



The Association Between Gender and Complications of Type 2 Diabetes Mellitus Among Patients in Almarj City-Libya

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Abstract: This study was carried out to provide new data on patients with type 2 diabetes mellitus and any suggestions for the prevention of what is a life-threatening disorder. Four hundred and seventy-three type 2 diabetic mellitus patients from Almarj general hospital were used: (222) females and (251) males for the period from October -2017 to April – 2018. The study focused on the relationship between genders and complications of diabetes mellitus. The study showed no significant differences ($P > 0.05$) between hypertension, heart disease, respiratory dysfunction, nephropathy, urinary tract infection, anemia, hypothyroidism, diabetic ketoacidosis, gastric infection, and gender. On the other hand, a significant ($P \leq 0.05$) relationship was found between hepatopathy and foot complications and gender. Findings showed that males with the risk of the dangers of type 2 diabetes mellitus complications were more than females in Almarj city.

Keywords: Diabetes Mellitus; Complications; Gender Difference.

INTRODUCTION

Diabetes mellitus is a chronic endocrine disorder which is characterized by high glucose levels prevalent in the blood for a considerable duration of time. (Behl et al. 2014).

The rate of diabetic patients with major complications has increased, such as stroke, hypertension, amputation, nephropathy, neuropathy, retinopathy, cardiovascular complications, impotence, and skin lesions. However, in the Eastern Mediterranean, the essential health care and facilities for self-care are often inadequate. Also the lacking of basic education services and knowledge on diabetes, as well as its prevention, management, and treatment to people with diabetes and their families, leads to a serious impediment to the provision of the minimum standard of health care. The causes of DM are multi-factorial, which include genetic, physical inactivity, drug toxic agents, obesity, viral infection and location (Adeghate, 2006). Sex-related differences in lifestyle may lead

to differences in the risk of developing diabetes mellitus and, in consequence, to differences in the prevalence of this condition in women and men. However, the relationship between a known risk factor for diabetes mellitus – such as obesity – and the development of symptomatic diabetes mellitus may not be straightforward. For example, in many countries of sub-Saharan Africa, women are more likely to be obese or overweight than men, and therefore may be expected to have a higher prevalence of diabetes mellitus. Compared with the corresponding men, women in Cameroon, South Africa, and Uganda were indeed found to have a higher prevalence of diabetes mellitus. However, women in Ghana, Nigeria, Sierra Leone, and rural areas of the United Republic of Tanzania were found to have lower a prevalence of diabetes mellitus than the men in the same study areas. No significant differences between men and women in the prevalence of diabetes mellitus were detected in studies in Guinea, Mali, Su-

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dan, and urban areas of the United Republic of Tanzania (Esayas et al.;2013). This study assesses differences between men and women in the prevalence of type 2 diabetes mellitus and its complications.

This study aimed to determine the effect of diabetes mellitus complications in people of Almarj city\Libya, and investigate the independent association of each of these clinical characteristics with parasympathetic dysfunction.

DATA COLLECTION

This study examined the profile of type 2 diabetic patients in the Almarj clinic/ Libya. We began filling out of data from October -2017 to April – 2018. Data collection was performed through filling the researchers’ questionnaire considering the following: gender, age of type 2 diabetic patients and complications: heart disease, hypertension, nephropathy, stroke, foot complications, urinary tract infection, anemia, hypothyroidism, hepatopathy, gastric infection, diabetic ketoacidosis, and respiratory dysfunction.

It is a descriptive statistical study that was carried out on 473 diabetic mellitus patients admitted to Almarj clinic in Almarj city /Libya, females (222), males (251), their age ranged between (29 - 97) years with mean of 67 years.

Data were collected, checked, revised, and entered into a computer. Data were analyzed by SPSS statistical package version 19. Excel computer program was used to tabulate the results and represent it graphically.

RESULTS & DISCUSSION

Over the final few decades, the prevalence of diabetes reached epidemic proportions in western societies and is even higher in developing countries. The World Health Organization has assessed that the worldwide prevalence of diabetes will increase from 2.8 % in 2000 to 4.4 % by 2030 (Ali, A, 2011).

According to this study, a higher incidence of diabetes in males (53.1%) compared to females (46.9%) was reported, which disagrees with a previous study from India (Ramachandran et al., 2008), and agrees with a previous Libyan study (Shambesh et al., 2015) that found that type 2 diabetes was higher in males than females (54.1% and 45.9%) respectively. This discrepancy in results could be due to an inhomogeneous study sample, which could be related to the security situation, particularly in Almarj city

Table: (1). Subject characteristics

Age (years)	Gender				Total	
	Female		Male		No.	%
	No.	%	No.	%		
29-39	3	0.6	4	0.8	7	1.5
40-59	46	9.8	65	13.7	111	23.5
≥60	173	36.5	182	38.5	355	75
Total	222	46.9	251	53	473	100
Age (years) Mean ± SD			67 ± 12			

Table 1 shows that the predominance of diabetes increments with age. Within the age group of 29-39 years, it was evaluated that around 1.5% of subjects had diabetes, whereas within the age group 40-59 years, the value expanded to 23.5 %, and the highest rate of 75 % was found within the age group ≥ 60 years. Amati et al. have explained that older adults are at high risk for the development of type 2 diabetes due to the combined effects of increasing insulin resistance and impaired pancreatic islet function with aging. Age-related insulin resistance appears to be primarily associated with adiposity, sarcopenia, and physical inactivity (Amati et al., 2009).

Table: (2). shows the distribution of gender with complications of type 2 diabetes mellitus.

Disease		Female		Male		Total	
		No.	%	No.	%	No.	%
Heart disease	non	121	25.6	109	23.0	230	48.6
	exist	101	21.4	142	30.0	243	51.4
Hypertension	non	71	15.0	100	21.1	171	36.2
	exist	151	31.9	151	31.9	302	63.8
Nephropathy	non	190	40.2	219	46.3	409	86.5
	exist	32	6.8	32	6.8	64	13.5
UTI	non	186	39.3	229	48.4	415	87.7
	exist	36	7.6	22	4.7	58	12.3
Anemia	non	206	43.6	225	47.6	431	91.9
	exist	16	3.4	26	5.5	42	8.9
Stroke	non	158	33.4	165	34.9	323	68.3
	exist	64	13.5	86	18.2	150	31.7
Foot complications	non	213	45.0	241	51.0	454	96.0
	exist	9	1.9	10	2.1	19	4.0
Hypothyroidism	non	189	40.0	242	51.2	431	91.1
	exist	33	7.0	9	1.9	42	8.9
Hepatopathy	non	208	44.0	236	49.9	444	93.9
	exist	14	3.0	15	3.2	29	6.1
Respiratory dysfunction	non	167	35.3	193	40.8	360	76.1
	exist	55	11.6	58	12.3	113	23.9
DKA	non	214	45.2	245	51.8	459	97.0
	exist	8	1.7	6	1.3	14	3.0
Gastric infection	non	217	45.9	242	51.2	459	97.0
	exist	5	1.1	9	1.9	14	3.0

This study indicated that heart disease and hypertension were non-significant when it comes to gender, but males (30.0 %) were more likely to have heart disease than females (21.4 %), as in table 2. This finding agrees with those by Aseel, where males were higher than females (18.7 % & 10.8 %) (Ali, 2011). Whereas, hypertension in males was equal to females (31.9 % & 31.9%), as in table 2. Nouh et al. have indicated that a high prevalence of hypertension among diabetic patients was in females compared to males (30.0% & 35.1%) (Nouh et al., 2015). Hypertension is one risk factor for atherosclerosis. The atherosclerotic vessel is more prone to thrombosis and rupture. Vascular problems that happen as a result of diabetes are made worse when blood pressure is raised from other sources such as an unhealthy diet, lack of exercise, or smoking (Ali, 2011).

The present study showed that nephropathy was non-significant for gender, as females (6.8%) were more than males (6.6%), as in

table 2. This agrees with a study from Iraq by Aseel that shows females were higher in nephropathy than males (7.2 % & 5.9 %) respectively (Ali, 2011). However, it disagrees with Aho et al., whose findings show that males were higher than females (25.6 % & 17.9 %) respectively (Aho et al., 1998). They have found that high levels of blood glucose increase the risk that a person with diabetes will progress to kidney failure.

Our study showed that UTI has no significance with gender, but females were higher than males (7.6 % & 4.7 %), as in table 2 respectively. This result agrees with Shengsheng et al., who have found that females higher than males (12.9 % & 3.9 %) in urinary tract infection among diabetes mellitus in the U.S (Shengsheng et al., 2014). Sridhar et al. have clarified that the urinary tract is the primary site of infection in diabetes. Changes in host defense mechanisms and the presence of diabetic cystopathy and microvascular disease in

the kidneys may play a part in the higher rate of UTI in diabetic patients (Sridhar et al., 2002). Whereas, Wheat has indicated that the high level of contamination in the urinary tract infection of diabetic women may be determined by the number of microorganisms found within the vagina (Wheat et al., 1980).

We observed that anemia has no significance with gender, as males were more than females (5.5% & 3.4%), as in table 2. Similarly, this agrees with previous study (Kaushik et al., 2018), that showed that males were more than females (68.25 % & 31.74 %) respectively, and this disagrees with another study (Rathod et al., 2016), which showed that females were more than males (18.60 % & 17.54 %) respectively. The development of anemia in diabetes due to different factors such as symptomatic autonomic neuropathy, which can lead to efferent sympathetic denervation of patients taking metformin, have high chances of B12 deficiency leading to clinical symptoms of anemia (Gulati1 et al., 2016).

The results showed no significant relationship between gender and stroke, the males (18.2 %) were higher than females (13.5 %) as in table 2, this agrees with Jehangir et al. They found that male to female ratio of stroke is 2.18:1 (Jehangir et al., 2006), but disagrees with Narayan et al. that have found that stroke diabetes patients were higher in females than males (Narayan et al., 2003). Jehangir et al. have discussed that stroke is a frequent medical problem occurring in patients with hypertension and other risk factors. They concluded that hypertension is the leading risk factor for stroke (Jehangir et al., 2006).

The results showed a significant relationship between gender and foot problems, with males (2.1 %) higher than females (1.9 %) with foot problems, as in table 2. A study by Hussain et al., however, found that females were more than males. Hussain et al. have also explained that the cause of the common diabetic foot complications include neuropathy, infections,

vascular disease, and ulcerations (Hussain et al., 2010).

Our study also concluded that there was no significant relationship between gender and hypothyroidism, as females were more than males (7.0 % & 1.9 %). This agrees with the following reference (Sami et al., 2018), which also found that females were more than males (13.8 % & 3.7 %). This sex difference may be due to less consultations, less awareness, and less education regarding women in our study. DM irritates thyroid function by influencing both the hypothalamic control of TSH production and the transformation of T4 to T3 in the peripheral tissue (Ibrahim et al., 2017).

Our study found a significant relationship between gender and hepatopathy, where males (3.2 %) were higher than females (3.0%), as in table 2, and Patel et al. have found that the prevalence rate among males (65.62 %) was higher than for females (34.38 %) (Patel et al., 2018). Another study by Sharavanan et al. in Chennai found the prevalence rate among females (62.2%) was higher than for males (37.8 %) (Sharavanan1 et al., 2015). DM might initiate liver damage by promoting inflammation and fibrosis through an increase in mitochondrial oxidative stress by the activity of leptin, adiponectin, interleukin-6, and TNF, which are created in chronically inflamed adipose tissue (adiposities) (Marra, and Bertolani, 2009) .

Our study also showed no significant relationship between gender and respiratory function. Males were more than females (12.3 % & 11.6%), as in table 2. This finding is consistent with Qayyum et al., who also found that males were more than females (77.77 % & 22.22 %) (Qayyum et al., 2004), but disagrees with Keerthi et al., that found that the female percentage was higher than that for males (Keerthi et al., 2012). The presence of abundant connective tissue and an extensive microvascular circulation in the lungs increase the possibility that lung tissue may be influenced by the microangiopathy process and non-enzymatic gly-

cosylation of tissue proteins, this is induced by chronic hyperglycemia, thereby rendering the lung a “target organ” in diabetic patients. An indication of this may be the prevalence of tuberculosis among diabetic patients (Keerthi et al., 2012).

The results showed no significant relationship between gender and DKA. The females were higher than males (1.7 % & 1.3 %) as in table 2. This finding agrees with findings from other studies on the Saudi population, which indicate the higher incidence of DKA among female patients. Yousuf and Chaudhry have reported that a female to male ratio was 2:1 among the Saudi population (Yousuf and Chaudhry, 1994). Al-Rubeaan et al. have reported that a male to female ratio was (1.6:1) (Al-Rubeaan et al., 2011), and also Balasubramanyam et al. have reported that male to female ratio was equal (Balasubramanyam et al., 1999), It shows that the gender difference may not be a significant factor in the prevalence of DKA. However, the blood pH was found significantly lower in females when compared with that of males. This finding may show that ketoacidosis was severe among females when compared to male patients (Balasubramanyam et al., 1999).

We observed that gastric infection has no signification with gender as affected males were more than females (1.9% & 1.1%), as in table 2. This finding agrees with Devrajani et al. that have confirmed that *Helicobacter pylori* infection were predominant in males (Devrajani et al., 2010), but disagrees with Kanbay et al. that have reported that *Helicobacter pylori* infected females were prevalent as compared to males (Kanbay et al., 2005). This predominance may be due to patients with DM being more inclined to infection and severe diseases such as of phagocyte dysfunction and cellular immunity disorders caused by hyperglycemia and diminished vascularization (Keramat et al., 2013).

Table: (3). Distribution of gender with diabetic patients DM T2 with cancer.

Diseases	Female		Male		Total		
	No.	%	No.	%	No.	%	
Ovarian cancer	non	221	46.7	251	53.1	472	99.8
	exist	1	0.2	0	0.0	1	0.2
Bladder cancer	non	222	46.9	250	52.9	472	99.8
	exist	0	0.0	1	0.2	1	0.2
Rectal cancer	non	222	46.9	249	52.6	471	99.6
	exist	0	0.0	2	0.4	2	0.4
Breast cancer	non	212	44.8	251	53.1	463	97.9
	exist	10	2.1	0	0.0	10	2.1
Gastric cancer	non	220	46.5	251	53.1	471	99.6
	exist	2	0.4	0	0.0	2	0.4
Colon cancer	non	219	46.3	249	52.6	468	98.9
	exist	3	0.6	2	0.4	5	1.1

The previous table 3 shows the study to know the association between gender and cancer of diabetic patients. The result showed no signification between gender and cancer. T2DM and cancers often share many risk factors such as age, obesity, sedentary lifestyle, smoking, higher intake of saturated fats and refined carbohydrates, and some psychological factors (Giovannucci et al., 2010).

In our study, we found that out of 473 subjects with diabetes, only one woman had ovarian cancer. Additionally, just one diabetic man suffered from bladder cancer. The association between diabetes and ovarian cancer is not clear, but there is ample evidence for biological plausibility. Several studies have assessed the impact of elevated insulin-like growth factor (IGF) (Giovannucci et al., 2010), where IGF-I playing a significant role in the development of bladder cancer, is also supported by studies in animals.

The number of breast cancer incidences of diabetic females was 10 women as in table 3. Hyperinsulinemia with insulin resistance has been postulated to increase the risk of breast cancer (Del Giudice g et al., 1998). Obesity is related to type 2 diabetes and leads to a rise in endogenous estrogen levels.

The total number of diabetic females that had gastric cancer was 2 women, as in table 3. Mi-

ao et al. found that gender difference was not significantly associated between DM and gastric cancer incidences (Miao et al., 2017). On the other hand, Lin et al. (Lin et al., 1997) found a significant association between DM and the higher risk of gastric cancer. They explained this relationship by stating that hyperglycemia in DM patients may lead to dysregulation of energy balance. Consequently, this could influence intracellular metabolism and impair the immune system and might play a critical role in the progression of gastric cancer (Vigneri et al., 2009). Moreover, women were found to have an increased risk of gastric cancer. The percentage of colon cancer incidences was 1.1 %• 0.6 % in females and 0.4 % in males, and 0.4 % of diabetic females with rectal cancer, as in table 3. Hyperinsulinemia is one of the prime characteristics of T2DM. It might initiate carcinogenesis and also may initiate the proliferation of colonic tumors in vitro and experimental animals (Wu et al., 2004). However, there was no significant difference between men and women in this relationship.

CONCLUSION

It was concluded from this study that men with type 2 diabetes mellitus are more likely to have serious complications compared to women with the same disease.

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العلاقة بين الجنس والنوع الثاني من مرض السكري ومضاعفاته في مدينة المرج - ليبيا

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المستخلص: الغرض من هذه الدراسة توفير معلومات حديثة عن إمكانية حدوث المضاعفات لمرضى السكري من النوع الثاني وتقديم مقترحات للسيطرة عليها عن طريق منع حدوث مضاعفات خطيرة. شملت الدراسة 473 مريض سكري من النوع الثاني، تم جمع العينات من المرضى المراجعين بقسم الباطنة بمستشفى المرج العام حيث كان العدد 251 ذكراً و222 أنثى للفترة من أكتوبر 2017 إلى إبريل 2018. لقد تمت دراسة علاقة نوع الجنس مع مضاعفات مرض السكري. أظهرت النتائج عدم وجود فرق معنوي ($P > 0.05$) بين النسب المئوية لكلا الجنسين والمضاعفات التالية :- ارتفاع ضغط الدم وأمراض القلب والكلية والجهاز التنفسي والأنيميا والتهاب القناة البولية والتهاب المعوي والأحماض الكيتونية السكرية وقصور الغدة الدرقية وكذلك أظهرت وجود تأثير معنوي لكلا الجنسين ($P \leq 0.05$) مع أمراض الكبد ومشاكل القدم. تم الاستنتاج من خلال هذه الدراسة إن الرجال المصابين بمرض السكري من النوع الثاني هم الأكثر عرضه للإصابة بالمضاعفات الخطيرة مقارنة بالنساء اللاتي تعاني من المرض نفسه.

الكلمات المفتاحية: السكري، المضاعفات، الفروق بين الجنسين.