

Mortality patterns among type 2 diabetes mellitus patients in Ilorin, Nigeria

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Abstract

Objective: People living with diabetes mellitus (DM) are prone to varied forms of complications which often lead to their premature death. The vulnerability has the greatest impact in type 2 DM because of larger numerical strength, insidious onset and late recognition especially in resource-poor nations like Nigeria. This study is designed to provide information on current trends in mortality among type 2 DM patients.

Design: The study was a 10-year retrospective analysis of causes of death and contributing factors in type 2 DM patients. Information was obtained from case files and the hospital death register.

Setting: It was carried out in adult medical wards and the accident/emergency unit of the University of Ilorin Teaching Hospital, Ilorin, Nigeria.

Subjects: The study subjects were type 2 DM patients who were admitted from the diabetic clinic and/or accident and emergency units of the hospital. Data analysis was done using SPSS, version 16.

Outcome measures: The study is an attempt to provide insight into preventive measures against complications that culminate in the premature death of Nigerians with type 2 DM. The findings may form a basis for future research on characteristics of type 2 DM in our environment

Results: The overall mortality rate was 32.5% with mean age at diagnosis and death being 53.43 + 15.07 and 57.07 + 14.29 respectively. Systemic hypertension was present in 50% of the study population with male and female rate of 55% and 43% respectively. The highest number of admissions were due to diabetic hyperglycaemic emergencies, septicaemia and diabetic foot syndrome (DFS). Mortality rates were highest in those that presented with hypoglycaemia, stroke and diabetic foot syndrome. There was gender disparity in the first three major causes as more males died from DFS and stroke while females accounted for the majority of deaths from diabetic ketoacidosis (DKA).

Conclusion: Type 2 DM is a common cause of morbidity and mortality in Nigeria. The contributory factors to high mortality were ignorance, poor hygiene, infections, lack of foot care and inadequate glycaemic/blood pressure control. There is a need to improve hygiene and provide education programmes targeted at DM patients on proper foot care and good glycaemic and blood pressure control. We should emphasise the importance of early diagnosis of diabetes and proper management.

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Introduction

The incidence and prevalence of diabetes mellitus (DM) has continued to increase globally, despite a great deal of research, with the resulting burden resting more heavily on tropical, developing countries.^{1,2} Type 2 DM, which is the commonest of two basic types of DM, is increasingly being recognised in relatively young persons, due to the high prevalence of environmental and genetic risk factors.² People living with type 2 DM are more vulnerable to varied forms of both short- and long-term complications, which often lead to their premature death. This vulnerability to increased morbidity and mortality is seen in patients with

type 2 DM because of the commonness of this type of DM, its insidious onset and late recognition, especially in resource-poor developing countries like Nigeria.^{3,4} It is predicted that prevalence of DM in adults will increase in the next two decades and much of the increase will occur in developing countries where the majority of patients are aged between 45 and 64.⁵

With the current trend of transition from communicable to non-communicable diseases, it is projected that the latter will equal or even exceed the former in developing nations, thus culminating in double burden.^{6,7} Knowledge about mortality patterns in type 2 DM will give

insight into the magnitude of the disease and provide effective tools for planning, delivery and evaluation of health care needs. Although hospital-based studies have their limitations, as they may not reflect the actual magnitude of the disease, they nevertheless have the potential of providing information on the current trends in morbidity and mortality patterns of diseases.

This study was undertaken to obtain data on the causes of death and contributing factors in type 2 DM. The findings would form the basis for future research and provide strategic preventive measures against major complications that lead to premature death in diabetic Nigerians.

Subjects and methods

This was a retrospective study carried out to determine causes of death among type 2 DM patients in adult medical wards and the accident/emergency unit of University of Ilorin Teaching Hospital, Ilorin, over a ten-year period (Jan 1998–Dec 2008). The hospital is a tertiary health institution strategically located in the north central zone of the Guinea savannah region in Nigeria. Data were collected from the case files of deceased patients and the hospital death register. Information obtained included gender, age, occupation, duration of illness before death, state of blood pressure and sugar control, duration of hospitalisation before death, co-morbid conditions and causes of death. Most patients were referred from primary and secondary health care centres while some, particularly in emergency situations, were brought by relatives. Uncontrolled BP and blood sugar were taken as BP > 130/80 mm Hg and fasting blood sugar > 7 mmol/L, being the average of readings on three different occasions for the purpose of this study. Facilities for measuring HbA1c were not available in our centre. Resistant hypertension was taken as failure to achieve treatment goal of 130/80 mmHg with the use of at least three antihypertensive drugs, including a diuretic, for a minimum of one month.⁷ Analysis of data was done using SPSS statistical software version 16 and mean \pm SD was generated for continuous variables. The chi-square test was used to determine significance of difference between proportions, while student t-test was utilised to compare means of continuous variables. The level of statistical significance was taken as $p \leq 0.05$.

Results

Seven hundred and eighty-five out of 15 320 medical admissions were due to type 2 DM (5.12%). Two hundred and fifty-five of these 785 patients died, giving an overall mortality of 32.5%. Age range of patients was 30 to 86, with the majority (57.4%) aged between 35 and 55. The mortality rate among males and females was 35% (154 out of 440) and 29.3% (101 out of 345) respectively. Total mean age at diagnosis and death was 53.43 ± 15.07 and 57.07 ± 14.29 respectively. The mean age of males at diagnosis and death was 53.86 ± 13.44 and 57.73 ± 12.94 while that of females was 52.79 ± 17.45 and 56.06 ± 16.33 respectively. Overall prevalence of hypertension was 127 (49.8%), with male and female prevalence rates of 84 (54.5%) and 43 (42.5%) respectively. Resistant hypertension was observed in 43 males (51.2%) and 19 females (44.2%), with an overall prevalence rate of 62 (48.8%). A combination of uncontrolled hypertension and

poor glycaemic control was present in 53 patients (21%). The pattern of admissions (Table I) showed that diabetic hyperglycaemic emergencies, septicaemia and diabetic foot syndrome (DFS) accounted for the highest number of admissions (29.81%, 21.91% and 16.81% respectively), while stroke (8.28%), hypoglycaemia (6.75%), diabetic nephropathy (5.98%) and meningitis (4.58%) accounted for almost all the rest. Mortality rates were highest among those that presented with hypoglycaemia (57%) and stroke (51%), followed by DFS (45.5%), hyperglycaemic emergencies (35.89%), diabetic nephropathy (23.4%), hypertensive encephalopathy (22%), meningitis (17%) and septicaemia (10.5%).

The causes of death (Table II) were DFS (23.5%), diabetic ketoacidosis (DKA) (22.4%), stroke (12.9%), hypoglycaemia (11.8%), hyperglycaemic hyperosmolar state (HHS) (16.6%), septicaemia (7%), diabetic nephropathy (DN) (4.3%), meningitis (2.4%), and hypertensive encephalopathy (1.6%), with nine unclassified deaths (3.5%). There was gender disparity in the first three major causes as more males died from DFS (78%, $\chi^2 = 10.56$, $p = 0.00012$) and stroke (82%, $\chi^2 = 7.27$, $p = 0.0069$), while females accounted for the majority of deaths from DKA (63%, $\chi^2 = 14.58$, $p = 0.00013$). The majority of the mortality from DFS and DKA occurred in a setting of septicaemic illness, and most patients that died primarily from septicaemia had urinary tract infection as the focus. The majority were traders (44.7%), followed by civil servants (16%) and housewives (7%). The cause of death in some patients (3.5%) was not identified due to inadequate information from case notes.

Table I: Pattern of admissions and mortality rates

Cases	Admissions	Deaths	Percentage mortality
Hyperglycaemic emergencies (DKA, HHS)	234	84	35.89
Septicaemia	172	84	10.46
Diabetic foot syndrome (DFS)	132	60	45.45
Stroke	65	33	50.76
Hypoglycaemia	53	30	56.60
Diabetic nephropathy (DN)	47	11	23.40
Meningitis	36	6	16.66
Hypertensive encephalopathy	18	4	22.22

Table II: Causes of death in type 2 DM patients

Causes	Total (%)	Male (%)	Female (%)	χ^2	P = value
Diabetic foot syndrome (DFS)	60 (23.52)	47 (30.52)	13 (12.87)	10.56	0.00012
Diabetic ketoacidosis (DKA)	57 (22.36)	22 (14.28)	35 (34.65)	14.58	0.00013
Cerebrovascular disease (Stroke)	33 (12.94)	27 (17.53)	6 (5.94)	7.27	0.0069
Hypoglycaemia	30 (11.76)	18 (11.68)	12 (11.88)	0.0001	0.96
Hyperglycaemic hyperosmolar state (HHS)	27 (10.58)	12 (7.79)	15 (14.85)	3.21	0.073
Septicaemia	18 (7.05)	10 (6.49)	8 (7.92)	0.19	0.66
Diabetic nephropathy (DN)	11 (2.35)	9 (2.59)	2 (1.98)	0.001	0.9
Meningitis	6 (2.35)	4 (2.59)	2 (1.98)	0.001	0.9
Hypertensive encephalopathy	4 (1.57)	3 (1.94)	1 (0.99)	0.001	0.9
Unidentified	9 (3.53)	2 (1.29)	7 (6.93)		
Total	225 (100)	154 (100)	101 (100)		

Discussion

Type 2 DM is the most prevalent form of diabetes mellitus and accounts for about 90% of cases. The WHO 2004 report estimates that 1.7 million people in Nigeria have diabetes, with the projection that the number will triple by 2030.⁸ There is a paucity of data on type 2 DM in Nigeria and what little is available showed crude prevalence rates of 2.2% and 6.8% in 1997 and 2003 respectively.^{9,10} Our study reveals a prevalence rate of 5.12%, which falls within the range observed in earlier studies. The study settings and methods used may have contributed to the varied rates, as 2.2% was a national survey and 6.8% was a hospital-based prospective study, while our study was retrospective. Despite the differences, available data from other nations suggest that type 2 DM is fast becoming a major health issue in Africa.¹¹ Contributory factors responsible for increased prevalence of type 2 DM include change in diagnostic criteria, increased public awareness, decreasing overall mortality, increase in frequency of obesity and widespread adoption of sedentary lifestyle.

The pattern of type 2 DM admissions shows that diabetic hyperglycaemic emergencies, septicaemia and DFS accounted for the majority of admissions. This is not surprising, as severe infections were major precipitating factors in this population of patients with poor glycaemic control. Mortality rates were highest in those that presented with hypoglycaemia and stroke, followed by DFS and hyperglycaemic emergencies. The majority of our patients were managed on oral hypoglycaemic agents that usually comprise sulphonylureas and biguanide. Many of these patients also patronise traditional medicine practitioners who claim to cure diabetes with herbal remedies, which may contain potent hypoglycaemic agents. Some patients combine both orthodox and unorthodox medicine in a bid to cure diabetes. Most of those patients that died from hypoglycaemia presented in coma after taking oral agents, and their relations were unsure of the duration of loss of consciousness before presentation. It is possible that the majority must have suffered irreversible brain damage from prolonged hypoglycaemia, which may explain why their condition did not improve on glucose administration. The contribution of herbal concoctions to the poor outcome of these hypoglycaemic patients is not clear, as the active ingredients are largely unknown. This underscores the need for the proper education of these patients on hypoglycaemic awareness and the steps required to prevent hypoglycaemic coma.

This study shows that diabetic hyperglycaemic emergencies (DKA, HHS), DFS and stroke were the leading causes of death in type 2 diabetic patients. There was gender disparity in the overall mortality and case fatality rates. Males had an overall mortality rate of 35% while females accounted for 29% of deaths. The case fatality rates from DFS and stroke were higher in males, in contrast with case fatality rates from DKA, in which females were the majority. Severe infections precipitated and/or complicated the majority of cases that died from DFS and hyperglycaemic emergencies. The burden of infectious diseases on the outcome of our patients is in accord with recent studies from other parts of Nigeria in which infection was the leading cause of death among medical admissions.^{12,13} This contrasts with earlier studies in Nigeria which implicated cardiovascular disease as leading cause of death.^{14,15}

Although diabetes, especially type 2 DM, is a major cause of morbidity and mortality world-wide, the associated burden is felt more in developing countries because of delays in diagnosis, and late presentation.^{9,16} In a recent study on mortality among diabetic patients, the most common cause of death was diabetic hyperglycaemic emergencies, followed by DFS – results which are similar to our findings.¹⁷ The high prevalence of hyperglycaemic emergencies in association with septicaemia, as observed in this study, shows that poor glycaemic control, lack of foot care, low immune status and ignorance are contributory factors. Our findings are similar to other studies which demonstrated the interaction between ignorance, neuropathy, vasculopathy and infections in the genesis of DFS.^{18–21}

Earlier studies have alluded to the fact that severe infections, in association with both hyperglycaemic emergencies and DFS, are very important diabetic complications in Nigeria.^{22–24} The authors observed that diabetic foot ulceration and gangrene were responsible for 40% of limb amputations, with about 35% of these complicated by severe infection which accounted for 25% mortality in DKA.^{22,24} The majority of our patients were traders and civil servants who were ignorant about foot care, which is in accord with earlier studies.^{18,23,24} Our study also shows that males in their prime died more from DFS than females, which is in support of earlier studies that lamented the enormous economic burden of DFS in Nigeria.^{18,19,21,25}

Hypertensive stroke ranked third to DFS and DKA as the commonest cause of death in our study. This is not surprising as the majority of our patients were hypertensive, with more than 50% of the hypertensive males being uncontrolled, which may explain the gender disparity observed. The case fatality rate from stroke was three times higher in males than females. Studies have shown high prevalence of hypertension among type 2 DM patients in our environment.^{26,27} This is in agreement with studies from other parts of the world that show a high prevalence of hypertension among type 2 DM patients.^{28,29} In a related study which assessed prognostic indices for mortality in Nigerian type 2 DM patients, stroke was responsible for a high death rate among hypertensive type 2 DM with male preponderance.³⁰ This is in accord with our findings. Diabetes and hypertension potentiate each other in predisposing patients to atherosclerotic cardiovascular disease, and hypertension is twice as common in patients with diabetes as in the general population.^{28,31} The majority of type 2 DM patients have essential hypertension and they constitute more than 90% of people with dual diagnosis of both conditions.^{28,31}

Diabetic nephropathy as the cause of mortality was uncommon (4%) in our study. This is difficult to explain, as hypertension contributes to the development of nephropathy in type 2 DM and it can complicate diabetic renal disease.^{26,28,32} It appears from this study that the majority of our patients could have died earlier from sepsis-related hyperglycaemic emergencies and foot lesions, before the development of overt microvascular complications of the disease. Our findings also suggest that macrovascular complications develop either earlier or faster than microvascular lesions among type 2 DM patients, as prevalence of stroke was three times higher than diabetic nephropathy. This study shows that poor hygiene, infections, lack of foot care and poor glycaemic/

blood pressure control were responsible for the high mortality among our type 2 DM patients. There is a need for health care providers to intensify efforts in educating people living with type 2 diabetes about good personal and environmental hygiene. We should emphasise the importance of early diagnosis of diabetes, good glycaemic and blood pressure control, and proper education on foot care. We recommend periodic education programmes for health workers caring for diabetic patients, as well as public awareness talks and seminars on diabetes and its complications.

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