
Prevalence of Macrovascular complications in Diabetic Patients in Sohag Governorate – Sex Differences

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Abstract:

Background: Atherosclerotic cardiovascular disease (ASCVD) is the major cause of death and disability in patients with type 2 diabetes. **Objective:** The aim of the research was to study the differences between male and female diabetic patients as regard the prevalence of macrovascular complications in Sohag Governorate, Upper Egypt. **Methods:** This Study was a cross sectional study on diabetes mellitus in Upper Egypt. The study included 500 diabetic patients randomly selected from rural and urban areas of Sohag Governorate. all patients were subjected to: history taking, clinical examination, blood pressure and pulse evaluation, ECG, echocardiography and laboratory investigations including blood glucose and HbA1c estimation. **Results:** 500 diabetics patients included in this study, 44.2% of them were males while 55.8% were females. one third of males were smokers and body mass index was statistically higher in females than males. No difference between male and female diabetics as regard control of diabetes or lipogram. The prevalence of hypertension, heart failure with reduced ejection fraction (HFrEF), and diastolic dysfunction were higher in males with significant difference. Peripheral arterial disease was higher in females while stroke was higher in males but with no significant difference. **Conclusion:** Macrovascular complications are prevalent among male and female diabetic patients. Hypertension, HFrEF and diastolic dysfunction were higher in males than females with significant difference.

Running title: Macrovascular complications in diabetics: sex difference

Key words: Macrovascular complication, Diabetes, sex difference, Sohag

Introduction:

The global incidence and prevalence of type 2 diabetes has been increased four-time between 1980 and 2004 (1). Moreover, the prevalence is still increasing. By 2040, prevalence of diabetes is expected that the diabetic population will increase from 415 million in 2015 to 642 million. (2). Such increasing trend of DM is prominent especially in the developing countries. (3). Atherosclerotic cardiovascular disease

(ASCVD) is a main cause of death and disability in patients with type 2 diabetes (4). About two-thirds of causes of death in type 2 diabetes are due to ASCVD, including 40% from coronary heart disease (CHD), 15% from heart failure (HF), and 10% from stroke (5). Given that many macrovascular complications develop even 10 to 15 years before the clinical diagnosis of diabetes, management of diabetes and the associated ASCVD become even more difficult. (6).

Patients and methods:

This Study was conducted in Sohag Governorate as cross sectional study on diabetes mellitus in Upper Egypt. The study included 500 diabetic patients randomly selected from rural and urban areas of Sohag Governorate. After ethical committee approval and obtaining an informed written consent from all participants, all patients were subjected to:

1-History taking including; Age, sex, Smoking (past or current), Family history of diabetes mellitus, hypertension, family history of any cardiac disease or sudden death, History of diabetes mellitus (duration, compliance with treatment, type of treatment (oral, insulin, or both), any recognized complications), History of dyslipidemia, type of treatment, History of hypertension (duration, compliance with treatment, controlled or not), History of cardiovascular disease, and Any associated co morbidities.

2- Weight, height, waist circumference and calculated body mass index (BMI).

3-Blood pressure measurement and pulse assessment.

4- Detailed cardiovascular clinical examination.

5-Laboratory investigations: Fasting and 2h post prandial blood sugar, lipogram, and HbA1c.

6- Resting 12 ECG recording.

7-Transthoracic resting Echocardiography.

Results:

Our study population was nearly equal from males and females in rural and urban. The age of male and female were nearly equal. Nearly all smokers from male. In BMI most of the underweight were male; the obese were higher in females with significant difference (**Table 1**).

The patients on oral therapy were higher in males and those on insulin and combined (oral plus insulin) were higher in females with no significant difference. The non-hypertensive and controlled hypertension

were higher in females and the uncontrolled HTN was higher in males with significant difference and duration of HTN was higher in male with no significant difference (**Tables 2**).

Glycated hemoglobin (HBA₁C) was slightly higher in females rather than males. The lipid profile between male and female was nearly equal with no statically difference (**Table 3**).

Additionally, the prevalence of hypertension, Heart failure with preserved EF (HFrEF), and diastolic dysfunction were higher in males with significant difference. But PAD was higher in females with no significant difference (**Table 4**).

Variable	Females N=279	Males N=221	P value
Age/year Mean ± SD Median (range)	52.2±11.2 53 (18-78)	53.7±10.5 55 (21-80)	0.13
Residence Rural Urban	131 (47.0%) 148 (53.0%)	108 (48.9%) 113 (51.1%)	0.67
Smoking Non-smoker Smoker	276 (98.9%) 3 (1.07%)	86 (38.9%) 135 (61.1%)	<0.0001
BMI Mean ± SD Median (range)	32.7±5.7 32 (19.2-47.8)	30.4±5.1 31 (17-43)	<0.0001
BMI Group Underweight Normal Overweight Obesity class I Obesity class II Obesity class III	0 26 (9.3%) 46 (16.5%) 118 (42.3%) 55 (19.7%) 34 (12.2%)	6 (2.7%) 18 (8.1%) 62 (28.1%) 92 (41.6%) 34 (15.4%) 9 (4.1%)	<0.0001

SD: Slandered deviation, BMI: Body mass index.

Table (1): Relation between gender and personal characteristics:

Variable	Females N=279	Males N=221	P value
Types of DM Type I Type II	9 (2.2%) 270 (96.8%)	8 (3.62%) 213 (96.4%)	0.81
Duration of DM/years Mean ± SD Median (range)	5.7±4.1 5 (0.5-20)	5.7±5.2 4 (0.5-30)	0.19
Type of treatment Oral Insulin Oral & insulin	210 (75.3%) 65 (23.3%) 4 (1.4%)	178 (80.5%) 43 (19.4%) 0	0.11
Family history of DM No Yes	23 (8.2%) 256	35 (15.8%) 186	0.008

	(91.8%)	(84.2%)	
Hypertension			
No hypertension	135	86 (38.9%)	0.004
Controlled	(48.4%)	31 (14.0%)	
uncontrolled	53 (19.0%)	104	
	91 (32.6%)	(47.1%)	
Duration of hypertension / years			
Mean \pm SD	3.8 \pm 2.3	4.3 \pm 2.8	0.08
Median (range)	3 (0-12)	4 (0-20)	

DM: Diabetes mellitus, SD: Standard deviation

Table (2): Relation between gender and clinical features:

Variable	Females N=279	Males N=221	P value
HbA1c			
Mean \pm SD	9.0 \pm 2.2	8.8 \pm 2.0	0.29
Median (range)	8.9 (5-14)	8.4 (5.7-15)	
Diabetic control			
Controlled	63 (22.6%)	44 (19.9%)	0.47
Uncontrolled	216 (77.4%)	177 (80.1%)	
Cholesterol			
Mean \pm SD	190.5 \pm 45.5	190.5 \pm 35.2	0.99
Median (range)	190 (89-420)	189 (117-275)	
Triglyceride			
Mean \pm SD	216.5 \pm 35.5	220.6 \pm 39.8	0.80
Median (range)	200 (73-455)	215 (79-550)	
HDL			
Mean \pm SD	42.8 \pm 10.2	41.9 \pm 6.8	0.25
Median (range)	42 (23-58)	41 (30-58)	
LDL			
Mean \pm SD	112.7 \pm 24.0	112.6 \pm 27.8	0.48
Median (range)	109 (32-184)	111 (36-182)	

HDL: High density lipoprotein, LDL: Low density lipoprotein

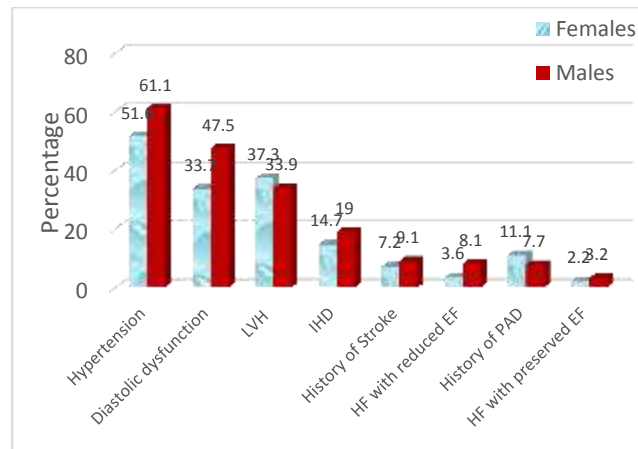
Table (3): Relation between gender and Lab investigation:

Variable	Females N=279	Males N=221	P value
Hypertension	144 (51.6%)	135 (61.1%)	0.03
IHD	41 (14.7%)	42 (19.0%)	0.20
HFpEF	10 (3.6%)	18 (8.1%)	0.03
HFpEF	6 (2.2%)	7 (3.2%)	0.48
Diastolic dysfunction	94 (33.7%)	105 (47.5%)	0.002
LVH (left ventricular hypertrophy)	104 (37.3%)	75 (33.9%)	0.44
History of Stroke	20 (7.2%)	20 (9.1%)	0.44
History of PAD	31 (11.1%)	17 (7.7%)	0.20

IHD: Ischemic heart disease, HF: Heart failure, EF: Ejection fraction, LVH: left ventricular hypertrophy. HFpEF: Heart failure with reduced EF. HFpEF: Heart failure with preserved EF.

Table (4): Relation between gender and prevalence of hypertension and cardiac abnormalities:

Figure 1: Relation between gender and prevalence of hypertension and cardiac abnormalities



Discussion:

More than half of the patients included in our study were females (55.8%) and the remaining were males (44.2%). Men and women included in the study did not differ significantly in mean age (52.2 years versus 53.7 years). Nearly all smokers were from males. Most of the underweight patients were male while obesity was significantly higher in females.

The uncontrolled hypertension was higher significantly in males. The lipid profile between male and female was nearly equal. It is noted that the prevalence of HTN, IHD, and stroke were higher in males, but PAD was higher in females.

Our results were similar to that documented by data from large population-based study in Germany. By Dua Y et al (7). for cardiovascular risk profiles in type 2 diabetic patients, women with T2D had a higher prevalence of elevated non-HDL cholesterol and central obesity, but a lower CVD prevalence compared with men. Also, women in the study had a significantly lower CVD prevalence than men. Nevertheless, it is possible that CVD is underdiagnosed in women (8).

However, previous studies have reported a greater prevalence of hypertension in

women compared with men, especially in older age groups (9).

Most of the patients in our study were not controlled on anti-diabetic therapy, with no significant difference in the mean HbA1c between males and females.

A primary care study in US patients with diabetes found that women had 19% greater odds of achieving HbA1c levels < 7% than men (10).

The prevalence of heart failure in our study either HFrEF or HFpEF was higher in males.

A study of Jesper Jensen MD et al, 2018 showed that both HFpEF and HFrEF patients were older, with more women in the HFpEF group and more males in the HFrEF group. HFpEF patients had a longer duration of T2DM, whereas more HFrEF patients had a history of IHD (11).

In contrast with our study Paola Ballotari et al, 2017 in a Population-Based Study in Italy found that the relative risk for myocardial infarction associated with T2D was significantly greater in women than in men ($P < 0.0001$), while there is no evidence of sex difference for the stroke and heart failure ($P = 0.9151$ and $P = 0.9289$, resp.). They found an excess risk for cardiovascular diseases in population with diabetes of both sexes, stronger in women and in particular for myocardial infarction. These results were consistent with those of another study that showed a diabetes-related excess risk greater in women than in men for myocardial infarction but not for heart failure and stroke (12).

In a Finnish cohort study (13), the presence of diabetes reduced the so-called female advantage for CVD risk; indeed, mortality from CHD was three times higher in women compared with men with diabetes.

In a systematic review and meta-analysis of 64 cohorts including 858,507 individuals and 28,203 coronary events by Peters SA et al, 2014 (14), they confirmed that the 40%

greater risk of incident CHD in women with diabetes compared with men with diabetes.

In another systematic review by Huxley R et al 2006 (15), The relative risk for fatal coronary heart disease associated with diabetes is 50% higher in women than it is in men. This greater excess coronary risk may be explained by more adverse cardiovascular risk profiles among women with diabetes, combined with possible disparities in treatment that favor men. (15)

Conclusion:

Macrovascular complications are prevalent among male and female diabetic patients in Sohag Governorate. Hypertension, HFrEF and diastolic dysfunction were higher in males than females with significant difference.

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