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Assessment of quality of care provided to type 2 diabetic adults in primary health care centers in Cluster 1, Riyadh

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Abstract

Background: Diabetes Mellitus (DM) is on the rise in the Kingdom of Saudi Arabia (KSA), as well as other Middle Eastern countries. A risk-stratified approach to managing these patients in primary care has been established, according to management guidelines. Diabetic patient care is dependent on both the health care providers and the type of health care setting.

Aims: To assess the quality of care delivered to diabetic patients compared to standards of the American diabetes association (ADA) in studied population in Riyadh, Saudi Arabia.

Materials and Methods: This is an observational cross-sectional study was conducted in the primary health care centers in cluster 1, Riyadh, Saudi Arabia. The study involved 386 respondents, who were selected by a convenient sampling technique. Data analysis was performed using a statistical package for social sciences (SPSS) version 23.

Results: A total of 386 participants included in this study. The mean age was 55.4. 11.0 years (range 27-99) and more than half of the respondents were males (54.4%). The vast majority of the participants had their blood pressure measured in their visits. Only 24.1% and 30.6% underwent foot and eye examinations respectively during their last year of follow-up. Moreover, our result revealed that haemoglobin A1c (HbA1c) was measured at 3-6 months intervals in nearly half of the patients and it was ≤ 7 in 43.5% of them. In addition, the albumin-creatinine ratio (ACR) was measured in 4.1% and it was normal in most of them. Furthermore, our findings showed that only a few number of the participants developed macrovascular complications, 3.6% had a stroke and 4.7% had a heart attack. Lastly, we found that there was no significant association between ACR and the different socio-demographic characteristics of our participants and the control of Type 2 diabetes mellitus (T2DM).

Conclusion: Our results concluded that the quality of care delivered to diabetic patients in Riyadh in Saudi Arabia was below the average when compared to the standards of the American diabetes association. More studies are needed to determine the causes of this lack of optimal services. Furthermore, training and proper interventional programs are strongly recommended to improve overall quality of care for these patients.

Keywords: Depression, elderly, geriatric patients, anxiety

Introduction

Diabetes mellitus is a major contributor to morbidity and mortality around the globe ^[1]; however, its prevalence is increasing dramatically in the past three decades, in countries of all income levels ^[2]. According to the International diabetes federation, the estimated global prevalence in 2019 is 463 million of all age groups and the annual mortality related to diabetes is estimated over 4 million (one in every 8 seconds). Middle East and North Africa have 55 million diabetic adults aged (20-79). This number is expected to rise to 108 million by 2045 if no actions were taken now. In Saudi Arabia around 4.3 million adults aged (20-79) are diabetics, which means 1 in every 5 in addition, 15 thousand deaths annually are related to diabetes in the same age group ^[3].

In Saudi Arabia, several studies have studied the prevalence of different microvascular complications, three of them are large cross-sectional studies reviewing the national diabetes registry. These studies included all adults aged ≥ 25 years with diabetes. Results showed the prevalence of retinopathy as 19.7%, diabetic nephropathy as 10.8% and diabetic foot complications including (ulcers, gangrene or amputation) as 3.3% ^[4-6]. The target is to reduce diabetes mellitus complications.

Several clinical guidelines have been published including the American diabetes association (ADA), the Nation Institute to for health care and Excellence (NICE) and European Association for the Study of Diabetes (EASD), etc. Adhering to the recommendations of these evidence-based guidelines will hopefully help reduce these complications and the burden of T2DM.

Several studies have assessed the quality of care provided to diabetic patients compared to a specific guideline. With different process and outcome indicators. In an outpatient clinic in Ibadan, Nigeria, Jo Adeleye, *et al.* found that more than 90% of Patients #Blood pressure and weight were recorded at each visit; however, HbA1c and LDL were not tested annually in most of patients. Urine for microalbuminuria was performed only in one patient while dipstick for proteinuria was done in 25.9%. More than 60% had HbA1c levels less than 8 [7]. Another study in New England showed that 50.4% of responders did have complete annual diabetes care (annual retinal exam, annual foot exam and biannual Hb A1c testing) [8]. In North Carolina Huabin Luo, *et al.* investigated diabetes preventive care practices from an electronic database. In multiple years 2000- 2015 showed that 80-90% of patients had at least biannual HB A1C testing, 70-85% had annual foot exam, 70-80% had an annual retinal exam and 50-63% had annual flu shots [9]. In the Middle East region, a large retrospective cross-sectional study done in Qatar showed more than 85% were seen or referred annually for retinopathy screening, while HB A1C was checked at least bi-annually in only 47%. Feet were examined in 89% [10]. In India, Blood pressure (BP) and weight measurements, blood sugar determination were assessed in each visit in $\geq 70\%$ of patients. The same percentage of patients received annual laboratory screening and baseline ECG, whereas $\leq 50\%$ had annual retinal screening, foot examination and dental assessment [11].

Szabo SM, *et al.*, found that more than 90% of their patients received HbA1c and LDL measurements. BP measurement, retinopathy screening and nephropathy were assessed infrequently as 55%, 30% and 22% respectively. 28% of the studied population were defined as having poor HB A1C control [12]. Azam IS, *et al.*, identified BP measurement, foot examination, lipids assessment and microalbuminuria testing in 80%, 53%, 48% and 32% respectively. Poor HB A1C control was identified in 58% of subjects [13].

In Alexandria, a similar study identified optimal glycemic control in 12.9% only [14]. Kristensen JK, *et al.*, recognized HB A1C testing in 85% of subjects. Examination of albuminuria and creatinine were found in 84 and 74% respectively. Retinal examination, foot care, and BP measurement were identified in 76, 67 and 60% respectively. While to a lesser extent weight was measured in 47% only [15].

In Austria, feet were examined in 5% of patients whereas around 2% only received retinal screening [16]. Gavran L, *et al.*, found $\geq 80\%$ of their participants received retinal exams, lipid and fasting or postprandial glucose testing, and BP measurements annually, furthermore, satisfactory Hb A1c levels were defined in 60% [17]. In a Canadian population, Hb A1C was below 7 in 58% of subjects [18].

In South Africa, Rotchford AP, *et al.*, found that 15.7% only had an acceptable levels of HB A1C, whereas retinopathy, micro albuminuria and foot complications were identified in 40.3, 46.4 and 6% respectively [19]. Majkowska L, *et al.*, took a different view identifying patients who never have

been examined for BP measurement, retinal screening and feet examination which was 10, 26, and 66% respectively. ECG was never done in 39% of subjects. Cholesterol was measured in the last year in 52% of their population [20]. For this purpose, researchers are interested in assessing the quality of care provided to the diabetic patient population.

Study objectives Primary

To assess the quality of care given to diabetic patients compared to standards of the American diabetes association in studied population.

Secondary

To evaluate the control of type 2 diabetes in the study population.

To evaluate the albumin-creatinine ratio control among diabetic patients in the study population.

To evaluate the presence of macrovascular complications, stroke and heart attack in the study population.

Methodology

Clinical setting: There are 11 primary health care centers among the cluster 1 in Riyadh who have established chronic disease clinics headed by a family medicine consultant.

Study design: Observational cross-sectional study using a structured validated questionnaire written by the researchers according to American diabetes association recommendations which was validated by King Saud medical city research centre.

Study population: All T2DM adults who are followed up in the chronic disease clinics in the primary health care centers in cluster 1, Riyadh.

Inclusion criteria: Adults aged 18 years and above diagnosed with T2DM, following in chronic disease clinics in cluster 1 primary health care centers.

Exclusion criteria: Children and adolescents aged less than 18 years and those diagnosed with type 1 diabetes mellitus were excluded.

Data collection: Data collection was in two steps, the first step was collected through questionnaires answered by the patients and the second part was done by the investigators who reviewed and retrieved laboratory results.

Study sample: The sample was collected after using a convenient sampling technique. It took place during July – December 2021. Based on an estimated population of 35,000 persons, a P value of less than 0.05 and a confidence interval of 95%, the sample size required was 380.

Statistical analysis

Data analysis was done through SPSS version 23. The chi-square test was used to determine whether there is a statistically significant difference between the expected frequencies and the observed frequencies.

Ethical Considerations

Data collection was handled and secured by the investigators after collection. Information sheets were secured and only authors used them. Information was

utilized for the research purposes. Informed consent was taken from all participants. This is a descriptive study with no expectation to harm any subject. Researchers assured the IRB committee that the confidentiality of patients' information was of topmost consideration to them.

Results

Characteristics of the participants

A total of 386 participants included in this study. The mean age was 55.4 11.0 years (range 27-99), more than half of respondents were males (54.4%) and (45.6%) were females. Regarding the nationality of our participants, most of them were Saudi (79.8%). As demonstrated in Table 1.

Table 1: Demographic characteristics of the participants (N=386)

Variable	Frequency	Percent
Sex		
Male	210	54.4%
Female	176	45.6%
Nationality		
Saudi	308	79.8%
Non-Saudi	78	20.2%

Assessment of the quality of care given to type 2 diabetic patients

Table 2: Assessment of the quality of care given to type 2 diabetic patients

Variable	Yes	No		
Blood pressure measured last visit	374 (96.9%)	12 (3.1%)		
Body mass index measured last visit	329 (85.2%)	57 (14.8%)		
Feet examination was done in 1 year	93 (24.1%)	293 (75.9%)		
Smoking status addressed	87 (22.5%)	299 (77.5%)		
Diet counselling done	247 (64%)	139 (36%)		
Physical activity counselling done	276 (71.5%)	110 (28.5%)		
Hypoglycemia counselling done	142 (36.8%)	244 (63.2%)		
Advised for Flu vaccine	20 (5.2%)	366 (94.8%)		
Got eye examination by an ophthalmologist or referred in last year	118 (30.6%)	268 (69.4%)		
Got dental examination by a dentist or referred in last year	27 (7%)	359 (93%)		
	Yes	No	Incomplete	Requested
HB A1c test done at 3-6 months interval	200 (51.8)	169 (43.8)	0 (0)	17 (4.4)
Urine ACR test was done last year	16 (4.1)	334 (86.5)	0 (0)	36 (9.3)
Lipids tested last year	260 (67.4)	81 (21)	32 (8.3)	13 (3.4)
Vit B12 tested last year	18 (4.7)	334 (86.5)	0 (0)	34 (8.8)
KFT done last year	276 (71.5)	100 (25.9)	0 (0)	10 (2.6)
LFT done last year	194 (50.3)	103 (26.7)	80 (20.7)	9 (2.3)
CBC done last year	272 (70.5)	101 (26.2)	0 (0)	13 (3.4)

Evaluation of the control of type 2 diabetes in the study population

Regarding the control of type 2 diabetes in our participants, our findings showed that the HbA1c level was ≤ 7 in 43.5% of the group who had their HbA1c tested and the HbA1c

Our results found that the majority of respondents reported that their blood pressure and Body mass index were measured in the last visit (96.9%) and (85.2%) respectively. Moreover, we found that only 24.1% of participants stated that they received a food examination in 1 year. Regarding lifestyle modifications, only 22.5% admitted that their Smoking status was addressed, however, most of them received diet and physical activity counselling, (64%) and (71.5%) respectively. More than a third of respondents received hypoglycemia counselling.

Additionally, only 5.2% of our participants were advised for receiving flu vaccine. Less than one-third of them received eye examination by an ophthalmologist or referred in last year and only (7%) received dental examination by a dentist or referred in last year. Almost half of participants had their HbA1c tested for them at 3-6 months intervals and only 4.1% had their urine albumin creatinine ratio tested last year. Also, we found that 67.4% of respondents had their lipids tested in last year.

On the other hand, only 4.7% of participants were investigated for Vit B12 in last year. Furthermore, our results found that a Liver function test (LFT) was done for almost half of the participants in last year; Complete blood count (CBC) and Kidney function test (KFT) were done for almost 70 percent of respondents in last year (Table 2).

was more than 10 in 16.5% of them. As shown in Figure 1. In addition, in those who had their ACR tested, it was normal in most of them (83.1%), and it showed microalbuminuria in 16.9% and fortunately, there was no macro albuminuria detected (0.0%), (Figure 2).

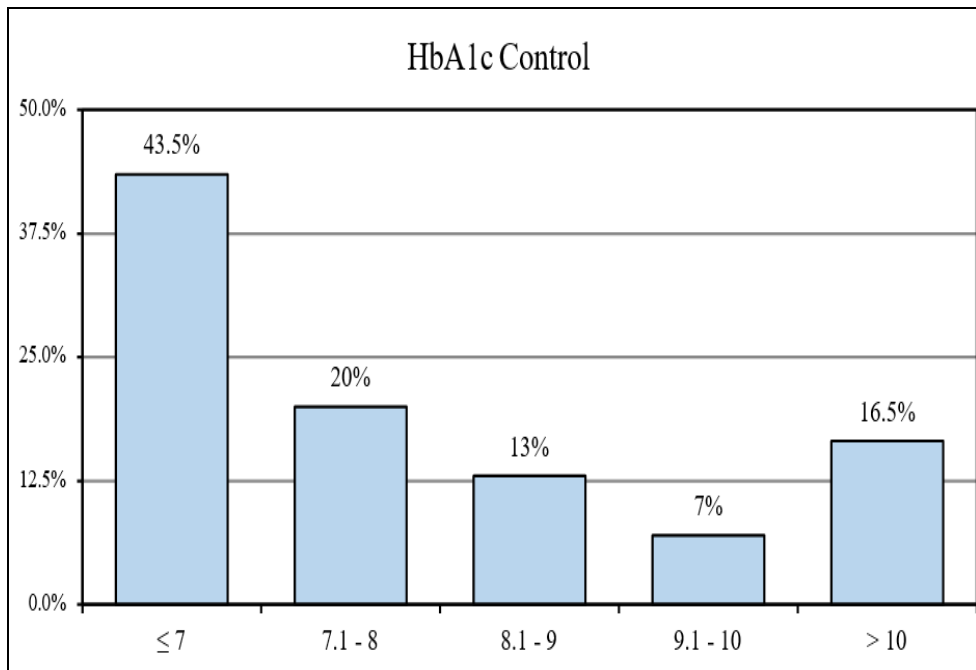


Fig 1: Control of type 2 diabetes in the proportion of participants who had their Hb A1c tested (N=200)

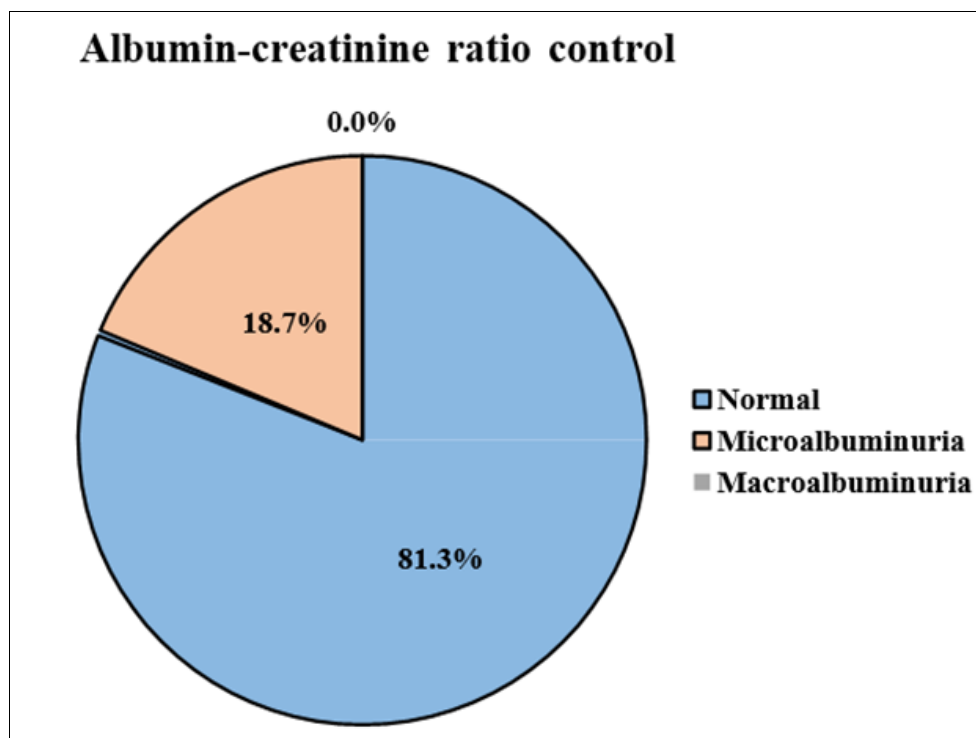


Fig 2: Albumin-creatinine ratio control among diabetic patients in the study population who had their urine tested for ACR (N=16)

Presence of macrovascular complications: Stroke and heart attack

Our results reported that the majority of participants were not diagnosed by Stroke as a major macrovascular complication (96.4%). It was only 3.6% who had Stroke

patients. As demonstrated in Figure 3.

Regarding heart attack, the majority of respondents stated that had no history of heart attack 95.3%, and heart attack was reported by only 4.7% of participants (Figure 4).

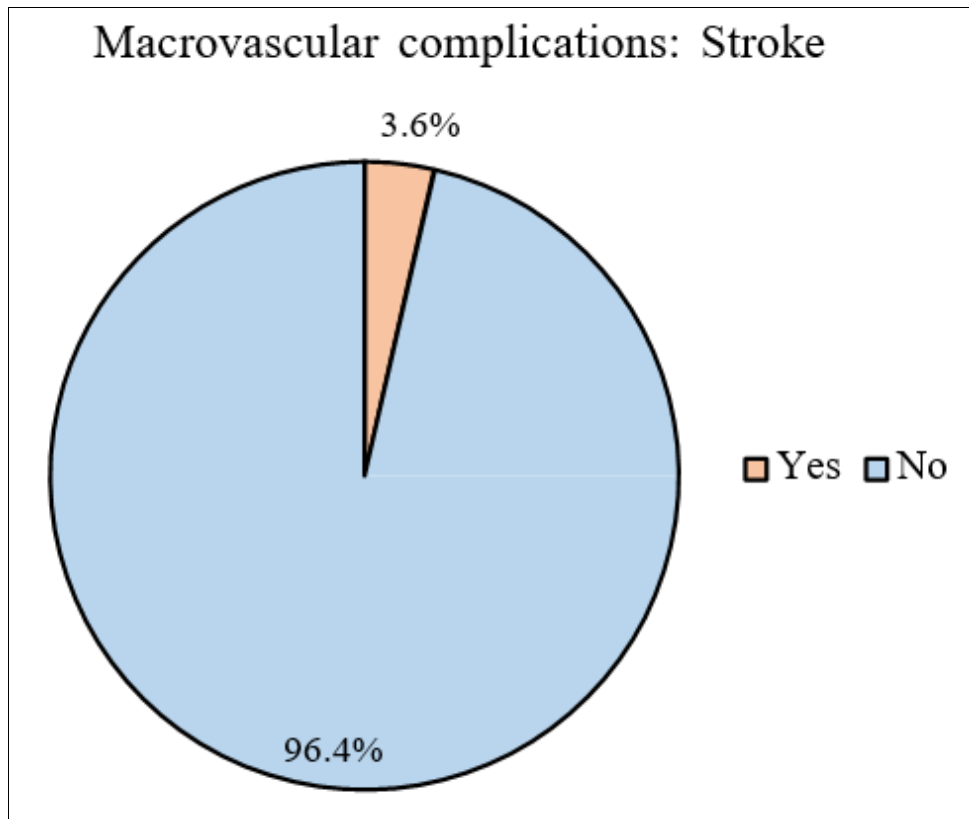


Fig 3: Frequency of Stroke among the study population (n=386)

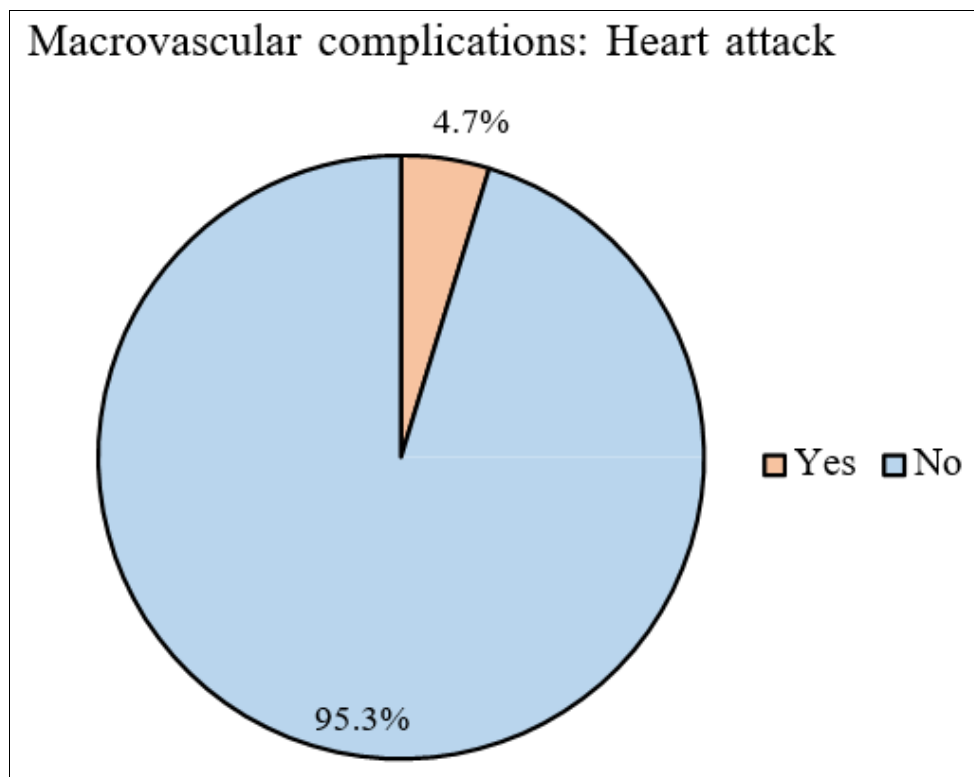


Fig 4: Frequency of Heart attack among the study population (n=386)

Factors associated with control of type 2 diabetes in the study population

Our finding clarified that there was no significant association between HbA1c control of T2DM and different socio-demographic variables such as: Sex, nationality and age. However, males showed relatively better control of

HbA1c than females but without any significant difference (P Value= 0.076) (Table 3).

Additionally, our results showed that there was no significant association between ACR result and the control of T2DM and different socio-demographic characteristics like sex, nationality and age. As shown in Table 4.

Table 3: Factors associated with HbA1c control of T2DM in the study population

Variable		HBA1C control					P Value
		7 or below	7.1-8	8.1-9	9.1-10	> 10	
		N (%)					
Sex	Male	50 (45.5)	26 (23.6)	13 (11.8)	3 (2.7)	18 (16.4)	0.076
	Female	37 (41.1)	14 (15.6)	13 (14.4)	11 (12.2)	15 (16.7)	
Nationality	Saudi	69 (43.7)	33 (20.9)	20 (12.7)	13 (8.2)	23 (14.6)	0.447
	Non-Saudi	18 (42.9)	7 (16.7)	6 (14.3)	1 (2.4)	10 (23.8)	
		HB A1C control					
		7 or below	7.1-8	8.1-9	9.1-10	> 10	
		Mean (SD)					
Age (Years)		57.6 (10.6)	56.4 (10.7)	53.8 (9.1)	55.8 (13.1)	53.8 (11.3)	0.362

Table 4: Factors associated with Albumin-creatinine ratio control of T2DM in the study population

Variable		Albumin-creatinine ratio control		P Value
		Normal	Microalbuminuria	
		N (%)		
Sex	Male	9 (81.8)	2 (18.2)	0.931
	Female	4 (80)	1 (20)	
Nationality	Saudi	11 (78.6)	3 (21.4)	0.468
	Non-Saudi	2 (100)	0 (0)	
		Albumin-creatinine ratio control		
		Normal	Microalbuminuria	
		Mean (SD)		
Age (Years)		55.7 (11.5)	52.3 (24.8)	0.717

Discussion

In this study, we aimed to assess the quality of care delivered to diabetic patients compared to the standards of the American diabetes association in studied population in Riyadh, Saudi Arabia. Although published assessments of clinical outcomes among T2DM patients in the Arabian Gulf countries are increasing, evaluations of the quality of care received are still uncommon [21-24]. Therefore, regular assessment is crucial to improve the standard of quality of care given for diabetic patients in Saudi Arabia.

Our result showed that blood pressure was measured in vast majority of our respondents during their last visit (96.9%). This was consistent with several studies conducted in Saudi Arabia. The rates were between (92%-100%) [25, 26]. Also, our findings demonstrated that only 24.1% and 30.6% have received foot and eye examinations during their last year of follow-up. This result was lower than another study in Saudi Arabia done by Alharbi Tj, *et al.*, which showed that screening was higher for diabetic foot (72%) [25]. An earlier study in Saudi Arabia reported that only 22% (at 3rd year of follow-up) had > 1-foot examination. The proportion of patients, who had >1 eye examination was also reduced during their follow-up [27]. On the other side, these findings were better than other results of study in Mexico where 13.0% of patients were referred to an ophthalmologist [28]. Similar results were achieved in Iran and Dubai [29, 12]. A previous study in Saudi Arabia revealed a lower rate of retinopathy and nephropathy screening [30]. This goes in line with our results which showed a low level of nephropathy screening, with only 4.15% undertaking Urine albumin creatinine ratio test in last year of follow-up. A study was conducted in Dubai reported a higher rate of nephropathy screening, 30% [12]. The lipid profile was done in 67.4% of our participants, which was higher than in another study in Ethiopia, 5% [31]. Almost half of the participants showed that their HbA1c was measured at 3-6 months interval, this finding was higher than another results of study in Iran which revealed that only 6.4% of the respondents had an

HbA1c test during the year [29]. Regarding aspects of counselling, only 36.8% of participants received hypoglycemia counselling, but most of them received diet and physical activity counselling (64%) and (71.5%) respectively. Another study in Saudi Arabia demonstrated that meal and physical activity planning received by 78% and 71% respectively [26]. Also, we found that only 5.2% of respondents advised to receive the Flu vaccine. These variations in results could be explained by the availability of resources and over healthcare are structure. The variations in the knowledge of healthcare providers also could affect these outcomes.

Regarding control of type 2 diabetes in our participants, our findings showed that HbA1c was measured in only 51.8% in this latter group our findings showed that Hb A1c level was ≤ 7 in 43.5%. These findings were better than many studies. In Mexico, only 23% had HbA1c < 7% [28]. In Saudi Arabia, a study done in the Al Qassim region by Abarrak AI, *et al.*, HbA1c level of ≤ 7.0 was maintained by only 24.7% of patients [26]. Moreover, the albumin-creatinine ratio was normal in majority of our respondents who had ACR tested (83.1%). Microalbuminuria was detected in only 16.9%. This could be affected by the result of the few numbers of ACR tests done. Our result was similar to the results of a previous study in Saudi Arabia [27]. This emphasizes the importance of revising infrastructure and improving training programs for both patients and caregivers regarding diabetes care quality issues. Furthermore, our results showed that only a small percentage of participants developed macrovascular complications, 3.6% had Stroke and 4.7% had heart attack. An earlier study in Ethiopia reported that Diabetic neuropathy (25.0%) and retinopathy (23.1%) were the most common chronic complications [31]. Finally, we found that there was no significant association between HbA1c level or Albumin-creatinine ratio and different socio-demographic characteristics of the participants. Another study which was conducted in Saudi Arabia revealed that there was a statistically significant correlation

between HbA1c level and level of education^[30]. These differences in development of complications may be due to variations of diabetes duration, which is a main determinant for the development of complications.

Diabetes management standards are a critical component of the management plan's success. Healthcare providers should think about implementing clinical programs and clinical education to improve adherence to the ADA standards of care.

There are some potential limitations in our study that need to be addressed. The main limitation was incomplete information of patients' medical records, which may have prevented us from obtaining complete information about chronic diabetes complications. Another limitation was the cross-sectional study design, which was insufficient for assessing the majority of the chronic complications of diabetes.

Conclusion

Our results concluded that the quality of care delivered to diabetic patients in Riyadh in Saudi Arabia was below the average when compared to the standards of the American diabetes association. Moreover, we found that most of the respondents did not develop complications. More studies are needed to determine the causes of this variation in the quality of care delivered. The preferred model of healthcare delivery will be a well-organized and comprehensive multidisciplinary approach to care. Formal evaluation studies are required to demonstrate that these models help to improve the quality of care provided to our patients.

Conflict of Interest

Not available

Financial Support

Not available

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