Adherence to the American Diabetes Association Standards of Care In Saudi Arabia, 2012

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ABSTRACT: **AIM:** To assess the adherence and achievement of the American Diabetic Association (ADA) Standard of Care for patients with type 2 diabetes **Methods**: cross-sectional retrospective epidemiological study conducted on 324 patients during the period (June-August 2012G) by reviewing the files of patients with diabetes type 2 attending the chronic disease clinic in a primary care center in SA. **RESULTS:** It was found that 54.9% of patients were males, 59% in the age group 40-<60 years and all had positive family of type 2 diabetes. (95.4%) had associated co-morbid. Among 64.5% of the patients with a mean BMI of 31.85±5.92. Desirable total cholesterol level and triglycerides were found among 73.5 % & 70.7 % of patients respectively. Optimal levels of LDL and high HDL levels were found among 37.3% & 17.9%, respectively. Foot and retinopathy screening were done among 64.8% & 49.7%, respectively .More than half of the patients (51.5%) were on both insulin and oral hypoglycemic drugs (OHD), 24.7% on insulin alone and 23.8% on OHD alone. The majority of patients (86.7%) were receiving Statins and ACE. 83.3%, 73.5% & 70.7% of patients had achieved controlled blood pressure, desirable cholesterol level, and desirable triglyceride level, respectively. About 35.5% had achieved HbA1C target. And only 12.3% & 5.2% of patients had normal BMI and fasting blood glucose level, respectively. **CONCLUSION:** Assessment of both the processes and outcome indicators showed variable percentage of achievement and adherence to the standard although it is satisfactory to some extent but improvements are necessary.

1. Introduction

Diabetes mellitus (DM) is a growing health problem worldwide, in developed as well as developing countries.[1–3] DM in adults is now recognised as a particular threat to the public health of third-world communities, particularly those living in rapidly developing countries and disadvantaged minorities in industrialised nations.[1–3] An estimated global prevalence of 2.8% was reported in 2000 and a projected prevalence of 4.4% is expected in 2030 (171 million in 2000 to 366 million in 2030).[4,5] Healthcare expenditures on DM type 2 alone is expected to increase from US $376 billion in 2010 to US$490 billion in 2030.[6]

The Middle East region has not been spared from this scourge and currently is among those worst-hit.[4] Prevalence of DM is highly variable among different populations; Reported prevalence data from the Gulf region revealed high rates in Bahrain (25.7%) and Oman (16.1%) .[7,8]

The Kingdom of Saudi Arabia (KSA) is one of the biggest developing countries has witnessed major lifestyle changes and a rapid epidemiologic transition in the past four decades.[9-11] A significant rise in DM prevalence has accompanied these changes [9,10], with an estimate of prevalence being as high as 23.7% among adult citizens. [11,12]

U.K. Prospective Diabetes Study (UKPDS) confirmed that intensive glycemic control was associated with considerably reduced rates of microvascular and neuropathic complications in patients with type 2 diabetes. Long-term follow-up of the UKPDS cohorts showed persistence of the effect of early glycemic control on most microvascular complications. [13]

Diagnosis of diabetes in Chronic Disease Clinic (CDC), Family Medicine Department in military hospital –Airbase Dhahran, KSA is currently performed by applying the criteria suggested by the last edition of American Diabetic Association (ADA) 2012 which includes the following criteria: Hb A1C (48 mmol/mol) 6.5%. OR FPG 126 mg/dL (7.0 mmol/L) OR 2-h plasma glucose 200mg/dL (11.1mmol/L) during an 75 g OGTT, or in a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose 200 mg/dl (11.1 mmol/L) .[14]

The aim of the present study was to assess the adherence and achievement of the American Diabetic Association (ADA) Standard of Care for patients with Diabetes type 2 in the chronic disease

clinic in King Abdullaziz Airbase Hospital, Family and Community Medicine Department, Dahran, Saudi Arabia.

2. Material and Methods

This was a cross-sectional retrospective epidemiological study conducted during the year 2012 G on adult, Saudi diabetic patients whether males or non pregnant females attending for followed-up at the chronic disease clinics in King Abdullaziz Airbase Hospital, Family and Community Medicine Department, Dharhan, Saudi Arabia. This PHC center is responsible for treatment of Saudi military personnel and their families. Patients attending the chronic disease clinic were referred from the primary care clinics at the same center and it is run by family medicine specialists responsible for managing chronic diseases including diabetes type 2, hypertension, dyslipemia, hypothyroidism, obesity, bronchial asthma, and others.

Necessary permissions to conduct the study were obtained from research and ethical committee at King Abdullaziz Airbase Hospital. Confidentiality of the information was strictly adhered to by assuring that no personal details would be released and that data would be used for research purposes only. The total number of registered patients with diabetes at the chronic disease clinic was 2090 patients with an average of 25 patients attending per day. The study was carried out during the period from June till August 2012 G by reviewing the files of patients with diabetes attending the clinic during the period of study by systematic random sampling technique by reviewing the files of every third patient attending the clinic for follow up. The study sample was calculated by the statistical computer package Epi Info (Epi Info TM version 3.3.2, 2005, CDC, Atlanta, USA). and was estimated to be 324 patients.

Pilot study was applied on fifteen files, in order to test the validity and reliability and they were not included in the study, after which the necessary changes were made.

Data was collected by reviewing the patients' data from patient medical record that fulfilled the criteria for DM according to ADA guidelines[14], and WHO classification for obesity. [15] Some of the patients' data were computerized as laboratory data while other patient information and assessment is still paper based. Incomplete files were excluded.

The available collected data were included the following main parts:

1-Socio-demographic characteristics of the studied patients with diabetes including: age, gender, family history of diabetes, and co-morbid diseases.

2-Last available values of Glycated Hemoglobin HbA$_1$c, Blood pressure, Fasting Blood Glucose level, LDL, HDL, TG, Total Cholesterol, and BMI.

3- Medication profile including the use of insulin, oral hypoglycemic drugs, Statins, Antiplatlets, Angiotensin converting enzyme inhibitors/Angiotensin receptors blockers as indicated.

4-Adherence to annual screening for nephropathy, retinopathy, immunization chart updates (influenza and pneumococcal vaccine), and foot care assessment every visit.

The collected data were reviewed, coded, verified, and statistically analyzed using the computer statistical package SPSS version 16 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics for all studied variables, and Chi-square, test were used, and a p-value level of <0.05 was considered statistically significant throughout the study.

3. Results:

Table 1 shows the socio-demographic characteristics of the studied patients with diabetes. It was found that 54.9% of the diabetic patients was males, 59% in the age group 40-<60 years and all the diabetics had positive family of DM. The majority of patients with diabetes (95.4%) had associated co-morbid diseases like hypertension, dyslipidemia, cardiovascular disorders and others.

Table 1: Socio-demographic characteristics of the studied diabetic patients

Socio-demographic characteristics	Total (n=324)	
	No.	%
1- Gender		
Male	178	54.9
Female	146	45.1
2- Age in years		
15 -< 40	49	15.1
40-< 60	191	59.0
60 -< 80	81	25.0
≥ 80	3	0.9
Mean age = 51.67 ± 11.1 SD		
3- Positive family history of DM	324	100.0
4- Associated co-morbidity*	309	95.4

* Hypertension, dyslipidemia, cardiovascular disorders and others

Table 2 demonstrated the distribution of patients with diabetes according to their different parameters of diabetic control. It was noticed that 35.5% had good control level of HBA$_1$C and only 21.9% were poor controlled with a mean level of HBA1c (63 mmol/mol) 7.91%±1.83. On the other hand fasting blood glucose levels was normal among only 5.2% patients with diabetes with a mean level of FBG=2.72±0.56. The majority (83.3%) of patients with diabetes in the present study had achieved controlled level of blood pressure (<130/80 mm hg).

Overweight was reported among 22.8% of patients with diabetes and obesity with its different classes was found among 64.5% of the patients with diabetes with a mean BMI of 31.85±5.92. Desirable total cholesterol

Table 2: Distribution of patients with diabetes according to different parameters of control

	Total (n=324)	
	No.	%
Glycated Hemoglobin HbA$_1$c		
Good control (<53 mmol/mol, < 7 mmol/L)	115	35.5
Fair control (53-75mmol/mol , 7-<9 mmol/L)	138	42.6
Poor control (>75 mmol/mol , ≥ 9 mmol/L)	71	21.9
Mean HBA1c	7.91±1.83	
Cholesterol Level		
Desirable (<200 mg/dl (5.17 mmol/L)	238	73.5
Borderline-High (200 mg/dL and 239 mg/dL (5.17–6.18 mmol/L)	64	19.8
High (≥240 mg/dL (6.21 mmol/L)	22	6.8
Mean Cholesterol level	4.57±1.24	
LDL Level		
Optimal (<100 mg/dL (2.6 mmol/L)	121	37.3
Near optimal (100-129 mg/dL (2.6–3.34 mmol/L))	109	33.6
Borderline-high (130-159 mg/dL (3.36–4.13 mmol/L)	45	13.9
High (160-189 mg/dL (4.14 - 4.90 mmol/L))	30	9.3
Very high(≥190 mg/dL (4.91 mmol/L)	19	5.9
Mean LDL level	3.04±1.11	
HDL Level		
Low (<40 mg/dL (1.04 mmol/L)	95	29.3
Acceptable range (40- 60 mg/dL (1.04–1.56 mmol/L).	171	52.8
High (≥60 mg/dL (1.56 mmol/L)	58	17.9
Mean HDL level	1.25±0.33	
Triglyceride Classification		
Desirable (150 mg/dL (1.69 mmol/L)	229	70.7
Borderline-high (between 150 mg/dL (1.69 mmol/L) and 199 mg/dL (2.25 mmol/L)	50	15.4
High (between 200-499 mg/dL (2.26-5.63 mmol/L))	37	11.4
Extremely High (above 500 mg/dL (5.64 mmol/L)	8	2.5
Mean TG	1.64±1.27	
Blood pressure		
<130/80 mm Hg	270	83.3
>130/80 mm Hg	54	16.7
Body Mass Index BMI(kg/m^2)		
Underweight (<18.50)	1	0.3
Normal weight (18.50 - 24.99)	40	12.3
Overweight (25.00 - 29.99)	74	22.8
Obese-class I (30.00 - 34.99)	117	36.1
Obese-class II (35.00 - 39.99)	69	21.3
Obese-Class III (≥40.00)	23	7.1
Mean BMI	31.85±5.92	
Fasting Blood Glucose (FBG)		
Normal (<5.6 mmol/L)	17	5.2
Impaired Fasting Glucose (5.6-6.9 mmol/L	58	17.9
Diabetes Mellitus (>7 mmol/L)	249	76.9
Mean FBG	2.72±0.56	

level and triglycerides were found among 73.5% and 70.7% of the patients respectively. Optimal levels of LDL and high HDL levels were found among 37.3% and 17.9% of patients, respectively.

Foot and retinopathy screening were done among 64.8% and 49.7% of patients with diabetes, respectively More than half of the patients (51.5%) were on both insulin and oral hypoglycemic drugs (OHD), 24.7% on insulin alone and 23.8% on OHD alone. The majority of patients (86.7%) were receiving Statins and Angiotensin receptor blocker. (Table 3).
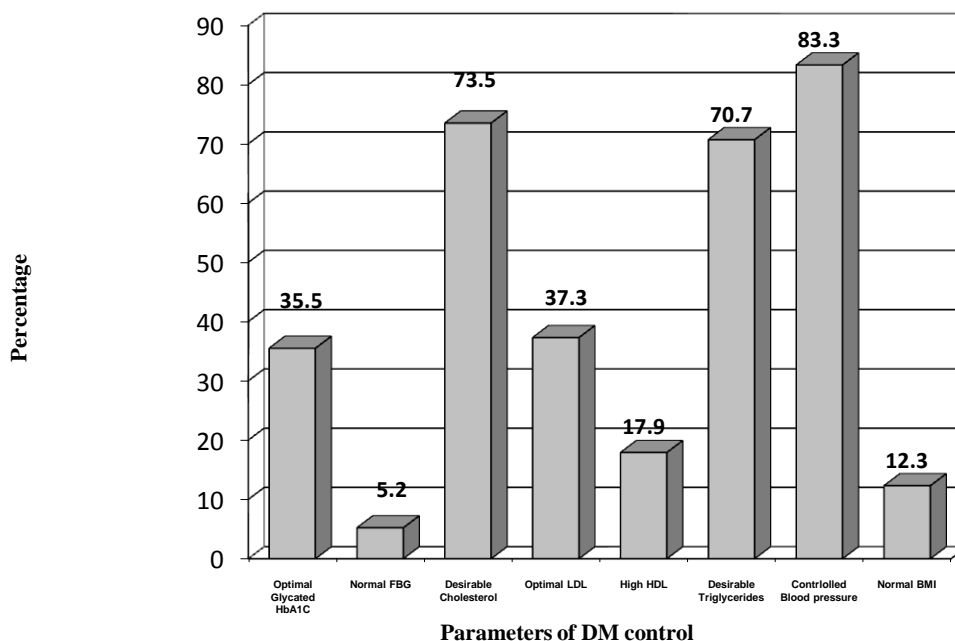
Table 3: Distribution of the patients with diabetes type 2 according to their diabetic condition

Variables	Total (n=324)	
	No.	%
1- Ordered Investigations:		
Nephropathy screening (Albumin Creatinine ratio)	107	33.0
Foot examination	210	64.8
Retinopathy screening	161	49.7
Immunization updates	101	31.2
2- Current Medications :		
Oral hypoglycemic drugs only	77	23.8
Insulin only	80	24.7
Insulin & oral hypoglycemic drugs	167	51.5
Angiotensin receptor blocker	281	86.7
Statins	281	86.7
Aspirin	148	45.7

By studying the association between the socio-demographic characteristics and parameters of control of patients with diabetes with their level of Glycated Hemoglobin HbA$_1$c (Table 4). It was found that the statistically significant factors associated with controlled level of glycated HbA$_1$c were LDl, HDL levels and those who were receiving insulin medications. Where 47%, 19.1% and 96.5% of those with controlled glycated HbA1C had optimal LDL levels, high HDL level and on insulin medications, respectively.

Table 4: Association between socio-demographic characteristics and parameters of control of patients with diabetes type 2 and their level of Glycated Hemoglobin HbA$_1$c

Variables	Glycated Hemoglobin HbA$_1$c				Test of significance (*P-value*)
	Controlled (n=115)		Uncontrolled (n=209)		
	No.	%	No.	%	
LDL Level					
Optimal	54	47.0	67	32.1	
Near optimal	32	27.8	77	36.8	χ2=10.17
Borderline-high	13	11.3	32	15.3	(<0.05)
High	7	61.1	23	11.0	
Very high	9	7.8	10	4.8	
HDL Level					
Low	22	19.1	73	34.9	χ2=9.18
Acceptable range	71	61.7	100	47.8	(<0.05)
High	22	19.1	36	17.2	
Insulin Medications					
Yes	111	96.5	133	63.6	χ2=43.14
No	4	3.5	76	36.4	(<0.001)

4. Discussion: Diabetes mellitus (DM) is an emerging public health problem worldwide that can affect quality of life through involvement of several systems with its serious complications. [1-3] In the present study, obesity among diabetics had shown alarming figures, where 22.8% were overweight and 64.5% were obese (table 2). Similar results were reported in A study conducted at Al-Asyah primary health care (PHC) center, Qassim region, KSA which showed high percentages of overweight and obesity among patients with diabetes (32.7%) and (49.7%) respectively.[16] Internationally, In 2009–2010, 35.7% of U.S. adults were obese, the alarming statistic that 20.4% of American adults were overweight, including 26.5% who were obese.[17] Valk et al. noted that the main risk factors contributing to the increasing incidence of type 2 diabetes are the unrelenting rise in obesity and physical inactivity,[18] but unfortunately our study lack the data about physical activity .

Studies in Saudi Arabia has been done regarding the assessment of the quality improvement processes indicators regarding the adherence to ADA standard at different level of care in different areas of the kingdom. A study in Diabetes Center at Armed Forces Hospital, Southern Region (2006) assessed the compliance with the annual screening for albuminuria , annual screening for retinopathy ,and yearly foot examination which showed 28.8% , 35.4% ,and 12.7%, respectively, in comparison to33% ,49.7% and 64.8% respectively in the present study (table 3). [19] Another study in Taif armed forces hospital in 2007 at seven family practice clinics showed results of 45%, 35% 41% respectively.[20] A study done in internal medicine tertiary care national guard hospital in Riyadh 2006 evaluating the adherence to screening of albuminuria showed a figure of 26% and no data available for other parameter to evaluate screening of neuropathy or foot exam frequency and retinopathy.[21]

Internationally university-based family medicine teaching practice during 2006 wake forest school U.S showed adherence screening to albuminuria in 39% of the patients, retinopathy screening in 15.2%, foot exam in 41.7%.[22] immunization updates we reached 31.2% of patients with up to date vaccination practice of influenza and pneumococcal in diabetics type 2 in the present study (table 3), in comparison to 10.2% in the U.S. study.[22]

Regarding achievement of outcome indicators of DM control as stated by the ADA standard of care 2012. The present study reported HbA1C (less than 53 mmol/mol) < 7mmol/L among 35.5%, and targeted BP <130/80mm/Hg in 83.3% of patients with diabetes (table 2). Moreover, 24.7% of our patients were on insulin, 23.8% on oral hypoglycemic agents, and 51.5% on both, while Angiotesin converting enzymes inhibitors /Angiotensin receptors blocker (ACEI/ARBS) was prescribed to 86.7% of patients (table3). Various studied have been done from kingdom of Saudi Arabia showed different figures , A study done on patients with diabetes type 2 in teaching tertiary hospital in Riyadh showed the target reached in 21.8% for HbA1C control and 39%for targeted BP , these figures are lower than figures reported in the present study and this may be explained by collecting the data from

tertiary hospital where diabetic complication and co morbidities act as barrier to achieve such targets, and regarding their medication use percentage they showed that 13.7% of their patients were on insulin, 51% on oral hypoglycemic agents, 29% on both insulin and oral hypoglycemic agents, 59% on ACEI/ARBS, 72% on antilipids ,and 71.5% of their patients on aspirin and other antiplatlets drugs.[21] Another study from eastern western region in Saudi Arabia (2007) showed figures of 24%, and 32% respectively for same target of HbA1C and BP but there was no information about percentage of patients on antidiabetics' drugs.[23] In Lebanon practice run by family physician targets hit in 28%for HbA1C and targets systolic BP with 55% and targets diastolic BP with 65% where the targets readings of BP was 135/85 mm/Hg which is different from our target BP reading.[24] Medical college in South Carolina (2011) showed higher figures of control than the current study for HbA1C level 40% and for BP 25% but we must say that this practice intergrated with clinical pharmacy practice and cant be compared to the current study.[25] Another study in US university based family medicine teaching clinics showed HbA1C level of 41.8 % for male, 47.7% for female and no reported figures about BP goals was mentioned.[22] On the other hand, In UK national diabetes audit 2009-2010, HbA1C came to be the highest among all studies reviewed which is 63% where their targets for HbA1C is different from this study target (58 mmol/mol) 7.5% and BP targets of 130/80 achieved in 51% of patients.[26]

LDL-Cholesterol target in the current study was <100mg/dl (2.6mmol/l) and this was achieved in 37.3% of patients with diabetes and 86.7% of them on antilipids therapy (tables 2 &3). A Study done in eastern and western population of Saudi Arabia showed 50% reaching the same targets.[23] and 55% in tertiary care practice in Riyadh[6], and 27% in armed forces hospital, south area of KSA.[19] in US south Carolina LDL-Cholesterol target was achieved among 36% of patients which is similar to our results.[25] Other targets achieved for total cholesterol and HDL in our study was satisfactory 73.5% & 53% respectively.

Results was statistically significant in patients with controlled HbA1C showing almost half of them (47%) having the desirable target of LDL-Cholesterol level, 61.7% of them having acceptable target range of HDL and 96.5% of them was on insulin therapy (table 4). Meneghini LF, recommended aggressive and often temporary use of insulin therapy at disease onset in type 2 diabetes is associated with effective glycemic control with minimal weight gain and hypoglycemia.[27] Study done in USA to examine strict diabetic control,

showed significant A1C reductions (P<.001), and 33.0% of patients achieved an HbA1C level (less than 53) ≤7.0%.[28]

In the current study 47% of patient with controlled HbA1C had optimal LDL target with p value <0.05 and the same was recorded for HDL target that was achieved in 61% of diabetes type 2 patients with controlled a1c level with p value <0.05. Higher results was reported in kharal et,al. study [21] where the results showed optimal LDL values of 55.5% in controlled patients but no data were reported regarding HDL. Colayco DC et al study in their case control study showed significant association between LDL and HbA1c controlled (less than 42mmol/mol) 6% (p value 0.0006). [29]

In conclusion, our study results concluded the ADA guidelines were applied in most of our patients regarding foot examination and retinopathy screening. However, similar to other studies we are still lagging behind regarding albuminuria screening ,immunization updates, which indicate that reasons for non-adherence to a specific guidelines is multifactorial.

In the present study, results of assessment of both the quality improvement processes and outcome indicators showed variable percentage of achievement and adherence to the standard although it is satisfactory to some extent but improvements are necessary if ADA standards are the goals. Several factors might contribute to these findings. These include poor patient compliance to advice, treatment or appointments, or lack of self care and effective health education programs. However, further studies are needed in Saudi Arabia with improved methodology to ensure quality of care delivered to diabetic patients in Saudi Arabia and to address the actual reasons for such performance and managed accordingly. Furthermore stressing on key performance measures to evaluate the adherence to the diagnostic test for primary prevention in high risk population and ensure quality and efficacy of life style modification programs.

Being a retrospective study the results of the present study can't be generalized to other population, Furthermore our data collected from paper based records lacking the information about neuropathy screening, diet and life style intervention and frequency of HbA1C ordered by the treating physician per year and many other information this indicates the importance of proper complete recording and reporting.

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