Original Article

Causes of Death among Adult Diabetic Patients in Hawler Teaching Hospital, Erbil, Iraq

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Abstract

Background: Type 2 diabetes mellitus (T2DM) is one of the most challenging diseases of this age. T2DM is responsible for 1.5 million deaths across the world. **Objectives:** This study aimed to determine the causes of mortality in T2DM patients in one general hospital in Erbil city, Iraq. **Materials and Methods:** In this cross-sectional study, medical records of patients who attended Hawler Teaching Hospital between January 1, 2012, and December 31, 2012, were reviewed retrospectively for eligibility criteria. The patients who were diagnosed with T2DM by an internist or an endocrinologist regardless of sociodemographic characteristics were included in this study. The patients were categorized into two groups as dead and alive. The death of the patients was confirmed by reviewing the death certificate issued by the hospital. **Results:** The study showed that of the total 1310 patients diagnosed with T2DM, 186 (14.20%) passed away due to different factors. The study revealed that type 2 diabetic patients were aged >70 (49.47%) and 50–70 (39.24%) years followed by 35–50 (9.67%) and <35 years (1.62%). Most of the T2DM patients had a duration of >5 years (86.03%). The most common causes of mortality in T2DM patients were hypertension and its complications (50.0%) and kidney failure (25.26%). Some other causes of mortality were sepsis (6.46%), cancer (5.92%), respiratory issues (5.92%), diabetic ketoacidosis (3.22%), and some other causes (3.22%). **Conclusions:** The present study showed that a high percentage of the patients died due to T2DM in Erbil. In addition, the most common factor for mortality in these patients was hypertension and its compactions.

Keywords: Complication, mortality, type 2 diabetes mellitus

INTRODUCTION

Type 2 diabetes mellitus (T2DM) is a clinical syndrome presented by increasing plasma blood glucose (hyperglycemia).[1] The disease causes many complications if left untreated.[2] The acute complications of the disease are diabetic and nonketotic hyperosmolar coma.[3] The serious long-term complications of diabetes are cardiovascular disease, stroke, chronic kidney failure, foot ulcers, and damage to the eyes.[2]

T2DM is one of the most challenging diseases of this age, due to increasing prevalence and its burden on patients and health systems.[4] T2DM has been shown to associate with an increased mortality rate. The mortality rate is twice as seen in the general population.[5] Diabetes-related mortality is an age-related condition. The trends of mortality are less diagnosed in the late age 70s (47%–51% are diagnosed at age 65 years and more)[6] compared to those in the mid-40s.[7] Most of the patients with T2DM (89%) have one or more modifiable risk factors.[8] In T2DM patients, macrovascular

disease is the predominant cause of mortality, and coronary vascular diseases (CVDs) are responsible for between 52% and 80% of mortality rate, followed by renal disease accounting for 10%–20% of mortality[9] and cerebrovascular disease accounting for 15%.[10]

The International Diabetes Federation[11] reported that diabetes was responsible for 4.2 million deaths across the world. Diabetes is the eighth leading cause of mortality in both sexes and the fifth cause of death in women in 2012.[12] The prevalence of T2DM has been grown dramatically worldwide over the past decades. The disease has been confirmed to be

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the main factor for kidney failure, heart attack, blindness, stroke, and lower limb amputation by a significant burden on socioeconomic and health-related quality of life. Moreover, it has the main role in mortality and morbidity and direct and indirect costs.[13] It is anticipated that 150 million persons are currently affected by this disease across the world, and this number will be doubled by 2025. In Iraq, 561,000 and 678,000 persons were affected by this disease in 1995 and 2000, respectively. It is expected that this number be reached 1,739,000 by 2025.[14]

Mansour[15] reviewed the medical records of 4926 patients diagnosed with T2DM in Al-Faiha Diabetes and Endocrine Centre in Basrah (Southern Iraq) between April 2003 and February 2009. They aimed to evaluate the prevalence of chronic complications in T2DM patients in Basrah. They found that of the total 4926 patients enrolled, 67.6% were overweight or obese. The most prevalent complication was hypertension (31.0%) followed by peripheral neuropathy (13.8%), ischemic heart disease (7.8%), proteinuria (6.6%), cerebrovascular accident (4.6%), interdigital fungal infection (4.3%), heart failure (3.4%), and erectile dysfunction (6.0%).

The aim of this study was to determine the causes of mortality in patients with T2DM who were diagnosed in one general hospital in Erbil city. In addition, the difference in the prevalence of mortality in patients with different age groups was explored in this cross-sectional study.

MATERIALS AND METHODS

Study design and setting

In this cross-sectional study, medical records of the patients aged 18 years and older who attended Hawler Teaching Hospital, Erbil, Iraq, between January 1, 2012, and December 31, 2012, were reviewed retrospectively for the eligibility criteria. The patients who were diagnosed with T2DM by an internist or an endocrinologist regardless of sociodemographic characteristics were included in this study. The patients were categorized into two groups as dead and alive. The death of the patients was confirmed by reviewing the death certificate issued by the hospital.

The patients who were diagnosed with other diseases than T2DM and other types of diabetes were excluded from this study. The types of exclude diseases were other chronic diseases, such as cancer, respiratory and cardiovascular disorders, type 1 diabetes mellitus, etc.

The medical history of the patients diagnosed with T2DM was reviewed for the causes of mortality. The factors that were considered responsible for the patient mortality were recorded in the predesigned questionnaire. The diagnosis of T2DM was checked through medical features and investigations, including hemoglobin A1c (HbA1c) equal to or more than 6.5%. The age of the patients was categorized as <35, 35–50, 50–70, and >70 years. The diabetes duration was categorized as 1–5 and >5 years.

Statistical analysis

The descriptive purposes of the study were presented in number and percentage, including age group, sex, and disease duration. The causes of T2DM patients and mortality rate were determined in number and percentage. The difference in the mortality rate of causes between males and females was examined in the Pearson's Chi-square test. The significant level was determined in a $P < 0.05$. The statistical calculations were perfumed by Statistical Package for the Social Sciences Version 25 (SPSS 25; IBM Corp; USA).

Ethical considerations

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patient's verbal and analytical approval before sample was taken. The ethical approval of the present study was taken from the local health ethics committee in Erbil city.

RESULTS

The study showed that of the total 1310 patients diagnosed with T2DM, 186 (14.20%) passed away due to different factors. The study revealed that type 2 diabetic patients were aged >70 (49.47%) and 50–70 (39.24%) years followed by 35–50 (9.67%) and <35 years (1.62%). The patients were female (53.76%) and male (13.97%). Most of the T2DM patients had duration >5 years (86.03%), as presented in Table 1.

The most common causes of mortality in T2DM patients were hypertension and its complications (50.0%) and kidney failure (25.26%). Some other causes of mortality were sepsis (6.46%), cancer (5.92%), respiratory issues (5.92%), diabetic ketoacidosis (3.22%), and some other causes (3.22%) [Table 2].

The study showed that most of the patients were in age groups of >70 and 50–70 years in all causes of mortality [Table 3].

The study showed that male dead patients had significantly more hypertension and its complications as a cause of mortality (63.95%) compared to male live patients (34.03%)

Table 1: General characteristic of patients

Sociodemographics (*n*=186)	Statistics, *n* (%)
Age group (years)	
<35	3 (1.62)
35-50	18 (9.67)
50-70	73 (39.24)
>70	92 (49.47)
Sex	
Male	86 (46.24)
Female	100 (53.76)
Diabetes mellitus duration (years)	
1-5	26 (13.97)
>5	160 (86.03)

contrast to females, $P < 0.001$. The dead male and female patients had significantly lower percentage of chronic kidney failure (16.28% and 30.0%) compared to the live male and female patients (83.72% and 70.0%, respectively; $P < 0.05$). There was no significant difference in the prevalence of cancer, diabetic ketoacidosis, sepsis, and other diseases between dead and live male and female patients [Table 4].

DISCUSSION

The present study showed that of the total 1310 patients diagnosed with T2DM, 186 (14.20%) passed away due to different factors. Hypertension and its complications were reported to be the main cause of mortality in T2DM patients.

Patients with T2DM have a between 2- and 4-fold increased risk of mortality, owing to CVD.[16,17] Patients with T2DM have frequent comorbidity of hypertension resulted in an increased risk of CVD.[18,19] The effectiveness of lowering blood pressure on CVD mortality in T2DM patients has been established in several studies.[20,21] Hansson *et al.*[21] included 18,790 patients from 26 countries aged 50–80 years with hypertension (diastolic blood pressure [DBP]: 100–115 mmHg). The patients were randomly allocated a target DBP, 6264 assigned to the target pressure ≤90 mmHg, 6264 to ≤85 mmHg, and 6262 to ≤80 mmHg. The study found the lowest incidence of major CVD events at a mean achieved DBP of 82.6 mmHg and the lowest risk of cardiovascular mortality at 86.5 mmHg. They reported a 51% reduction in major cardiovascular events in the target group ≤80 mmHg in comparison with the target group ≤90 mmHg.

A study from the same region collected the statistics of mortality for a 5-year period between 2007 and 2012 in Erbil city. They reported that the average crude mortality was 3.1/1000 persons with male predominance in all years. The mortality rate was higher in the old and middle-age groups and under 5 years. However, they did not report the T2DM-related deaths. They just reported that accidents and circulatory diseases are the leading causes of deaths, with a rate of 65.2 and 58.3/100,000 population, respectively.[22]

Our study showed that hypertension and its complications were the main responsible factors for mortality in patients with T2DM. Mansour[15] reviewed the medical records of 4926 patients enrolled in Basrah in Southern Iraq. They found that 2.8% of the patients passed away due to cardiovascular factors (2.7%), 2.7% developed diabetic foot, 2.4% had nonalcoholic fatty liver disease, 0.7% had an amputation, 0.4% developed ophthalmoplegia, 0.2% had peripheral vascular disease, and 0.04% developed mucormycosis.

The studies have reported that the relative mortality risk is strongly related to CVD, coronary heart disease, and acute myocardial infections in patients with T2DM.[23-25] A history of T2DM has been confirmed to have a worse relative mortality risk; however, when it is combined with chronic heart failure, the mortality risk doubled.[24]

Florkowski *et al.*[23] aimed to establish the mortality rates in a cohort of patients with T2DM over 10 years in New Zealand. In addition, the baseline prognostic factors were determined in the study. The mortality rates were compared to the general population. They reported that 232 patients were alive and 187 were dead at 10 years. They found that the 10-year survival rate was 55% for the cohort compared to 70% in the general population at 6 years. The independent prognostic for total mortality were aging (relative risk [RR]: 2.0, 95% confidence interval [CI]: 1.6–2.5), preexisting coronary artery disease (RR: 1.7, 95% CI: 1.2–2.4) and albuminuria (RR 1.58, 95% CI: 1.1–2.3).

Hypertension is a prevalent condition in T2DM patients and is responsible for considerable morbidity and mortality. Therefore, the treatment of hypertension in T2DM patients has substantial benefits. Target DBP of <80 and a systolic of 135 mmHg are the optimal points.[26]

The seminal strategies for overall control of glycemic levels in patients with T2DM are the establishment of awareness of diabetes' risk factors, symptoms, dietary counseling, increasing

Table 2: Causes of mortality among patients with Type 2 diabetes mellitus

Causes	Dead, *n* (%)	Alive, *n* (%)
Hypertension and its complications	93 (50.0)	93 (8.27)
Respiratory problem	11 (5.92)	175 (15.57)
Kidney failure	47 (25.26)	149 (13.26)
Diabetic ketoacidosis	6 (3.22)	179 (15.93)
Sepsis	12 (6.46)	173 (15.39)
Cancer	11 (5.92)	175 (15.57)
Others	6 (3.22)	180 (16.01)
Total	186	1124

Table 3: Association of age with causes of mortality in patients with Type 2 diabetes mellitus

Age group (*n*=186)	Causes of mortality						
	HTN and its complication	CKD	Respiratory problem	Cancer	DKA	Sepsis	Other
<35	0	0	0	0	3	0	0
35-50	10	3	1	1	1	1	1
50-70	33	16	7	7	2	8	3
>70	50	28	3	3	0	3	2
Total	93	47	11	11	6	12	6

CKD: Chronic kidney disease, DKA: Diabetic ketoacidosis, HTN: Hypertension

Causes of death among diabetic	Male (*F*)		Female (*F*)		*P* Chi-square test and decision
	Death	Alive	Death	Alive	
Hypertension and its complication	55 (63.95)	31 (34.05)	38 (38)	62 (62)	**<0.001**
Chronic kidney failure (CKD)	14 (16.28)	72 (83.72)	33 (30)	77 (70)	**<0.05**
Respiratory problems	5 (5.81)	81 (94.19)	6 (6)	94 (94)	0.957
Cancer	6 (6.98)	80 (93.02)	5 (5)	95 (95)	0.569
DKA	2 (2.35)	83 (97.65)	4 (4)	96 (96)	0.529
Sepsis	3 (3.53)	82 (96.47)	9 (9)	91 (91)	0.132
Others	1 (1.63)	85 (98.84)	5 (5)	95 (95)	0.140
Total	86	514	100	610	1310

Table 4: Causes of mortality between male and female patients with Type 2 diabetes mellitus

The bold numbers show a significant difference. Pearson's Chi-square test was performed for statistical analyses. CKD: Chronic kidney disease, DKA: Diabetic ketoacidosis

physical activity, and glycemic monitoring, medication, and insulin use in line with normalization of carbohydrate, protein, and fat metabolism. The cornerstone of diabetes is changing patients' lifestyles by diabetes self-management (DSM) based on the clinical guidelines to reach a decrease in disease-related mortality and morbidity.[27] A study conducted in Duhok city aimed to evaluate the effectiveness of a 3-month DSM on glycemic control, physical activity, and dietary behavior in 16 noncomplicated T2DM showed that walking and taking vegetable, fruit, and bread were higher and taking full-fat cheese and full-fat spread was improved in the experimental compared to a control group.[28] The DSM is defined as the concept that a person systematically is involved in medical and nonmedical management conditions. The studies have shown that little change in HbA1c has important clinical effectiveness in long-term diabetes complications.[29,30]

CONCLUSIONS

The present study showed that a high percentage of the patients died due to T2DM in Erbil. In addition, the most common factor for mortality in these patients was hypertension and its compactions.

Strengths and limitations

We did the strict criteria for the patients who were diagnosed with T2DM in this study. However, the study was not exempt from limitation, since the data were taken from one hospital and from one geographic area precluding us to make generalization of the findings to other settings across the country.

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Conflicts of interest

There are no conflicts of interest.

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