

Original Article

## Gender discrepancy in CardioVascular Disease prevalence & risk factors among diabetic patients at Tripoli – Libya (between 2013 & 2022).

Samia A Ali Elmiladi <sup>1</sup>, Elham O Elgdhafi<sup>1</sup>, Ali A. Alahrash<sup>2</sup>.

1-Faculty of Medicine, Tripoli University<sup>1</sup>,

2- Faculty of Medicine, Zawia University<sup>2</sup>, Libya.

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### Abstract:

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Cardio-Vascular Disease (CVD) remains the leading cause of death among diabetic patients. Aim: To compare the CVD prevalence and assess the CVD risks between females and males diabetic patients. Methods: All patients with diabetes who attended the outpatient clinic at National Diabetes Hospital from Sep 2013 to April 2022 were interviewed and examined, demography data about their ages, smoking habits, Body Mass Index measures, history of prior cardiovascular events, blood pressure measurement and fasting lipid profile were collected, these data were analyzed Statistically by SPP. Results: 1060 patients have completed the study, 689 females representing (65%), the mean age was 54.07±14.5 years, Body weight of the studied patients ranged from 44 kg to 186 kg (85.66 ±1.73) underweight was seen in 1.4%, normal BMI seen in 15.8%, and 828 (78.55%) have uncontrolled body weight. The duration of diabetes varying from newly diabetes (20.3%) to more than ten years duration (37.9%). (72%) of the patients were Non-smokers, (27.2%) had uncontrolled blood pressure. Uncontrolled dyslipidaemia was seen in (7.1 %), uncontrolled hyperglycaemia was seen in (62.9 %), and Established CVD was positive in (23.2%). Those who are 54 to 74 years of age had multiple CVD risk factors were female patients, with long standing history of diabetes (more than 10 years), had uncontrolled hyperglycemia (HbA1c >10g%), uncontrolled body weight, uncontrolled blood pressure, and dyslipidemia as well. Conclusion: This study shows that female diabetic patients have higher CVD risk factors than male diabetic patients sharing the same age and the same duration of diabetes. The male diabetic smokers have a significant CVD risk. Recommendation: increase the awareness of females' diabetic patients regarding the early symptoms of cardiovascular diseases, the importance of preventive measures against CVD risks of diabetes, and the importance of regular follow up especially in females.

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**Keywords:** *Diabetes Mellitus; Body Mass Index, CVD; Cardio-Vascular Disease.*

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## **Introduction:**

Nearly 592 million individuals thought to be diabetic by the year 2035, as the prevalence of diabetes is expected to rise<sup>1</sup>, in relation to the expected increase in the world's, also the increase in the prevalence of overweight and obesity and the increasing lack of physical activity, however, North Africa, and the Middle East have the highest prevalence of diabetes, with rates ranging from 21–25 % in men and 21–32 % in women<sup>2</sup>, this difference between regions and sexes can be explained by substantial biological, socioeconomic and societal differences<sup>3</sup>. There is a well-known gender difference observed in the manifestations of cardiovascular disease (CVD). Where Men have a higher risk of coronary heart disease (CHD), compared with women, who are found to have a similar or greater propensity of developing stroke<sup>4,5</sup>, Cardiovascular disease is the most common underlying cause of death, accounting for 52 % of deaths in type 2 diabetes<sup>6</sup>, based on the result of large analysis of data from 64

## **Methodology**

A total of 1312 patients were enrolled in this study, only 1060 patients have completed the study, all patients (female and male) who attended the outpatient clinic at the National Diabetes Centre from Sep 2013 to April 2022, were included in this study.

cohorts, including nearly 900,000 patients of diabetes and more than 28,000 incident CHD events, showed that the presence of diabetes nearly tripled the risk of incident CHD in women, whereas it doubled the risk in men<sup>7</sup>. So, diabetes conferred a 44 % greater excess risk for incident CHD in women compared with men. This estimate is comparable to the 46 % excess risk for fatal CHD in women with diabetes found in a previous analysis<sup>8</sup>, the explanation for these disparities might be the result of cardiometabolic risk in women such as obesity and overweight which are associated with higher levels of biomarkers of endothelial dysfunction, inflammation, and procoagulant state. Also, sex differences in the prescription and use of some cardiovascular drugs may play a role in an "existing" disparity.

**AIM:** To compare the CVD prevalence and assess the CVD risks between female and male patients with diabetes in the studied sample.

There demography data include the age, smoking habit, weight, height, Body Mass Index, blood pressure measurements, as well as fasting lipid profile, HBA1c measurements. Duration of diabetes, Assessment of cardiovascular disease in by

the history of previous cardio vascular events, the management of previous cardio vascular events either on conservative medical measures, or underwent diagnostic or intervention coronary Angio-catheterization.

Statistical analysis: they were interviewed and examined using standardized methods, the data was Statistical analysis by SPP, for continuous variables are expressed as mean

## Results

In our study of 1312 patients only 1060 patients completed the study, Females represent 65% of the studied sample, and their mean age was  $54.07 \pm 14.5$  years. Their Bodyweight ranged from 44 kg to a maximum of 186 kg. according to the Body Mass Index for each patient, the patients were categorized into; underweight seen in 1.4%, normal BMI seen in 15.8%, and 78.55% have uncontrolled body weight (morbid obese). The duration of diabetes among the studied sample, varying from newly discovered diabetes seen in (20.3%), and long standing diabetes more than ten years seen in (37.9%). About 72% of the patients were Non-smokers. Uncontrolled high blood pressure despite treatment present in 27.2%. Uncontrolled dyslipidaemia was present in 7.1 %. Uncontrolled hyperglycemia was in 62.9 %. Established cardiovascular disease was seen in 304 patients

$\pm$  standard deviation and analyzed using descriptive statistics, Cross tabulation, Chi-square tests to calculate Pearson Chi-square, Asymp. Sig (2-sided) as p-value 95% confidence intervals (95% CI) with a p-value  $< 0.05$  was considered statistically significant. All calculations were performed with Statistical v10.0 (StatSoft, Tulsa, OK, USA) or STATA v11 (Stat Corp LLC, College Station, Texas, USA).

(23.2%). Those female patients who have multiple (more than 3) CVD risk factors their age ranged between 54 and 74 years. They have long standing diabetes more than 10 years and have uncontrolled hyperglycemia ( $HbA1c > 10\%$ ), uncontrolled body weight, uncontrolled blood pressure, and dyslipidemia. Our results were tabulated in to two main categories: category (A) shows the distributions of CVD risk factors in relation to the gender in Diabetic patients and category (B) shows the distributions of diabetic patients who got CVD in relation to the gender.

Category (A): Distributions of CVD risk factors in relation to the gender in Diabetic patients at National Diabetes Center (Tripoli-Libya 2013-2022)

Table (1): AgeGroup distribution;

	Female	Male	Total	
<b>12- 32</b>	82	27	109	0.188
<b>33-53</b>	328	168	49	
<b>54-74</b>	395	175	570	
<b>75-95</b>	76	44	122	
<b>Total</b>	<b>883</b>	<b>414</b>	<b>1297</b>	

Table (2): Duration of Diabetes;

	Female	Male	Total	
<b>Newly diagnosed</b>	167	99	266	0.079
<b>2-5 years duration</b>	96	47	143	
<b>5-10 years duration</b>	100	55	155	
<b>&gt;10 years duration</b>	328	170	498	
			1062	
<b>Total</b>	<b>691</b>	<b>371</b>	<b>1062</b>	

Table (3): Glycaemic Control;

	Female	Male	Total	
<b>HBA1c &lt;6g%</b>	69	16	85	0.000
<b>HBA1c 6.5-7g%</b>	111	39	150	
<b>HBA1c 8-9g%</b>	280	175	455	
<b>HBA1c &gt;10g%</b>	230	141	371	
<b>Total</b>	<b>690</b>	<b>371</b>	<b>1062</b>	

Table (4): Fasting Lipid;

	Female	Male	Total	
<b>Normal</b>	90	52	142	0.341
<b>Controlled with treatment</b>	562	311	873	
<b>Uncontrolled</b>	37	8	45	
<b>Total</b>	<b>689</b>	<b>371</b>	<b>1060</b>	

Table (5): Smoking Habit;

	Female	Male	Total	
<b>Non Smoker</b>	798	156	954	0.000
<b>Ex-smoker</b>	2	104	106	
<b>Passive</b>	92	2	94	
<b>Active</b>	0	158	158	
<b>Total</b>	<b>892</b>	<b>420</b>	<b>1312</b>	

Table (6): BMI;

	Female	Male	Total	
<b>Under weight</b>	6	12	18	0.000
<b>Normal</b>	61	147	208	
<b>Over weight</b>	174	92	266	
<b>Obese</b>	201	66	267	
<b>Morbid obese</b>	242	53	295	
<b>Total</b>	<b>684</b>	<b>370</b>	<b>1054</b>	

Table(7): Blood Pressure Status;

	Female	Male	Total	
<b>Normal Blood pressure</b>	184	145	329	0.003
<b>Controlled with treatment</b>	286	136	422	
<b>Uncontrolled</b>	219	90	305	
<b>Total</b>	<b>689</b>	<b>371</b>	<b>1060</b>	

Category (B): the distributions of diabetic patients who got CVD in relation to the gender at National Diabetes Center (Tripoli-Libya 2013-2022).

Table (8): Age Group distribution;

Age Group	Female		Male		Chi-Square tests	
	Established CVD	No	Established CVD	No	Female	Male
<b>Age:≤ 32</b>	1	27	0	17	0.000	0.000
<b>33-53</b>	32	202	21	121		
<b>54-74</b>	118	235	66	97		
<b>75≥</b>	35	32	22	20		
<b>Total</b>	<b>186</b>	<b>496</b>	<b>109</b>	<b>255</b>		

Table(9): Duration of Diabetes;

Duration of diabetes	Female		Male		Chi-Square tests	
	Established CVD	No	Established CVD	No	Female	Male
Newly diagnosed	31	136	84	98	0.000	0.000
2-5 years duration	18	76	40	47		
5-10 years duration	19	80	37	55		
>10years duration	124	204	97	170		
<b>Total</b>	<b>192</b>	<b>496</b>	<b>258</b>	<b>370</b>		

Table(10): Glycaemic Control;

Glycaemic Control	Female		Male		Chi-Square tests	
	Established CVD	No	Established CVD	No	Female	Male
HBA1c <6	13	56	2	13	0.000	0.44
HBA1c 6.5-7	25	85	11	28	pearson chi square	0.364
HBA1c 8-9	71	208	51	124		
HBA1c ≥10	83	147	48	93	0.005	0.19
					likelihood Ratio	
					0.001	
					Linear by linear association	
<b>Total</b>	<b>192</b>	<b>496</b>	<b>112</b>	<b>258</b>		

Table(11): Fasting Lipid;

Dyslipidemia	Female		Male		Chi-Square tests	
	Established CVD	No	Established CVD	No	Female	Male
<b>Normal</b>	6	84	0	52	0.000	0.000
<b>Controlled</b>	172	389	109	201		
<b>Uncontrolled even with drugs</b>	14	23	3	5		
<b>Total</b>	<b>192</b>	<b>496</b>	<b>112</b>	<b>258</b>		

Table(12): Smoking Habit;

Smoking Habit	Female		Male		Chi-Square tests	
	Established CVD	No	Established CVD	No	Female	Male
<b>Non Smoker</b>	174	442	50	89	0.752	0.04
<b>Ex-smoker</b>	1	1	33	64		(pearson chi square
<b>Passive</b>	19	53	1	1		0.036
<b>Active</b>	0	0	28	104		(likelihood Ratio
						0.006
						Linear by linear association
<b>Total</b>	<b>192</b>	<b>496</b>	<b>112</b>	<b>258</b>		

Table(13): BMI;

BMI	Female		Male		Chi-Square tests	
	Established CVD	No	Established CVD	No	Female	Male
Underweight	4	3	3	9	0.041	0.312
Normal	8	52	42	105		
Overweight	44	130	30	61		
Obese	242	138	25	41		
Morbid obesity	72	170	11	42		
<b>Total</b>	<b>190</b>	<b>493</b>	<b>111</b>	<b>258</b>		

Table(14): Blood Pressure Status;

Blood Pressure Status	Female		Male		Chi-Square tests	
	Established CVD	No	Established CVD	No	Female	Male
normal	18	166	19	125	0.000	0.000
Controlled	110	175	59	77		
Uncontrolled	83	155	34	56		
<b>Total</b>	<b>192</b>	<b>496</b>	<b>112</b>	<b>258</b>		

### Discussion:

In this study of nationally representative data from the National Diabetes Center (Tripoli-Libya) between 2013 and 2022, trends in CVD risk factors were different

between the sexes, on the other hand, our data add to existing evidences that gender difference in diabetes-related diseases. Reductions in mean TC were lesser in

women than men, and increases in BMI were greater in women than men.

data from US adults between 2001 to 2004 and 2013 to 2016, several CVD risk factors were similar between male and females, but statistically significant were present in the trends in lipid and BMI levels. Reductions in lipid were lesser in women than men, and increases in BMI were greater in women than men. The control of hypertension, diabetes mellitus, and dyslipidemia remains suboptimal in both sexes, Men were less likely to have control of hypertension and diabetes mellitus, whereas women were less likely than men to have adequate control of dyslipidemia<sup>9</sup>.

In our series, the most prevalent diabetic patients who were at the age group between 54 and 74 years were females, but without any statically significance (0, 18)table (1), meanwhile the same age group patients have a higher numbers of established CVD 395 (30%) with high significance (0.000)(Table8).

In regards to the overall disease duration, our diabetic female patients with more than ten years disease duration shows higher presentation than men 328 ( 11%) (Table 2), moreover, these group of patients who got established CVD has a higher presentation than men(0,000) (Table 9).

#### HbA1c and Diabetes Mellitus

In our series, the mean levels of HbA1c increased highly significant (0.000) in women in compare to men Table (3). On the other hand those female who don't have established CVD 496 (72%) have high HA1C was highly significant (0.000) in compare to those females who got established CVD 192 (38%) (Table10).

Zhang and his group found, there was no evidence of variations in sex differences in treatment and control rates by age, CVD status, or race<sup>10</sup>.

#### Diabetes and Dyslipidemia

The prevalence, treatment, and control of dyslipidemia for women and men, compared with men, women 562 (64%) were more likely to be treated and to have controlled dyslipidemia (Table 4).

A higher percentage of women 14 (30%) than men 3 (6%) with CVD had dyslipidemia, which is highly significant (0.000) whereas rates were similar for those without CVD (Table 11). Unlike our results, Zhang<sup>10</sup>,and his group found, there was the prevalence, treatment, and control of dyslipidemia increased over calendar periods for women and men and a higher percentage of men than women with CVD had dyslipidemia, whereas rates were similar for those without CVD.

#### Smoking

Non Smokers rates in women 798 (83%) are obviously lower than in men, without any

significance (0.7) Table (5), in relation to the established CVD Table (12), which is similar to the report from Zhang<sup>10</sup>, showing that smoking rates were 8 to 10 percentage points lower in women than in men.

#### Body Mass Index

Abnormal BMI in the form of overweight, obese, and morbid obesity are significantly increased (0.000) in women than in men Table (6).

There were minimal differences in CVD status (0.04) Table (13), as seen by Zhang et al<sup>10</sup>.

#### Assessment of Blood Pressure

The prevalence, uncontrolled of hypertension is higher in women 219 (71%) than men which is significant (0.003) (Table 7).

Compared with men 112 (10%), women 192 (18%) were more likely to have established CVD (0.000) Table (14).

De Jong<sup>11</sup> and his group found, that the assessment of blood pressure, women were more likely to receive blood pressure screening and one study reported men being more likely to receive blood pressure screening

Our data add to existing evidence that gender difference in diabetes-related diseases suggest the need for further work

to clarify the biological, behavioral, or social mechanisms involved.

The relative risk of diabetes-related CAD is substantially higher in women than in men<sup>12</sup>,

A recent systematic review and meta-analysis estimate the relative effect of diabetes on the risk of stroke significantly higher in women than in men<sup>13</sup>,

The reason for this global “female disadvantage” in diabetes remains unknown. Gender disparity in the treatment of cardiovascular risk factors in individuals with diabetes, is possibly involved<sup>14</sup>.

Other data suggest that the diabetes-related increased risk of cardiovascular disease in women may be due to the combination of both a deterioration in cardiovascular risk factor levels and undiagnosed and untreated, cardiovascular risk in the pre-diabetic state<sup>15</sup>.

Results from the UK General Practice Research Database the age-adjusted average BMI at diagnosis of diabetes was higher in women than in men, the Scottish data showed that HbA1c levels within 1 year of diagnoses were broadly similar in men and women, indicating that they were diagnosed at a similar stage of diabetes<sup>16</sup>.

**Conclusion:** The study clearly shows that female patients have higher CVD risk factors than diabetic male patients with the

same age groups and the same duration of diabetes. Smoking has a significant CVD risk in male patients.

**Recommendation:** More efforts need to increase education in female patients with diabetes regarding the importance of preventive steps for CVD in patients of diabetes, the regular follow up and early recognition of cardiovascular diseases risk factors in females is crucial.

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