

Mortality among type 2 diabetic in-patients in a Nigerian tertiary hospital

J E Ojobi, G Odoh, E Aniekwensi, and J Dunga

Abstract

This report sets out to highlight the current status of diabetes-related mortality in north-central Nigeria and compare the results with other reports. We undertook a retrospective descriptive hospital-based study to determine the cause of death of type 2 diabetic patients over a 5-year period (2009–2013) at Federal Medical Centre, Makurdi, Nigeria. Approval for the study was obtained from the Ethics Committee of the institution. Relevant data (gender, age, occupation, blood pressure, and glycaemic control, co-morbid conditions and cause of death) were extracted from the case files of deceased patients and the hospital death register. There were 903 type 2 diabetic patients made up of 490 males (54%) and 413 females (46%), with a gender ratio of 1.2:1. Mean age was 54±16 years (mean±SD) years with a range of 36–82 years. Seventy-eight (78) patients (8.6% of type 2 diabetic admissions) died within the study period, made up of 37 males (47% of mortality) and 41 females (53% of mortality) respectively. The age range 60–69 years had the highest mortality. The most common causes of death were hyperglycaemic crises (38%), septicaemia (18%), diabetic ulcers (15%), and a variety of other causes (29%). We conclude that diabetes is still associated with an unacceptable in-patient high mortality burden.

from diabetes in 2013, accounting for 8.4% of global all-cause mortality among people in these age groups. This estimated number of deaths is similar in magnitude to the combined deaths from several infectious diseases that are major public health priorities, and is equivalent to one death every six seconds. Close to half (48%) of deaths due to diabetes are in people under the age of 60 years.⁴ Routine sources of health statistics consistently under-estimate the burden of mortality from diabetes, largely because diabetes is often omitted from death certificates as the cause of death.⁴ While there has been a documented decline in mortality from some NCDs in some countries,⁵ no such decline has been reported for diabetes.⁴ This study aimed to highlight the prevalence and pattern of diabetic mortality in a tertiary health facility in north-central Nigeria.

Patients and methods

This was a retrospective, descriptive hospital-based study to determine the cause of death of patients with type 2 diabetes over a five-year period (2009–2013) at Federal Medical Centre, a 400-bed tertiary referral centre in Makurdi, Benue State, Nigeria. Benue State is located in the north-central region of Nigeria. Benue shares boundaries with five other states, namely Nasarawa to the north, Taraba to the east, Cross River to the south, Enugu to the south-west, and Kogi to the west. The state shares a common boundary with the republic of Cameroon on its south-east border. The 2006 national census put the state's population at 4 210 244, (2 164 058 males and 2 055 186 females).⁶ Approval for the study was obtained from the Ethics Committee of the institution. Relevant data (gender, age, occupation, blood pressure and glycaemic control, co-morbid conditions, and cause of death) were extracted from the case files of deceased patients and the hospital death register. Uncontrolled blood pressure (BP) and blood glucose were taken as BP>130/80 mmHg, and fasting blood glucose (FBG)>7.0 mmol/l, or a random blood glucose (RBG)>11.0 mmol/l measured at different times.

Results

Socio-demographic characteristics of subjects. A total of 9101 patients were admitted into the medical wards in the five years this study lasted: 940 (9.7%) were individuals living with diabetes; 903 had type 2 diabetes (96%), while 37 (4%) had type 1 diabetes. This study focused

Introduction

Diabetes mellitus now constitutes the highest morbidity and mortality of all chronic non-communicable diseases (NCDs) in Africa.¹ In Nigeria, diabetes accounts for 3–15% of medical admissions in most health facilities.² People living with type 2 diabetes are more vulnerable to various forms of both short- and long-term complications, which often lead to their premature death.³ Approximately 5.1 million people aged between 20 and 79 years died

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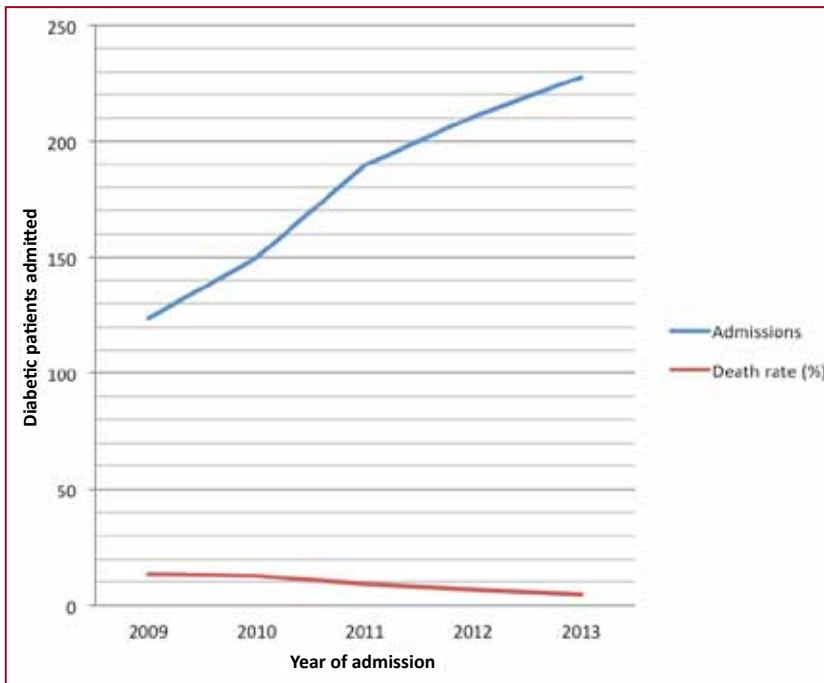


Figure 1. Temporal pattern of mortality in type 2 diabetics (2009–2013)

Age range (y)	30–39	40–49	50–59	60–69	70–79	80–89	Total
Study year							
2009	0	0	4	7	2	4	17
2010	0	0	4	10	2	3	19
2011	0	3	6	3	4	1	17
2012	0	4	2	2	1	5	14
2013	1	1	2	3	3	1	11
Total	1	8	18	25	12	14	78

Table 1. Mortality pattern in each age range

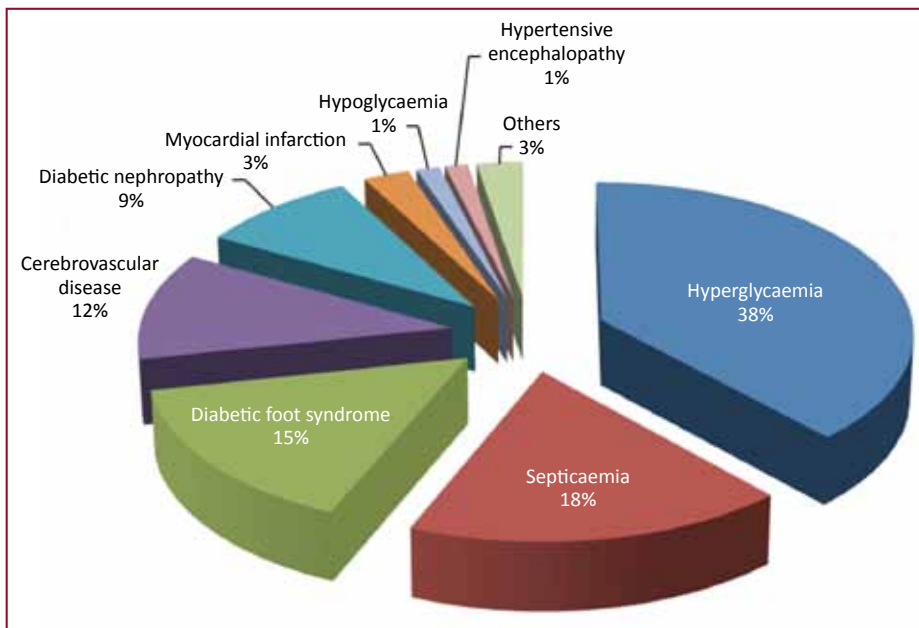


Figure 2. Pie chart depicting distribution of mortality of T2DM (2009–2013)

on individuals with type 2 diabetes only. Of these, 490 (54%) were male and 413 (46%) were female, giving a gender ratio of 1.2:1.0. The mean age was 54 ± 16 years with a range of 36–82 years. The temporal breakdown of type 2 diabetes mortality for the period of study is shown in Figure 1.

Mortality. Seventy-eight patients (9% of type 2 diabetes patients admitted) died within the study period, made up of 37 males (47%) and 41 females (53%). The age range 60–69 years had the highest mortality (25 patients in five years), followed by the age range 50–59 years (18 patients in five years). This is depicted in Table 1.

Distribution of mortality. The most common causes of death included hyperglycaemic crises especially those complicated by septicaemia, cerebrovascular accidents, diabetic foot ulcers, diabetic nephropathy/end-stage renal disease, myocardial infarction, and a diverse array of illnesses which are grouped together for the sake of convenience under the heading ‘others’ (e.g. concomitant advanced AIDS, etc). The relative contributions of each cause of mortality are as outlined in Figure 2.

Discussion

People living with type 2 diabetes are more vulnerable to various forms of both short- and long-term complications, which often lead to morbidity and premature death.³ One-tenth (10%) of all the admissions within the five years this study lasted were individuals living with diabetes. The overwhelming majority (96%) had type 2 diabetes, the predominant type of the disease regionally and globally.⁷ There was a slight male preponderance, similar to observations from other researchers in developing countries where males appear to access medical facilities more than females.^{2,3,8,9} The mean age was 54 years with an age range of 36–82 years.

Overall, mortality among individuals with type 2 diabetes progressively reduced from 13.7% to 4.8% even in the face of an increasing number of patient admissions (124 to 228). The total mortality for the period of study was 78 patients (19.4%). Males constituted 37 patients (9.2% of total mortality) and females 41 patients (10.2% of total mortality). The combined case fa-

tality rate observed in this study was higher than those from earlier reports.^{2,9,10,11} It was, however, lower than the 28.7% reported by Chijioke³ in 2010 from Ilorin. In contrast to our report, females had lower mortality rates than males in these other series.^{2,3,9,11}

The age group 60–69 years recorded the highest number of deaths (25 patients in five years, i.e. 32% of total type 2 diabetes mortality). This was followed by the age group 50–59 years which accounted for 18 deaths in five years (23% of mortality). In the age range 40–49 years, there were eight deaths (10% mortality). Young individuals (less than 60 years) made up more than one third (35%) of mortality for the five years examined. However, this percentage was still at variance with the 48% deaths (out of over five million) in people younger than 60 that were attributed to complications associated with diabetes in 2013.⁴

Hyperglycaemia was the most common single contributory factor for death in 38% of cases. Diabetic ketoacidosis (DKA) and non-ketotic hyperosmolar states (HHS) were the two principal hyperglycaemic crises recorded. DKA accounted for 20% of all mortality. It is a common factor in most studies that audited mortality among individuals living with diabetes.^{2,3,9} HHS was recorded as the cause of death in 9% of mortality cases in this study, but could be as high as 30% in some series⁹ and as common as 'three out of five' in another study.¹³

Up to 18% of study subjects succumbed to a septicemic process. Septicaemia was the second most common cause of death in this study. Most cases of hyperglycaemia were precipitated by septicaemia. In a related study, Adekanle et al¹⁴ reported that 70% of those that died presented with an infective process (e.g. urinary tract infection, diabetic foot disease, chest infection, or unidentified source). In their study, fever and signs of infection were significantly associated with in-hospital death.

Diabetic foot syndrome accounted for 15% of mortality. Diabetic foot ulcers are a leading cause of non-traumatic amputation and contribute significantly to diabetic morbidity and mortality.^{15,16} Often, the accompanying ulcer was complicated by infection. It is unfortunate as a cause of mortality because the ulcers were, in the majority of cases, preventable.¹⁵ Also, with adequate attention at an early stage, these foot disorders could be contained thereby averting amputation and the unnecessarily high cost of prolonged hospital stay, the prolonged time spent on wound care, and the cost of other consumables and drugs.^{16–18} The contribution of diabetic foot ulcers to mortality is variable, ranging from 9% in a report from south-south Nigeria¹⁸ to 30% in another report from western Nigeria.¹¹

Cerebrovascular accident (CVA) was responsible for 11% of mortality in our study. Diabetes is a risk factor for cerebrovascular disease, and in coexistence with other risk factors like hypertension, dyslipidaemia, obesity, and the negroid race may significantly increase the risk of CVA.¹⁸ Up to 50% of mortality in diabetic patients with

hypertension was from stroke, and stroke is independently a poor prognostic index for mortality.^{14,19} In their study on short-term case fatality rates and associated factors among in-patients, Chen et al showed that stroke was a significant risk factor for 28-day case fatality, and associated with both types of hyperglycaemic emergencies mentioned above.²⁰

Diabetic nephropathy complicated by uraemia led to the death of seven patients over the five-year period (i.e. 9% of mortality). The prevalence of this leading cause of end-stage renal failure in Nigeria varies but has been steadily rising.^{21–23} Diabetic nephropathy is characterised by persistent albuminuria, elevated blood pressure, and a progressive decline in renal function leading to end-stage renal disease. In addition, these patients have a high risk of cardiovascular disease which further increases with deteriorating renal function.²⁴ The excess mortality is due to cardiovascular disease and it has been suggested that the presence of albuminuria is a marker of generalised vascular dysfunction leading to increased atherosclerosis and subsequent cardiovascular events.²⁵

Documented hypoglycaemia is an important cause of death in any diabetes mortality audit. This is related to the action of drugs and regimens employed in the treatment of diabetes. Hypoglycaemia caused the death of one patient in this study: an 80-year old female being treated for diabetic nephropathy and sepsis. The incidence of hypoglycaemia varies across institutions.^{3,11,15} A similar study in the same geopolitical setting observed that up to 12% of mortality in a 10-year period was due to hypoglycaemia.³ In a decade-long retrospective study from south-south Nigeria, Unachukwu et al recorded a 10% mortality from hypoglycaemia.¹⁵ However, the former utilised the World Health Organization (WHO) criteria⁷ of 1999, while the latter (as well as this study) employed the American Diabetes Association (ADA) 2011 guidelines.²⁶ A report from south-west Nigeria also recorded one death from hypoglycaemia.¹¹ However, this study was prospective, lasted for a year, and employed the WHO criteria⁷ of 1999.

Our study is limited by the fact that hospital-based studies may not be a true reflection of the actual magnitude of diabetes-related mortality in the community, but it has the potential of providing information on the current trends in morbidity and mortality patterns of disease.

In conclusion, there was a progressive reduction in year-by-year fatality rate, but diabetes is still associated with an unacceptably high mortality burden in Nigeria. In this study, the male gender, diabetes-related emergencies (DKA, HHS, and sepsis), diabetic foot ulcers, and cerebrovascular disease gave poorer outcomes. Most of these deaths were preventable with primary intervention, emphasising that knowledge about the disease and encouraging early utilisation of health facilities including referral to secondary and tertiary centres is of vital importance. Expansion of the National Health Insurance scheme to include diabetes would go a long way in this regard.

Author declaration

Competing interests: none.

Any ethical issues involving humans or animals: none.

If required, was informed consent given: yes.

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