

Clinical diabetes care of patients with type 2 diabetes at a major tertiary care hospital in the United Arab Emirates

Abstract

Aim: The prevalence of type 2 Diabetes Mellitus is rapidly increasing in the United Arab Emirates (UAE), resulting in a huge burden on the healthcare economy of the country. Therefore, improvement in the standards of diabetes care is required to prevent the complications of diabetes. This study evaluated the adherence of a tertiary care hospital of the UAE to the international standards of diabetes care in order to provide clinicians with information for improving diabetes care in clinical setting.

Materials and methods: A retrospective analysis of 5% (n=240) of 4800 diabetic patients visiting the clinics was conducted in a tertiary care hospital of Al Ain, UAE. The data were collected on demographic characteristics (age, gender) and 12 clinical indicators of standards of diabetes care as per American Diabetic Association (ADA) guidelines. Chi-square tests were applied to compare standards of diabetes care with CDC targets. Independent t-tests and one way ANOVA were applied to measure difference in HbA1c by gender and age groups respectively.

Results: Of the total 240 patients, majority were females (58.3%) and 50-65years old (53.5%). About 63.0% of patients were obese and 56.2% had HbA1c above 7. Hospital significantly exceeded the CDC targets in blood glucose (95.0%, p=0.00), HbA1c monitoring (98.0%, p=0.00), ±detailed eye examination (77.0%, p=0.001) and blood pressure control (57.0%, p=0.39). However, the hospital significantly fell below the target of achieving HbA1c <7(38.0%, p=0.00) and foot examination (59.0%, p=0.006). Poor diabetes control (HbA1c >7) was significantly (p=0.007) associated with obesity. The proportion of poor diabetes control was slightly higher (p=0.421) in patients >60years and females (p=0.603).

Conclusion: The study highlighted the importance of adhering to diabetes care standards of ADA. Diabetes care could be further improved with more effort from diabetes care team, managing obesity and by improving patients' education and self-care.

Keywords: diabetes care indicators, clinical diabetes care, tertiary care hospital

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Abbreviations: ADA, american diabetes association; ANOVA, analysis of variance; BMI, body mass index; CDC, centre for disease control; DM, diabetes mellitus; FBS, fasting blood sugar; HbA1c, glycated haemoglobin; ICSI, institute of clinical systems improvement; IDF, international diabetes federation; MENA, middle east and north africa; NNHS, national nutrition health survey; UAE, united arab emirates

Introduction

Diabetes mellitus (DM) is a chronic disease and a major source of morbidity and mortality. The number of patients suffering from diabetes in 2013 was 382million, a total which is expected to increase up to 592million in 2035.¹ The prevalence of diabetes has increased dramatically all over the world.^{2,3} As per International Diabetes Federation (IDF) figures, 382million people have Diabetes in the world, of which more than 34.6million are in MENA (Middle east and North Africa), which is expected a rise up to 67.9million by 2035.¹ There is substantial evidence that many of the adverse outcomes of diabetes can be prevented, or at least delayed, by an aggressive programme of more preventive care, prompt identification of the

problem, early intervention and treatment.^{4,5}

According to IDF, United Arab Emirates is one of the most vulnerable countries in the world with a high prevalence of type 2 diabetes. In age group of 20-79years, the prevalence of Diabetes is approximately 10.2%.¹ In 2007, Saadi and co-workers reported that age standardized rates of diabetes (diagnosed and undiagnosed) and pre-diabetes in Al Ain city was 29.0% and 24.2% respectively.⁶ The number of undiagnosed diabetes patients is 30,360. The total number of death in age group of 20-79 years is 1,385, while mean expenditure due to diabetes per person is 2,228US dollars.¹

Diabetes clinical studies in the UAE either used a small sample size,⁷ or produced inconclusive results.⁸ These studies reported modest improvements in some key indicators of diabetes care. One clinical intervention study published in 2012 has shown improvement in two diabetes care indicators (glycated haemoglobin and blood pressure control). Results of this interventional study were generally positive and emphasized the feasibility of improving the current clinical practice and the need of further research to understand the long term impact of structured approach to improve the quality of type 2 Diabetes care in the UAE.⁹

A study conducted on 651 patients in Kingdom of Saudi Arabia reported that mean HbA1c was $9.0 \pm 2.0\%$, mean fasting plasma glucose was 9.9 ± 3.9 mmol/L, and mean 2hour postprandial plasma glucose was 15.0 ± 5.3 mmol/L. In 20.6% of patients the HbA1c level was less than 7%.¹⁰ Another study conducted in Riyadh, Saudi Arabia reported that 39.0% of the patients achieved overall ADA targets of Diabetes care with fasting blood glucose 21.8%, HbA1c 55.5% and LDL-C 55.5%. The study concluded that ADA standards of diabetic care were not met in most of diabetic patients, indicating that these standards are easy to preach than to practice.¹¹

The aim of this study was to explore the current diabetes care standards in type II diabetes patients at tertiary care hospital and compare practices with international standards.

Materials and methods

We conducted a retrospective analysis of records of type II diabetes patients who had attended diabetes clinics at a tertiary care hospital of Al Ain, United Arab Emirates in 2013. Al Ain is an Emirate of Abu Dhabi, United Arab Emirates with a population of approximately 400,000. The study was conducted in diabetes polyclinic of a tertiary care hospital providing health services to the population of the Al-Ain eastern region. The study participants included patients having confirmed diagnosis of type II diabetes mellitus with age of 18years and above. A total number of 4800 patients fulfilled our criteria. We selected a random sample of 240 patients (5%) from the total number of patients.

A tool was developed based on the prioritised aims and measures of Institute of Clinical Systems Improvement (ICSI) and finalized by diabetes team.¹² A reporting tool using agreed data definitions was completed for each patient on 12 clinical indicators for diabetes management. The Data analysis was made in compliance with measurement specification of the ICSI guidelines. Remedial measures were undertaken based on recommendations from local guidelines. We gathered data on characteristics of patients i.e. gender and age, Body Mass Index (BMI) and twelve diabetes care clinical indicators such as Glycated Haemoglobin (HbA1C), blood pressure, aspirin, foot examination, referral for dilated eye examination, self-monitoring of fasting blood glucose levels (FBS), advice on diet, advice on exercise, referral to the nutritionist and smoking status. The study was approved by the ethical committee of Faculty of Medicine, United Arab Emirates University, Al Ain, and United Arab Emirates.

The data were stored in Microsoft Excel and transferred to SPSS version 21 for statistical analysis. Both descriptive and inferential statistics were applied in statistical analysis. In descriptive statistics, average and standard deviations were calculated for continuous variables such as age, Glycated Haemoglobin (HbA1c), Body Mass Index (BMI) and Fasting Blood Sugar (FBS). Frequencies and percentages were computed for categorical variables of age, BMI and HbA1c categories, gender and standards of diabetes care. In inferential statistics, independent t-tests were run to measure differences in average BMI, FBS and HbA1c in gender and one way analysis of variance (ANOVA) by age categories. Chi-square tests were used to compare standards of diabetes care with centre for diseases control (CDC) 2000 goals and levels of HbA1c with BMI categories. Further, the comparison of HbA1c with BMI was stratified by gender and age group to reduce confounding and effect modification.

Results

Average age of 240 patients was 57.9 ± 14.1 years. Of the total

patients, 22.5% were equal or less than 50 years old, 52.5% were 50-65 years old and 25.0% were equal and above 65 years. The majority of patients were females (58.3%) were females (Table 1). Average HbA1c of patients was 7.85 ± 1.7 , FBS 9.70 ± 4.3 and BMI was 31.3 ± 7.4 . The majority of patients were obese (56.2%), while 26.7% were overweight. Most of the patients had had HbA1c above 7 (62.1%) and above one third of patients (37.9%) had HbA1c less than 7 (Table 1).

In standards of diabetes care, HbA1c was monitored twice a year for 99.0% of patients, smoking status 95% and foot examination for 59.2% of the patients. Detailed eye examination was conducted in 77.1% and blood glucose levels were monitored in 95% of the patients. The BMI of all patients was documented. About 98.0% of the patients were given advice on exercise and diet each and 54.2% were referred to nutrition counselling. Only 37.9% of the patients had HbA1c less than or equal to 7 and 52.1% had blood pressure less than 130 mmHg. To see the descriptive statistics on standards of diabetes care (Table 1).

Table 1 Descriptive statistics of baseline characteristics and standards of Diabetes care in patients (N=240)

Variables	Frequency/Mean	% \pm SD
Age(years)	57.9	± 14.1
Age-Cat		
<50years	54	22.5
50-65years	126	52.5
≥ 65 years	60	25
Gender		
Male	100	41.7
Female	140	58.3
HbA1c(%)	7.85	± 1.7
HbA1c - Cat		
≤ 7	91	37.9
> 7	151	62.1
Fasting blood Sugar(mmol/L)	9.7	± 4.3
BMI(Kg/m ²)	31.3	± 7.4
BMI-Cat		
Normal	41	17.1
Overweight	64	26.7
Obese	135	56.2
Standards of diabetes care*		
HbA1c check twice a year	238	99

Table Continued....

Variables	Frequency/Mean	%±SD
Smoking status documentation	228	95
Foot examination documentation	142	59.2
Dilated eye examination	185	77.1
Self-monitoring blood glucose levels	228	95
BMI documentation	240	100
Advice on diet	235	98
Advice on Exercise	235	98
Nutrition Referral	130	54.2
HbA1c<7	91	37.9
SBP <130mmHg	125	52.1
Aspirin	214	89.2

Categorical variables were presented as frequencies and percentages

Continuous variables were presented as means and ±standard deviations

SD, standard deviation, HbA1c, glycated haemoglobin, BMI, body mass index, SBP, systolic blood pressure

*American Diabetic Association (ADA) standards of diabetes care

Average HbA1c, FBS and BMI were compared with gender and age groups. No significant difference was found in average HbA1c and FBS in gender and age groups. However, average BMI was higher in 50-65years old patients (p=0.023) and females (p=0.007) (Table 2).

Table 3 shows the comparison of glycaemic control with BMI, age groups and gender. The percentage of patients with poor diabetes control (HbA1c>7) significantly (p=0.007) increased with increase in BMI i.e. proportion of poor diabetes control in patients with normal BMI was 41.5%, overweight 65.6% and obese was 68.1%. Similarly, the proportion of poor diabetes control was higher in patients older than 65years, but the increase was insignificant (p=0.421). Likewise, the prevalence of poor diabetes control was slightly higher (p=0.603) in females versus their male counterparts. Further, glycated haemoglobin levels were compared with BMI in strata of gender and age groups. Across all age groups, the proportion of patients with poor diabetes control was the highest in obese patients. In addition, the highest proportion of poor diabetes control was observed in the obese eldest age group. Within gender, the obese males (79.5%) had the highest proportion of poor diabetes control as compared to the patients who were overweight (57.6%) or normal (30.4%). However, the prevalence of poor diabetes control was maximum in overweight (74.2%) females, followed by obese (62.6%) and normal BMI (55.5%).

In comparison of diabetes care standards with CDC, Tawam hospital significantly exceeded the target in majority of its standards i.e. self-reported monitoring of blood glucose (95.0%, p=0.000), HbA1c test twice a year (98.0%, p=0.000), detailed eye examination (77.0%, p=0.001) and blood pressure control (57.0%, p=0.59). However, the hospital substantially fell below (20.9%) the target of achieving HbA1c <7 (37.9%, p=0.00) and comprehensive foot examination (59.0%, p=0.006) (Table 4).

Table 2 Comparison of average Glycated Haemoglobin, Fasting Blood Glucose and Body Mass Index with gender and age groups (N=240)

Variables	HbA1c(%)			FBS(mmol/L)		BMI(Kg/m ²)	
	N	Mean±SD	P-value	Mean±SD	P-value	Mean±SD	P-value
All	240	7.9±1.7	--	9.7(4.7)	--	31.3±7.4	--
Age(years)							
<50years	54	8.1±2.2	0.538	10.6±6.2	0.154	30.7±9.1	0.023
50-65years	126	7.8±1.7		9.7±4.3		32.5±7.5	
≥65years	60	7.8±1.3		8.9±3.7		29.4±5.0	
Gender							
Male	100	7.9±1.8	0.666	9.5±5.1	0.521	29.8±7.7	0.007
Female	140	7.8±1.7		9.9±4.5		32.4±7.1	

HbA1c, glycated haemoglobin, FBS, fasting blood sugar, BMI, body mass index, SD, standard deviation Independent t-test was performed to estimate differences in average HbA1c, FBS and BMI by gender. One way ANOVA was performed to estimate differences in average HbA1c, FBS and BMI by age groups. P-values≤0.05 were considered as statistically significant for both ANOVA and t-test

Table 3 Comparison of Glycated Haemoglobin with Body Mass Index, overall and by age groups and gender (N=240)

Variables	HbA1c≤7		HbA1c>7		P-value ≤0.05
	N	Freq (%)	Freq (%)		
Overall	240	89(37.1)	151(62.9)		
BMI(Kg/m²)					
Normal	41	24(58.5)	17(41.5)	0.007	
Overweight	64	22(34.4)	42(65.6)		
Obese	135	43(31.9)	92(68.1)		
Age (years)					
Age <50years	54	21(38.9)	33(61.1)	0.421	
Age 50-65years	126	50(39.7)	76(60.3)		
Age ≥65years	60	18(30.0)	42(70.0)		
Gender					
Male	100	39(39.0)	61(61.0)	0.601	
Female	140	50(35.7)	90(64.3)		
Age (years)					
Age <50years					
BMI(Kg/m²)					
Normal	15	10(66.7)	5(33.3)	0.001	
Overweight	12	0(0.0)	12(100.0)		
Obese	27	11(40.7)	16(59.3)		
Age 50-65 years					
BMI(Kg/m²)					
Normal	16	10 (62.5)	6 (37.5)	0.006	
Overweight	30	14(46.7)	16(53.3)		
Obese	80	26(32.5)	54(67.5)		
Age ≥65years					
BMI(Kg/m²)					
Normal	10	4(40.0)	6(60.0)	0.059	
Overweight	22	8(36.4)	14(63.6)		
Obese	28	6(21.4)	22(78.6)		
Gender					
Males					
BMI(Kg/m²)					
Normal	23	16(69.6)	7(30.4)	0.002	
Overweight	33	14(42.4)	19(57.6)		
Obese	44	9(20.5)	35(79.5)		
Females					
BMI(Kg/m²)					
Normal	18	8(44.4)	10(55.5)	0.147	
Overweight	31	8(25.8)	23(74.2)		
Obese	91	34(37.4)	57(62.6)		

HbA1c, glycated haemoglobin; BMI, body mass index

It was categorized according to CDC–2000 guidelines. Normal: BMI<25Kg/m², Overweight: BMI=25-29.9Kg/m², Obese=BMI ≥30Kg/m²

Chi-square tests were performed to estimate association of HbA1c with BMI, age and gender. P-value ≤0.05 was considered as statistically significant

Table 4 Comparison of Diabetes Care indicators of patients visiting Tawam Hospital with Centre for Disease Control targets (N=240)

Diabetes care indicators	Tawam hospital (%)	CDC target (%)	Difference (%)	X ² Score	P-value
				>3.84	≤0.05
HbA1c< 7	38	58.9	20.9	12.5	0
Comprehensive foot examination	59	74.8	15.8	7.7	0.006
Dilated eye examination	77	58.7	-18.3	11.4	0.001
Patients having HbA1c test twice a year	98	71	-27	56.8	0
Patients with controlled blood pressure	57	52	-5	0.7	0.39
Self-reported monitoring of blood glucose	95	70.4	-24.6	40.7	0

HbA1c, glycated haemoglobin, CDC, centre for disease control, X², chi-square

Chi-square test was applied to compare clinical indicators of patients at Tawam hospital with CDC target. P-value of ≤0.05 and chi square >3.84 were considered for statistical significance

Discussion

The majority of patients (37.1%) included in this study could not achieve the CDC target of glycaemic control (HbA1c< 7). These findings were consistent with National Nutrition Health survey 1999 (NNHS), in which around 35.0% of the patients achieved the CDC target of HbA1c.¹³ One of the possible explanations for not meeting the desired glycaemic control is the increasing prevalence of patients with multiple co-morbidities, which complicates the management of type 2 diabetes. Another reason might be that patients with better glycaemic control are usually managed at primary care centres, whereas complicated cases are referred to the tertiary care hospital. Moreover, the low control of HbA1c is associated with the gradual progression of the disease over time, which was also reported by the United Kingdom prospective diabetes study.¹⁴ Another possibility for the poor control of HbA1c is the clinical inertia by the physicians to take appropriate and timely actions for high HbA1c. Like HbA1c, blood pressure control was also lower than the CDC-target. Possible explanations is the progression of the disease over time, poor compliance with medications, as well as clinical inertia, an issue associated with health care professionals, has been suggested for the suboptimal control of blood pressure. The Canadian coalition of blood pressure control gave a non-compliance rate of 50% in its report.¹⁵

Regular fundoscopy can detect and prevent the diabetes eye complications. The figures showed excellent compliance with CDC target. Compared to the previous study conducted by Afandi et al., in which compliance of patients with detailed eye examination was lower because it was time-consuming for patient to have their eyes dilated and the examination had little importance to the patients.⁷ After much effort, by emphasizing on the importance of eye examinations, the percentage of patients attending the retinal clinic improved, and even exceeded the CDC targets. In addition, the percentage of patients initially attending regular foot examinations was low, due to the time

constraints in busy clinics; moreover, most physicians felt that it was inconvenient for patients to take off their shoes and socks. The action taken to improve it was to involve a podiatrist for a regular examination and to reduce the number of patients in the physician's clinic. Most of the patients were given advice to help them stop smoking and some of them were referred to the smoking cessation clinics.

Major improvement was seen in the documentation of BMI and advice on the diet and exercise, which was given to almost every patient, because the literature revealed that advice on changing to a healthy life style can significantly improve diabetes outcomes.¹⁶ Referral to a nutritionist also improved gradually to 52% in this context. The data indicated that the majority of the patients were obese (56.2%). A high proportion of obese patients indicate the increasing prevalence of obesity in UAE particularly in females.¹⁷⁻²¹ Another observation was that the HbA1c deteriorated with increase in BMI of patients. Obese patients had poor control of diabetes as compared to the patients with normal BMI. These findings suggest that obesity has played a significant role in deterioration of HbA1c.¹⁷⁻²¹

We compared BMI with glycated haemoglobin across age group. The study did not find a clear association of poor diabetes control with either age group or gender. However obesity increased with age group and was most common in age group of 50 to 65years and again decreased after 65years because of possible decrease in lean body mass. The glycated haemoglobin deteriorated with increasing age particularly in patients of age 65years and above. The main reason for it is the sedentary life style above age of 65 with increase in multiple co-morbidities which contribute to poor control.

Limitations

The study was conducted in a tertiary care hospital, but data on lipids, micro-albuminuria and annual influenza vaccination were not included. Moreover, referral to dental care was not included in the study.

Conclusion and recommendations

The findings of this study on diabetes care are consistent with other studies carried out in the Gulf region, Middle East and Western countries.²²⁻²⁹ This study highlights the importance of using diabetes standards (flow chart), which includes all the required indicators of diabetes management, as advised by international working groups like ADA. The study results were quite encouraging; however, diabetes care could be further improved with more effort from diabetes care team, improving patients' education and self-care. This study emphasizes the need for periodic monitoring of diabetes and its associated risk factors like obesity and complications. Also, there is a dire need to manage and prevent obesity, which is steadily increasing in the UAE. Further, training and education of the stake-holders is imperious to improve the quality of diabetes care at all levels of the health care system (primary, secondary and tertiary), in compliance with the policy of the UAE government.

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Conflict of interest

Author declares that there is no conflict of interest.

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