sugar or hemoglobin A1c — an upward trend has been seen. Due to the breadth of diabetes's potential repercussions, health policy must accord this issue significant consideration.

According to regression analyses, older individuals, women, and city inhabitants had higher diabetes rates. Similar studies [23, 26, 27] have shown that the risk of acquiring diabetes continuously increases beyond the age of 40. In addition, the incidence of gestational diabetes [28] explains why women are more likely to acquire diabetes than males, emphasizing the need of arranging high-quality prenatal care to identify and treat gestational diabetes. Several national and international research [22, 29-31] found a greater incidence of diabetes in urban regions compared to rural ones, which the literature verifies. This gap may be the result of dietary and activity variations. Even though diabetes is more prevalent in urban areas, the literature did not uncover any statistically significant differences in diabetes awareness or management between rural and urban settings. This contradicts the findings of past studies [32, 33] that indicated the growth of primary healthcare systems staffed by trained community healthcare workers enhanced disease management in rural areas.

The awareness of diabetes among diabetic patients grew from 53.5% at the beginning of the study period (2004) to 82.2% at the end of the period (2016), which is more than the estimated awareness (51% in 2017) throughout the MENA region [34]. One in two diabetics is undiagnosed, according to the International Diabetes Federation [7]. The degree of diabetes education individuals get has been proven to have a substantial link with glycemic control and the avoidance of diabetic complications [35, 36]. Multiple variables may account for the increase in awareness. The increase in public knowledge may be due, in part, to the fact that the literature indicates a rising trend in diabetes prevalence during the research period. Second, hospital-based health education and promotion activities and social media may be important factors. Last but not least, diabetes screening initiatives at PHC facilities may help spread the news. Consistent with other studies [37-39], the results of the logistic regression indicate that diabetes awareness increases with age. In accordance with earlier research [31, 39], we discovered that female participants were more likely to be aware of their diabetes risk factors and to maintain normal blood sugar levels.

While a growing trend was predicted as a consequence of publicity, the present study revealed that the proportion of individuals who had undergone treatment decreased to 39.6% by 2016. In the present study, the proportion of diabetic individuals with controlled FBS increased from 2004 to 2011 but has subsequently declined to 18.5%. During the experiment, the percentage of diabetes patients whose condition was under control increased by approximately four percent. Compared to what was projected, the percentage of patients who received medication and the percentage of patients with adequate glycemic control indicate that diabetes treatment is far from optimal [17, 40]. Multiple studies [41, 42] have questioned the efficiency of diabetes prevention and treatment activities at the system level.

Literature showed that people with health insurance were better able to spot illness signs and take preventive steps. People with health insurance are more likely to be diagnosed with diabetes than those without insurance, according to the majority of national and international research [24, 43, 44]. This is likely because insured patients have more access to healthcare than uninsured ones. Numerous studies have shown that uninsured individuals are much less likely to get routine screenings or preventive treatments [45, 46], are diagnosed with more serious diseases, and receive less therapeutic care [47]. It is good knowledge that diabetes imposes enormous financial pressures on patients, especially those with lower incomes. To improve diabetes treatment, it is essential to provide low-income individuals with financial assistance, such as increased insurance coverage and decreased copayments, particularly for drugs. In recent years, US sanctions have led to either a dearth of or astronomically high prices for essential medications like insulin, rendering them unavailable to many. Although oral pharmaceutical treatments for diabetes patients are inexpensive, the high expense of insulin therapy has been identified in prior studies [48, 49] as a critical cause of noncompliance with treatment.

Less than one-fourth of the diabetic participants in the literature attained satisfactory glycemic control. This degree of awareness is coupled with limited control. Progress in universal diabetes treatment may be gauged by whether or not type 2 diabetes is properly covered for people aged 15 and older [50]. Reaching this degree of protection requires a well-developed

healthcare delivery system that can customize its services to individual needs, therefore enhancing the health of persons who get treatment [51]. Finding the core reasons for diabetes patients' poor glycemic control will need more research. It is evident, however, that the present system of care for the management of diabetes patients must be rethought to give patients with easier access to therapies of greater quality and lower cost.

Conclusion

Participants in this study exhibited some risky behaviors with regard to their diabetes condition. Lack of exercise, smoking, less frequent blood glucose monitoring and not following up with a dietician were the most risky behaviors. This is reflected by the high prevalence of diabetes complications among study participants.

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