Gender differences of the clinical aspects and complication risks of diabetes mellitus among outpatient clinic visits, Jeddah, Saudi Arabia

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Abstract

Background: Gender differences are important in epidemiology, pathophysiology, treatment, and outcomes in Type 2 DM,

Objectives: To study gender differences of the burden of type 2 diabetes and complication risk among Saudi subjects visiting the outpatient clinics.

Subjects and methods: A cross sectional study, including 2501 patients, who visited the outpatient clinics at two private general hospitals in Jeddah during the years 2018 through to 2019. All patients were examined and diagnosed by specialists.

Data were collected using check list form to obtain personal characteristics and area of residence; vital signs, anthropometric measurements, clinical characteristics and outcome of the visits. Statistical analysis: SPSS version 23 (IBM), was used. Chi square, and logistic regression tests were used. OR, and 95% IC were used to describe the relationships. Level of significance was 0.05.

Results: Out of all the visits to the outpatient clinics, DM constituted 5.5%. Type 2 DM was common in those aged 40 years and above, while Type 1 DM was common in those aged 18 years and younger. Males were at 1.7 times more likely to develop DM compared to females (OR 1.715; 95% CI: 1.146, 2.257, p <0.009). The males with T2DM had significantly more frequent edema of the lower limbs compared to the females. Polyuria was the most common symptom, while HBA1C and FBS were the most common investigations ordered, and Biguanides and sulfonylurea and insulin were the common treatment prescribed. These were similar in both the males and females. Hypertension (22%), IHD (6%), and dyslipidemia (6%) were encountered among patients with T2DM; however, these CVDs were similar in the males and females.

Conclusion: DM is a common chronic disorder, which imposes burden on the primary health care in Saudi Arabia. It is more common in males than females, however, the pattern of cardiovascular complications and health care management were similar in both genders.

Key words: DM, Gender, outpatient clinics, Saudi Arabia,

Background

Diabetes Mellitus (DM) is a common metabolic disease; it is caused by defective insulin secretion by pancreatic β-cells and/or the inability of insulin-sensitive tissues to respond to insulin. It is classified as type 1 DM (T1DM), and type 2 DM (T2DM), and those with ketoacidosis (DKA) as a complication of uncontrolled DM (1 - 4). Diabetes affects a substantial proportion of hospitalized patients and is associated with considerable costs. Biologically males and females have similar diabetes prevalence. Gender differences in the social structure, gender differentials in diagnosis, access to care, access to medications and follow up, adherence to medications, life style modifications and all other self-care behaviors are likely to introduce a dramatic contrast in the experiences of women with diabetes. Prevalence of T2DM is higher in young women than young men (5 - 7). DM is associated with multi-system symptoms e.g. fatigue, urinary incontinence and polyuria, neuropathy, gastrointestinal manifestations, and headache (8 -16). DM is usually associated with comorbidities e.g. thyroid dysfunction, hypertension, dyslipidemia and cardiovascular disorders and neuroglycopenia (17 - 22). As DM is a systemic disorder which affects different systems of the body, routine investigations done on patients with DM may include a multitude of tests in addition to those to assess the blood sugar level (23-30). There are different types, or classes, of drugs that work in different ways to lower blood sugar levels: Alpha-glucosidase inhibitors, Biguanides, Bile Acid Sequestrants, Dopamine-2 Agonists, DPP-4 inhibitors, Meglitinides, SGLT2 Inhibitors, Sulfonylureas, TZDs , and Oral combination therapy (31-34). The aim of this study was to explore the impact of gender differences on the burden, clinical aspects and management of DM among outpatient visits.

Subjects and methods

It was a cross sectional study which was conducted in the outpatient clinics of two private general hospitals; one in a relatively high socioeconomic standard region, and the other in a relatively lower socioeconomic standard region of Jeddah city, Saudi Arabia. The sampling technique was a non-probability convenient one; the total number of patients examined was 2501 during a two yearsperiod (2018 – 2019). Data were collected on the patients by specialists in the outpatient clinics; it included clinical history, anthropometric and vital signs assessments, clinical assessment (which included physical examination, diagnosis, investigations and management), and outcome of the visits. Data were analyzed using the Statistical Package for Social Sciences (IBM SPSS, version 22, Armonk, NY: IBM Corp.). Chi Square and multinomial logistic regression tests of significance were employed. The Odds ratio (OR), and 95% confidence interval (95% CI) were calculated. The level of significance for the study was 0.05.

Ethical considerations

Ethical clearance was obtained from the institutional research review board (IRRB). Permission was obtained from the directors of the outpatient clinics for collecting data on the outpatient visits. In order to keep confidentiality of any information provided by study participants, the data collection procedure was anonymous.

Results

Table 1 shows the distribution of outpatient clinics (OPCs) visits according to type of diabetic disorders. Out of all the visits, those due to DM were 5.5%. T1DM was the most common in those aged 18 years or less (75%), while T2DM was most common in those aged 40 years old or older (95.5%). DKA was recorded only in those younger than 18 years old. These differences were statistically significant where p value was < 0,000. T2DM was higher in males compared to females (72.9% and 27.1% respectively); while T1DM and DKA were similar in both genders ($p < 0.005$). T2DM and DKA (62% and 100% respectively) were more common in the North of Jeddah region compared to the Southern region (37.6% and 0.0% respectively); this difference was statistically significant ($p <0.029$). The majority of patients with T2DM were discharged (96.2%) compared to patients with T1DM (75%); on the other hand all patients with DKA were admitted to the hospital. These differences were statistically significant where $p < 0.000$.
Table 2 reveals the distribution of outpatient visits due to T2DM according to presenting symptoms and signs. A large proportion of patients with T2DM visited the OPCs for follow up (46.6) and renewal of medicine. Polyuria was the most frequent complaint (11.3%) among the T2DM patients; fatigue, headache, and dyspepsia (9.0% each) were also common complaints among T2DM patients. Numbness in the hands and feet (6.8%), dizziness and polydipsia (5.3 each), and oedema of the lower limbs (3.8%) were reported complaints by the T2DM patients. Least frequent complaints were weight gain (1.5%) and weight loss, heartburn and hypotension (0.8% each). All these complaints were similar in males and females ($p >0.05$), except for oedema of the lower limbs which was significantly more common in males (11.0%) compared to females (1.0%), where $p < 0.007$. Among patients with T2DM, 22.0% had HTN, 8.3% had IHD, 6. 0% had dyslipidaemia, while DVT was encountered among 0.8% of the patients. No significant differences were found between males and females regarding these CVDs ($p > 0.05$).

Table 3 displays distribution of T2DM patients according to gender and type of investigation done. The majority of blood tests for assessment of DM were HBA1C (36.1%) and FBS (35.3%). RBS was done on 18.8% of the patients, while 2HPPG test was the least to be ordered (3.0%). No significant differences were found between males and females in ordering these investigations ($p > 0.05$). Next in frequency were tests for lipid profile (17.5%), Serum creatinine (16.5%), and urine analysis 15.0%).

Table 4 reveals the distribution of the T2DM patients according to gender and type of medication prescribed. About 13% of the patients with T2DM were prescribed insulin to control DM, mainly in the form of short acting insulin (SAI, 5.3%), and combination insulin (4.5%). Rapid acting insulin (RAI: 1.5%) and long acting insulin (LAI: 1.5%), were also prescribed to some T2DM patients. None of the patients with T2DM was prescribed intermediate acting insulin (IAI: 0.0%). No significant differences were found between males and females ($p > 0.05$). The groups of oral T2DM drugs included mainly biguanide antidiabetic medication 24.8%), Sulfonylureas medication (24.8%), Dipeptidyl peptidase drugs (6.0%) and to a lesser extent thiazolidinedione drugs (3.8%). The following antidiabetic drugs: Amylinomimetic, Alpha-glucosidase inhibitors, Dopamine agonist, GLP-1, Meglitinides, and SGLT were not prescribed to any patient with T2DM. This was similar in both males and females ($p > 0.05$). Vitamin B complex preparations (24.8%), and antihypertensive drugs (21.8%) and to some extent hypolipidemic drugs (6.8%) were, also, prescribed to patients with T2DM. Aspirin was prescribed to only, 3.8% of the patients. No significant differences were found between males and females ($p > 0.05$).

Table 5 reveals the Multi-nominal Logistic regression results between DM and age, gender, district and hospital admission. DM tends to occur among relatively younger age groups in patients who visit the outpatient clinics (B = - 0.065). Females were at 1.7 times more risk to develop DM compared to males (OR: 1.715; 95% CI: 1.146, 2.570, $p < 0.009$).

Table 1: Distribution of studied subjects according to having DM and personal and sociodemographic variables

Variables	Diabetes mellitus					X2 (p-value)
	No DM No %	T1DM N0 %	T2DM No %	DKA No %	Total No %	
Age (years)						
<18	1118 47.3%	3 75.0%	3 2.3%	2 100.0%	1126 45.0%	223.414 (.000)
18 - <40	481 20.4%	0 0.0%	3 2.3%	0 0.0%	484 19.4%	
40+	763 32.3%	1 25.0%	127 95.5%	0 0.0%	891 35.6%	
Gender						
Male	1353 57.3%	2 50.0%	97 72.9%	1 50.0%	1453 58.1%	12.830 (.005)
Female	1009 42.7%	2 50.0%	36 27.1%	1 50.0%	1048 41.9%	
District						
South	1050 44.5%	4 100.0%	50 37.6%	0 0.0%	1104 44.1%	9.048 (.029)
North	1312 55.5%	0 0.0%	83 62.4%	2 100.0%	1397 55.9%	
Outcome						24.225 (.000)
Discharged	2054 87.0%	3 75.0%	128 96.2%	0 0.0%	2185 87.4%	
Admitted	308 13.0%	1 25.0%	5 3.8%	2 100.0%	316 12.6%	

Table 2: Distribution of Type 2 DM patients according to gender and reason for visit outpatient clinics and clinical aspects

Variable	Categories	Doctor diagnosed DM				*Total*		*X2* (p- value)
		Male		Female				
		N	%	N	%	N	%	
Come for follow up	No	53	54.6%	18	50.0%	71	53.4%	.227[a] (.634)
	Yes	44	45.4%	18	50.0%	62	46.6%	
Fatigue	No	89	91.8%	32	88.9%	121	91.0%	.227[a] (.609)
	Yes	8	8.2%	4	11.1%	12	9.0%	
Polydipsia	No	92	94.8%	34	94.4%	126	94.7%	.008[a] .927
	Yes	5	5.2%	2	5.6%	7	5.3%	
Polyuria	No	86	88.7%	32	88.9%	118	88.7%	.001[a] .970
	Yes	11	11.3%	4	11.1%	15	11.3%	
Polyneuritis	No	89	91.8%	35	97.2%	124	93.2%	1.245[a] .265
	Yes	8	8.2%	1	2.8%	9	6.8%	
Dizziness	No	92	94.8%	34	94.4%	126	94.7%	.008[a] .927
	Yes	5	5.2%	2	5.6%	7	5.3%	
Hypotension	No	96	99.0%	36	100.0%	132	99.2%	.374[a] .541
	Yes	1	1.0%	0	0.0%	1	0.8%	
Edema of lower limbs	No	96	99.0%	32	88.9%	128	96.2%	7.374[a] .007
	Yes	1	1.0%	4	11.1%	5	3.8%	
Headache	No	87	89.7%	34	94.4%	121	91.0%	.723[a] .395
	Yes	10	10.3%	2	5.6%	12	9.0%	
Heartburn	No	96	99.0%	36	100.0%	132	99.2%	.374[a] .541
	Yes	1	1.0%	0	0.0%	1	0.8%	
Dyspepsia	No	87	89.7%	34	94.4%	121	91.0%	.723[a] .395
	Yes	10	10.3%	2	5.6%	12	9.0%	
Weight gain	No	95	97.9%	36	100.0%	131	98.5%	.754[a] .385
	Yes	2	2.1%	0	0.0%	2	1.5%	
Weight loss	No	96	99.0%	36	100.0%	132	99.2%	.374[a] .541
	Yes	1	1.0%	0	0.0%	1	0.8%	
History of Hypertension	No	78	80.4%	25	71.4%	103	78.0%	1.211[a] .271
	Yes	19	19.6%	10	28.6%	29	22.0%	
History of Ischemic heart disease	No	89	91.8%	33	91.7%	122	91.7%	0.000 .987
	Yes	8	8.2%	3	8.3%	11	8.3%	
Deep vein Thrombosis	No	96	99.0%	36	100.0%	132	99.2%	.374[a] .541
	Yes	1	1.0%	0	0.0%	1	0.8%	
Dyslipidemia	No	93	95.9%	32	88.9%	125	94.0%	2.268[a] .132
	Yes	4	4.1%	4	11.1%	8	6.0%	

Table 3: Distribution of Type 2 DM patients according to gender and type of investigation done on them

Variable	categories	Doctor diagnosed DM				Total		X2 (p- value)
		Male		Female				
		N	%	N	%	N	%	
1. FBS	No	62	63.9%	24	66.7%	86	64.7%	
	Yes	35	36.1%	12	33.3%	47	35.3%	
2 Hours Post Prandial Glucose test	No	94	96.9%	35	97.2%	129	97.0%	.009[a] (.925)
	Yes	3	3.1%	1	2.8%	4	3.0%	
Random Blood sugar	No	75	77.3%	33	91.7%	108	81.2%	3.541[a] (.060)
	Yes	22	22.7%	3	8.3%	25	18.8%	
Glycosylated hemoglobin	No	58	59.8%	27	75.0%	85	63.9%	2.632 (105)
	Yes	39	40.2%	9	25.0%	48	36.1%	
Lipid profile	No	78	80.4%	32	88.9%	110	82.7%	1.319[a] (.251)
	Yes	19	19.6%	4	11.1%	23	17.3%	
Urine analysis	No	84	86.6%	29	80.6%	113	85.0%	.750[a] (.386)
	Yes	13	13.4%	7	19.4%	20	15.0%	
Serum creatinine	No	82	84.5%	29	80.6%	111	83.5%	.301[a] (.583)
	Yes	15	15.5%	7	19.4%	22	16.5%	
Serum uric acid	No	93	95.9%	34	94.4%	127	95.5%	.125[a] (.724)
	Yes	4	4.1%	2	5.6%	6	4.5%	
Complete Blood Count	No	91	93.8%	33	91.7%	124	93.2%	.192[a] (.661)
	Yes	6	6.2%	3	8.3%	9	6.8%	
ALT & AST	No	95	97.9%	34	94.4%	129	97.0%	1.099[a] (.295)
	Yes	2	2.1%	2	5.6%	4	3.0%	
Sodium and potassiuminblood	No	95	97.9%	35	97.2%	130	97.7%	.061[a] (.805)
	Yes	2	2.1%	1	2.8%	3	2.3%	
T3 AND T4	No	97	100.0%	35	97.2%	13299.2%		2.715[a] (.099)
	Yes	0	0.0%	1	2.8%	1	0.8%	
H pylori	No	96	99.0%	34	94.4%	130	97.7%	2.438[a] (.118)
	Yes	1	1.0%	2	5.6%	3	2.3%	
I Troponin	No	93	95.9%	35	97.2%	128	96.2%	.131[a] (.717)
	Yes	4	4.1%	1	2.8%	5	3.8%	
Echocardiography	No	94	96.9%	35	97.2%	129	97.0%	.009[a] (.925)
	Yes	3	3.1%	1	2.8%	4	3.0%	
ECG	No	93	95.9%	33	91.7%	126	94.7%	.933[a] (.334)
	Yes	4	4.1%	3	8.3%	7	5.3%	

Table 4: Distribution of Type 2 DM patients according to gender and type of treatment given

Variable	categories	Doctor diagnosed DM				Total		X2 (p- value)
		Male		Female				
		N	%	N	%	N	%	
SAI	No	93	95.9%	33	91.7%	126	94.7%	.933[a] (.334)
	Yes	4	4.1%	3	8.3%	7	5.3%	
RAI	No	96	99%	35	97.2%	131	98.5%	.541[a] (.462)
	Yes	1	1%	1	2.8%	2	1.5%	
IAI	No	97	100.0%	36	100.0%	133	100.0%	
	Yes							
LAI	No	96	99.0%	35	97.2%	131	98.5%	.541[a] (.462)
	Yes	1	1.0%	1	2.8%	2	1.5%	
Combination Insulins	No	92	94.8%	35	97.2%	127	95.5%	.344[a] (.557)
	Yes	5	5.2%	1	2.8%	6	4.5%	
Amylinomimetic Drug	No	97	100.0%	36	100.0%	133	100.0%	
	Yes							
Alpha-glucosidase Inhibitors	No	97	100.0%	36	100.0%	133	100.0%	
	Yes							
Biguanides	No	71	73.2%	29	80.6%	100	75.2%	.762[a] (.383)
	Yes	26	26.8%	7	19.4%	33	24.8%	
Dopamine agonist	No	97	100.0%	36	100.0%	133	100.0%	
	Yes							
Dipeptidyl peptidase-4	No	90	92.8%	35	97.2%	125	94.0%	.915[a] (.339)
	Yes	7	7.2%	1	2.8%	8	6.0%	
GLP-1	No	97	100.0%	36	100.0%	133	100.0%	
	Yes							
Meglitinides	No	97	100.0%	36	100.0%	133	100.0%	
	Yes							
SGLT	No	97	100.0%	36	100.0%	133	100.0%	
	Yes							
Sulfonylureas	No	71	73.2%	28	77.8%	99	74.4%	3.342[a] (.188)
	Yes	26	26.8%	7	19.4%	33	24.8%	
Thiazolidinediones	No	95	97.9%	33	91.7%	128	96.2%	2.854[a] (.091)
	Yes	2	2.1%	3	8.3%	5	3.8%	
Asprin	No	92	94.8%	36	100.0%	128	96.2%	1.928[a] (.165)
	Yes	5	5.2%	0	0.0%	5	3.8%	
Hypolipidemic	No	92	94.8%	32	88.9%	124	93.2%	1.477[a] (.224)
	Yes	5	5.2%	4	11.1%	9	6.8%	
Vitamin B complex	No	71	73.2%	29	80.6%	100	75.2%	.762[a] (.383)
	Yes	26	26.8%	7	19.4%	33	24.8%	
Vitamin D	No	97	100.0%	35	97.2%	132	99.2%	2.715[a] (.099)
	Yes	0	0.0%	1	2.8%	1	0.8%	
Antihypertensive drugs	No	77	79.4%	27	75.0%	104	78.2%	.296[a] (.587)
	Yes	20	20.6%	9	25.0%	29	21.8%	

Table 5: Multi-nominal Logistic regression between DM and age, gender, district and hospital admission

Independent variables	B	Sig.	Exp (B)	95% Confidence Interval for Exp (B)	
				Lower Bound	Upper Bound
Intercept	5.453	.000	-	-	-
Age in years	-.065	.000	.937	.927	.947
Gender	0.540	.009	1.715	1.146	2.570
Hospital	-.304	.117	.738	.505	1.079
Hospital admission	.669	.095	1.953	.891	4.283

Discussion

This study, to our knowledge, is the first one to compare the gender differences in the clinical presentation, diagnosis, treatment and self-management practices of type 2 diabetes in Jeddah, KSA. Biologically there is no difference between men and women in the prevalence and characteristics of type 2 diabetes (1). The difference is likely to be much wider in developing countries where the position of women in the society is still poor. In this context the gender differences in the care of type 2 diabetes becomes very important. The present study looked at symptoms of diabetes, mode of diagnosis, blood sugar control levels and self- management behaviors among both males and females.

Changes in lifestyle and human behavior have increased the occurrence of DM, and an estimated 220 million people who are affected by DM was reported in 2010 (1).

In the present study, out of all the outpatient clinic visits, those due to DM were 5.5%. T1DM was most common in those aged 18 years or less (75.0%). This is in line with a previous study, which reported that 85.0% of T1DM was found in those younger than 20 years old (5). In the present study T2DM was more prevalent in those aged 40 years or older. This is consistent with previous studies (3, 7). DKA is caused by a decrease in effective circulating insulin associated with elevations in counter-regulatory hormones. This potentially life-threatening complication of T1DM is frequently mismanaged, leading to morbidity and increased length of hospital stay. DKA is not a rare presentation to hospital, despite being an entirely preventable condition (3).

In the present study DKA was recorded only in those younger than 18 years old.

Previous study revealed that prevalence of T2DM is higher in young women than young men due to more severe insulin resistance during puberty, whilst systemic insulin resistance is greater in middle-aged men than middle-aged women (8) We found that T2DM was higher in males compared to females, while T1DM and DKA were higher in females compared to males. In the present study, T2DM and DKA were more common in the higher social class region compared to the relatively lower one. The majority of patients with T2DM were discharged, compared to patients with T1DM; on the other hand all patients with DKA were admitted to the hospital. This is in agreement with previous studies (10, 11). A large proportion of patients with T2DM visited the OPCs for follow up (46.6%) and renewal of medicine; this was similar in both genders. On the contrary previous research reported that women utilized more medical care than men (34); this revealed that women have worse survival, higher risk of cardiac, renal complications and blindness compared to men (33). However, this was not the case in the present study.

In the present study it was found that polyuria, headache, fatigue, and dyspepsia, were common complaints among T2DM. However they were similar in both the males and females. This was contrary to other study which found that somatic and visceral pain syndromes such as fibromyalgia, migraine headache, pelvic pain, and interstitial cystitis were diagnosed more frequently in women (16). One likely reason for fatigue in diabetes (uncomplicated by severe comorbidities) is alterations in blood glucose levels. Altered blood glucose metabolism may result in acute and chronic hyperglycemic episodes, hypoglycemia, or blood glucose fluctuations (13). Diabetic neuropathies are common and rising in prevalence with the global burden of T2DM. Polyneuropathy is also emerging as a complication of impaired glucose tolerance, without frank diabetes (29). In the present study, numbness was encountered among about 7% of patients with T2DM. However, it was similar in both genders. Neuroglycopenia causes a rapid impairment of cerebral function through direct effects on neurons, and induces various symptoms, e.g. sense of warmth, weakness, difficulty thinking, confusion, tiredness and drowsiness occur (28). In the present study dizziness was encountered among 5.3% of the patients.

Patients with diabetes have a 2–5 times greater risk for developing peripheral arterial disease (PAD) as compared with the nondiabetic population (17). In the present study about 5% of patients with diabetes developed lower limb oedema and it was more common among females. Hypertension is common among patients with diabetes, with the prevalence depending on type and duration of diabetes, age, sex, race/ethnicity, BMI, history of glycaemic control, and the presence of kidney disease, among other factors (22). Hypertension was encountered among 22% of the patients in the present study. Despite advances made in the prevention and management of cardiovascular disease, people with diabetes mellitus continue to have

alarmingly high morbidity and mortality secondary to cardiovascular disease (25). In the present study T2DM patients had increased both CVD and dyslipidaemia.

The HbA1c is now recommended as a standard of care for testing and monitoring diabetes, specifically the type 2 diabetes (2). In the present study the majority of blood tests for assessment of DM were HBA1C, FBS and RBS; while 2HPPG test was the least to be ordered (3.0%). No significant differences were found between males and females in ordering these investigations. Prolonged hyperglycemia is associated with altered lipid metabolism, increased oxidative stress and alterations in the liver function test, which in turn result in different micro-vascular complications such as retinopathy, neuropathy, nephropathy and macro-vascular complications like cardiovascular diseases (25). In the present study lipid profile was done on 17.5% of the patients with DM. Annual screening for kidney function test is recommended by the American Diabetes Association (ADA), as a high proportion of patients with type 2 diabetes are found to have overt nephropathy shortly after diagnosis of their diabetes (9, 26). In the present study Serum creatinine (16.5%), and urine analysis 15.0%) were conducted on patients with DM to assess the kidney function; no significant differences between males and females were found.

The prevalence of high ALT levels may reach 20% in diabetics (12). Elevation of these enzymes is strongly related to obesity, diabetes and dyslipidemia (28). Insulin has been shown to decrease extracellular potassium concentration as well, likely through activation of Na-K-ATPase (29). At low insulin sensitivity, relatively minor changes in TSH levels are associated with marked changes in lipid risk factors and thus cardiovascular risk (6, 30). In the present study investigations for heart diseases e.g. ECG, Troponin I, and echocardiograph were also conducted on a small sector of patients with T2DM. No significant differences were found between males and females. Also tests such as CBC (6.8%), Serum uric acid (4.5%), ALT and AST (2.3%), Na+ and K+ (2.3%), and T3 and T4 (0.8%) were all ordered similarly in both males and females. Postprandial glycemic control plays a substantial role in reaching recommended HbA1c goals in diabetes (1). Compared with regular human insulin (RHI), rapid-acting insulin analogues (insulin aspart, insulin lispro and insulin glulisine) have provided better postprandial glucose control through an earlier and greater peak glucose-lowering effect (2, 3). Nevertheless, absorption of current rapid-acting insulins occurs too slowly to adequately replicate endogenous prandial insulin action (4, 5). Consequently, optimum postprandial glucose control remains a challenge in patients with diabetes (32). In the present study about 13% of the patents with T2DM were prescribed insulin to control DM, mainly in the form of short acting insulin (SAI, 5.3%), and combination insulin (4.5%). Rapid acting insulin (RAI: 1.5%) and long acting insulin (LAI: 1.5%), were also prescribed to some T2DM patients. None of the patients with T2DM was prescribed intermediate acting insulin. No significant differences were found between males and females. In the present study, the groups of oral T2DM drugs included mainly biguanide antidiabetic medication (24.8%), Sulfonylureas medication (24.8%), Dipeptidyl peptidase drugs (6.0%) and to a lesser extent thiazolidinedione drugs (3.8%). Glucagon-like peptide-1 (GLP-1) receptor agonists (GLP-1 RAs) are useful tools for treating type 2 diabetes mellitus (T2DM). In their recent position statement, the American Diabetes Association and European Association for the Study of Diabetes recommend GLP1-RAs as add-on to metformin when therapeutic goals are not achieved with monotherapy, particularly for patients who wish to avoid weight gain or hypoglycemia (1, 31). In the present study Amylinomimetic, Alpha-glucosidase inhibitors, Dopamine agonist, GLP-1, Meglitinides, and SGLT were not prescribed to any patient with T2DM. This was similar in both males and females. Vitamin B complex preparations (24.8%), and antihypertensive drugs (21.8%) and to some extent hypolipedimic drugs (6.8%) were, also, prescribed to patients with T2DM. Aspirin was prescribed to, only 3.8% of the patients. This pattern of treatment was similar in both males and females.

HbA1c is now recommended as a standard of care (SOC) for testing and monitoring diabetes, specifically type 2 diabetes (2). In the present study the majority of blood tests for assessment of DM were HBA1C (36.1%) and FBS (35.3%).

Prolonged hyperglycemia is associated with altered lipid metabolism, increased oxidative stress (OS) and alterations in the liver function test (LFT), which in turn results in different micro-vascular complications such as retinopathy, neuropathy, nephropathy and macro-vascular complications like cardiovascular diseases (40). In the present study, lipid profile (17.5%) was ordered on about 18% of the T2DM patients. Annual screening for microalbuminuria is recommended by the American Diabetes Association (ADA) [9], as a high proportion of patients with type 2 diabetes are found to have MAU or overt nephropathy shortly after diagnosis of their diabetes. Screening by means of a semi-quantitative dipstick test is easy, immediate and accurate (35). In the present study Serum creatinine (16.5%), and urine analysis 15.0%) were ordered for patients with T2DM. No significant differences were found between males and females ($p > 0.05$). Postprandial glycaemic control plays a substantial role in reaching recommended glycated haemoglobin (HbA1c) goals in diabetes (1). Compared with regular human insulin (RHI), rapid-acting insulin analogues (insulin aspart, insulin lispro and insulin glulisine) have provided better postprandial glucose control through an earlier and greater peak glucose-lowering effect(2, 3). Nevertheless, absorption of current rapid-acting insulins occurs too slowly to adequately replicate endogenous prandial insulin action (4, 5). Consequently, optimum postprandial glucose control remains a challenge in patients with diabetes (44). In the present study, about 13% of the patients with T2DM were prescribed insulin to control DM, mainly in the form of short acting insulin (SAI, 5.3%), and combination insulin (4.5%). Rapid acting insulin (RAI: 1.5%) and long acting insulin (LAI: 1.5%), were also prescribed to some T2DM

patients. None of the patients with T2DM was prescribed intermediate acting insulin (IAI: 0.0%). No significant differences were found between males and females ($p > 0.05$).

Glucagon-like peptide-1 (GLP-1) receptor agonists (GLP-1 RAs) are useful tools for treating type 2 diabetes mellitus (T2DM). In their recent position statement, the American Diabetes Association and European Association for the Study of Diabetes recommend GLP1-RAs as add-on to metformin when therapeutic goals are not achieved with monotherapy, particularly for patients who wish to avoid weight gain or hypoglycemia (1, 41). In the present study, Amylinomimetic, Alpha-glucosidase inhibitors, Dopamine agonist, GLP-1, Meglitinides, and SGLT were not prescribed to any patient with T2DM. The groups of oral T2DM drugs included mainly biguanide antidiabetic medication 24.8%), Sulfonylureas medication (24.8%), Dipeptidyl peptidase drugs (6.0%) and to a lesser extent thiazolidinedione drugs (3.8%). This is in line with other studies (1, 26, 27). Vitamin B complex preparations (24.8%), and antihypertensive drugs (21.8%) and to some extent hypolipidemic drugs (6.8%), were also prescribed to patients with T2DM. Aspirin was prescribed to only 3.8% of the patients. No significant differences were found between males and females ($p > 0.05$).

Conclusion

DM is a common chronic disorder, which imposes burden on the primary health care in Saudi Arabia. It is more common in males than females, however, the pattern of cardiovascular complications and health care management were similar in both genders.

Limitations of this study

This study was based on a non-probability convenient sample. As it is a nonprobability sample, so its findings cannot be generalized to the general population; however, it was an exploratory study, included sizable proportions of patients visiting the outpatient clinics, and reflected the burden imposed on the primary health care.

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