

# The pattern of diabetic admissions in UCTH Calabar, South Eastern Nigeria: a five year review

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## ABSTRACT:

**Background:** The world's adult population is increasing rapidly. This increase is expected to lead to an increase in the prevalence of diabetes especially in developing countries like Nigeria. Diabetes places a large burden on the society more so when it becomes complicated. This study is designed to provide information on hospitalisation trends and their outcomes among diabetic patients.

**Methods:** This was a 5 year retrospective analysis of hospitalisation trends and outcomes among diabetics admitted into the medical wards of UCTH Calabar between January 2006 and December 2010. Information was obtained from their case files and data was analysed using SPSS version 18 software.

**Results:** A total of 3490 patients were admitted into the medical wards during the period under review. Diabetes accounted for 360 (9.64%) of admissions. The average age of the subjects was  $48.5 \pm 14.0$  years. The mean duration of Diabetes was  $11 \pm 7.2$  years (range 1-32 years). HHS was the most frequent indication for admission (35.8%) followed by DKA (21.7%) and diabetic foot syndrome (15.8%). The duration of hospitalisation ranged from 1 to 150 days with an average of  $18.7 \pm 18.8$  days. Mean duration of hospitalisation was longest for diabetic foot syndrome ( $38.5 \pm 36.4$  days) and least for UTI ( $7.3 \pm 5.0$  days). Three hundred and nine patients (85.8%) were treated and discharged while 48 (13.3%) left against medical advice and 3 (0.8%) died while on admission. A majority of patients who left against medical advice were admitted for DFS (50.0%). 53.3% of the patients had blood pressure above 140/90 on admission and 69% of the subjects were non-compliant with their treatment.

**Conclusion:** Diabetes is a major cause of hospitalisation in our hospitals and most of the complications are preventable. With proper patient education and adherence to management, the burden of DM can be reduced in our society.

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## INTRODUCTION

As the world population grows, with increased aging, urbanisation, and increased prevalence of obesity and physical inactivity, the number of people with diabetes

mellitus (DM) is also increasing. The number of DM cases worldwide is expected to double by 2030, based solely upon demographic changes. The greatest relative increases will occur in the Middle Eastern Countries, sub-Saharan Africa, and India.

In the 1960s, diabetes was considered to be rare among Nigerians; reported prevalence rates were less than 1%. Since that time, surveys have shown a steady increase in DM over the years from between 1-2% in the 1980's; 2.8%; in the 1990's and 7% to 10% in the early 21<sup>st</sup> century. More recently, Dahiru et al in a study of the prevalence of diabetes among semi-urban dwellers in Northern Nigeria obtained a prevalence of 2% while Nwafor et al obtained prevalence as high as 23% among upper class urban dwellers in Port Harcourt in Southern Nigeria. This represents geographical variations within Nigeria.

Hospital admission is indicative of deterioration in health and the advent of disease complications. In America the cost of hospitalisation due to DM in 2008 came up to \$83 billion with poor blood sugar control being the commonest indication for hospitalisation. Studies in Nigeria have come up with different reports from that obtained from America. Chijioke et al found that diabetic hyperglycaemic emergencies; diabetic ketoacidosis (DKA) and hyperosmolar hyperglycaemic state (HHS) were the commonest causes of hospitalisation in Iorin. Ajayi et al on the other hand found that (DFS) was the commonest indication for hospitalisation in Ido Ekiti.

The health care demands in Nigeria are rapidly expanding and upgrading of the health care system is a pressing need. Priorities for transformation are not always easy to define and should be based on evidence. The knowledge of pattern and presentation of diseases is very important in making decisions concerning resource allocation in the health sector. Currently there is little data on the burden of Diabetes Mellitus in Calabar, South-eastern Nigeria hence the need for this study.

## MATERIALS AND METHODS

This study was carried out in the University of Calabar Teaching Hospital, Nigeria. We examined the medical records of all patients admitted into the medical wards of UCTH with a diagnosis of Diabetes Mellitus and diabetes related problems between January 2006 and December 2010. The following information was extracted from the records of each subject; demographics, family history of diabetes, duration of diabetes, presence of diabetes complications, co-morbidities, laboratory results, duration of hospital stay and outcome.

Data were analyzed using the program Statistical Package for the Social Sciences, version 18. Descriptive and frequency statistics were obtained for the variables studied. The chi-square test and students t test were used to evaluate associations among the variables, and values of  $p < 0.05$  was considered significant.

## RESULTS

Three thousand four hundred and ninety patients were admitted into the medical wards within the period of study. There were 2202 males and 1288 females giving a 1.7: 1 male: female ratio. Three hundred and sixty subjects were admitted with a diagnosis of DM (9.64%). 201 of them were males (9.1%) and 159 were female (12.3%) giving a male: female ratio of 1.3:1. The average age for the subjects was  $48.5 \pm 14.0$  years (range 22-81). The female subjects were significantly older than the male subjects ( $51.9 \pm 14.7$  years vs.  $45.8 \pm 12.9$  years  $p < 0.001$ ). The mean duration of Diabetes was  $11 \pm 7.3$  years (range 1-32 years). The average duration of diabetes was longer for the females than the males but this was not significant ( $11.5 \pm 8.7$  years vs.  $10.6 \pm 5.7$  years,  $p > 0.05$ ). Anthropometric measurements were not routinely kept for all patients during the study period.

### Indications for admission

The diabetic complications serving as indications for hospital admissions are shown on table 1. The acute hyperglycaemic complications of diabetes accounted for more than half of the admissions; HHS was the most frequent indication for admission accounting for 35.8% followed by DKA (21.7%) and then by DFS (15.8%). Urinary tract infection (UTI) and congestive cardiac failure (CCF) were the least common indications for admission accounting for 2.5% each. Although nephropathy was not recorded as an indication for admission, 120 (33.3%) of the patients had serum creatinine levels greater than  $132 \mu\text{mol/L}$ . Patients with elevated serum creatinine =  $132 \mu\text{mol/L}$  had a significantly longer duration of diabetes than patients with normal serum creatinine ( $10.1 \pm 6.6$  years vs.  $7.9 \pm 5.7$  years)  $F = 0.034$   $p < 0.05$ .

The age distribution of subjects for various indicators for admission are shown in table 2. DKA was the most frequent indication for admission among diabetic patients aged 20-45 years accounting for 41.4% of admissions. This was followed by HHS (32.8%), DFS (10.3%), and septicaemia (8.6%). No patient within this age bracket was admitted for CCF. For patients aged between 46-65 years, the most frequent indication for admission was HHS accounting for 42% of the admissions. This was followed by stroke (17.8%) and DFS (15.6%). DKA accounted for only 4.4% of admissions within this age bracket while all the patients admitted for CCF were in this age bracket (45-65 years). DFS was the most frequent indication for admission among patients aged above 65 years accounting for 37.5% of the admissions. This was followed by HHS (25%), stroke and UTI with 12.5% each. No patient within the age bracket of 45-65 years was admitted on account of DKA or CCF.

### Hypertension

44.7% of the subjects were previously known hypertensive. 53.3% of the patients had blood pressure above 140/90 at presentation. Blood pressure control was poor among the

previously known hypertensive. Only 10.5% of them had blood pressure below 140/90 mmHg. Elevated blood pressure (BP  $> 140/90$  mmHg) was detected in 26.2% of patients without any previous diagnosis of hypertension. The relationship between admitting blood pressure with age, the duration of diabetes and serum creatinine was examined (table 3). The blood pressure did not have significant correlation with the duration of diabetes but there was a moderate significant direct correlation with serum creatinine concentration and age. There was a direct correlation between serum creatinine and patient's age ( $r = 0.182$ ,  $p < 0.001$ ) as well as with duration of diabetes ( $r = 0.169$ ,  $p < 0.05$ ).

### Compliance to treatment

Compliance to treatment was largely poor. 69% of the subjects were non-compliant with their treatment. 43.5% of the female patients were regular on their anti diabetic medications compared to only 19.6% of the male patients ( $X^2 = 19.4$ ,  $p < 0.001$ ). Of those subjects who were compliant with their antidiabetic medications, there was no significant difference between oral hypoglycaemic users and insulin users (55.2% vs. 44.8%  $p > 0.05$ ). There was no significant difference in the mean ages of compliant subjects compared with non-compliant subjects ( $50.2 \pm 11.69$  years vs.  $50.05 \pm 13.7$  years)  $F = 4.60$ ,  $p > 0.05$ . Patients with poor compliance to diabetic medications had significantly higher admission blood sugar measurement ( $26.38 \pm 9.1$  mmol/L) compared with patients who were compliant to diabetic medications ( $20.3 \pm 8.4$  mmol/L),  $F = 0.79$ ,  $p < 0.001$ .

### Treatment outcome

The duration of hospitalisation ranged from 1 to 150 days with an average of  $18.67 \pm 18.76$  days. Mean duration of hospitalisation was longest for DFS ( $38.5 \pm 36.4$  days) and least for UTI ( $7.3 \pm 5.0$  days). A one way analysis of variance test was conducted to test the impact of complications of diabetes/ indication for admission on the duration of hospital stay. There was a statistically significant difference in the duration of hospitalisation for the various indications for admission:  $F = 10.9$ ,  $p < 0.001$ . The mean difference in duration of hospitalisation between groups was large as well as the effect size calculated using eta squared: 0.25. Post hoc comparison using Tukey HSD test indicated that duration of hospital stay due to DFS was significantly different from the other groups with no difference between the other groups (table 4).

Three hundred and nine patients (85.8%) were treated and discharged while 48 (13.3%) left against medical advice and 3 (0.8%) died while on admission. A majority of patients who left against medical advice were admitted for DFS (50.0%) followed by HHS with 18.8% (table 5). Three patients died while on admission and all of them were admitted with DFS.

A one way analysis of variance test was conducted to test the impact of the outcome of treatment and duration of hospitalisation. Patients who died while on admission spent more time in hospital ( $31 \pm 3.6$  days) compared to those who were discharged ( $18.7 \pm 19.8$ ) or LAMA ( $17.6 \pm 9.6$ ) but this difference did not attain statistical significance:  $F = 0.706$ ,  $P = 0.493$  (Figure 1).

**Table 1. Indications for admission.**

Indication for admission	Female N(%)	Male N(%)	Total N(%)
Septicaemia	6(3.8)	21(10.7)	27(7.5)
UTI	6(3.8)	3(1.5)	9(2.5)
Stroke	21(13.2)	15(7.5)	36(10.0)
Soft tissue infection	6(3.8)	9(4.5)	15(4.2)
DKA	39(24.5)	39(19.4)	78(21.7)
HHS	48(30.2)	81(40.3)	129(35.8)
CCF	6(3.8)	3(1.5)	9(2.5)
DFS	27(17.0)	30(14.9)	57(15.8)
<b>Total</b>	<b>159(100)</b>	<b>201(100)</b>	<b>360(100)</b>

$\chi^2=15.8$   $df=7$   $p=0.027$

**Table 2. Age distribution of subjects for various indications for admission**

Indication	20-45 years	46-65 years	>65 years	Total
	N(%)	N(%)	N(%)	
Septicaemia	15(8.6)	9(6.7)	3(6.3)	27(7.6)
UTI	3(1.7)	0(0.0)	6(12.5)	9(2.5)
Stroke	6(3.4)	24(17.8)	6(12.5)	36(10.0)
Soft tissue infection	3(1.7)	9(6.7)	3(6.3)	15(4.2)
DKA	72(41.4)	6(4.4)	0(0.0)	78(21.8)
HHS	57(32.8)	57(42.2)	12(25.0)	126(35.3)
CCF	0(0.0)	9(6.7)	0(0.0)	9(2.5)
DFS	18(10.3)	21(15.6)	21(37.5)	60(16.0)
<b>Total</b>	<b>174(100)</b>	<b>135(100)</b>	<b>51(100)</b>	<b>360(100)</b>

$\chi^2 = 139$   $df = 14$   $p = 0.000$

**Table 3. Correlation between diabetes duration and some variables.**

Factors	DM duration	Serum Cr	Age	BP
DM duration	1	0.169*	0.602**	0.102
Serum Cr		1	0.182**	0.357**
Age			1	0.398**
BP				1

\*Correlation at 0.05 level, \*\* Correlation at 0.001 level,

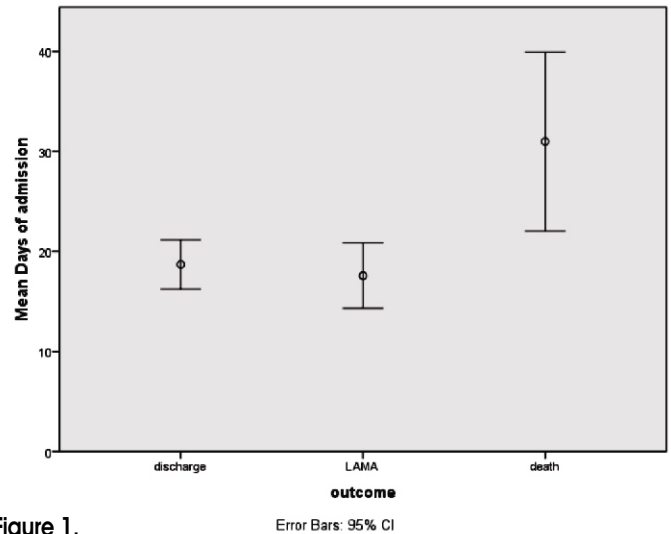
**Table 4. Indication for admission and duration of hospital stay.**

Indication for admission	Mean days on admission (SD)
Septicaemia	8.3(4.7)
UTI	7.3(5.0)
Stroke	14.4(4.8)
Soft tissue infection	14.4(2.6)
DKA	14.5(6.7)
HHS	15.8(8.0)
CCF	18.7(4.4)
DFS	38.5(36.4)
<b>Total</b>	<b>18.67(18.76)</b>

**Table 5 Indications for admission and outcome**

Indication for admission	Outcome of admission			Total N(%)
	Discharge N(%)	LAMA N(%)	Death N(%)	
Septicaemia	27(8.7)	0(0.0)	0(0.0)	27(7.7)
UTI	6(1.9)	3(6.3)	0(0.0)	9(2.6)
Stroke	30(9.7)	6(12.5)	0(0.0)	36(10.3)
STI	15(4.9)	0(0.0)	0(0.0)	15(4.3)
DKA	72(23.3)	6(12.5)	0(0.0)	75(21.4)
HHS	120(38.8)	9(18.8)	0(0.0)	123(35.0)
CCF	9(2.9)	0(0.0)	0(0.0)	9(2.6)
DFS	30(9.7)	24(50.0)	3(100)	57(16.2)
<b>Total</b>	<b>309(100)</b>	<b>48(100)</b>	<b>3(100)</b>	<b>360(100)</b>

$\chi^2 = 76.9$ ,  $df = 14$ ,  $p = 0.001$



**Figure 1.** Error bar chart of duration of hospitalisation and outcome of admission.

**DISCUSSION**

This study showed that diabetes or complications of diabetes was responsible for 9.6% of hospital admissions in UCTH for the period under review. This proportion is higher than figures reported from other studies in Nigeria; Ajayi and Ajayi<sup>13</sup> (4.4%) and Chijioko et al<sup>12</sup> (5.1%) but it is closer to figures obtained by Ogbera O. in Lagos State university Teaching Hospital over an 11 year period (10.3%) as well as with what was obtained Unachukwu et.al (10.4%) in the University of Port Harcourt Teaching Hospital (UPTH) but lower than that obtained by Okafor and Ofoegbu in the university of Nigeria Teaching Hospital, Enugu (13.4%) . Studies from America showed that diabetes and its complications were responsible for a higher proportion of hospital admissions ranging from 18% -20%.<sup>11</sup> In this study the average age of the patients was 48.5 years which is lower than the average ages obtained from previous studies in Nigeria.<sup>12,13</sup>

Previous studies in Nigeria<sup>12</sup>, and other parts of the world<sup>11</sup> have reported acute hyperglycaemic complications of diabetes as the most common indications for diabetes related hospitalisation with frequency of between 6.7% to 40% of diabetes admissions.. In this study, acute hyperglycaemic complications i.e. DKA and HHS were the most common indications for admission. This may be attributed to a lack of knowledge about the acute symptoms of diabetes among the

sufferers of diabetes and the preference for native medicine and divine healers among our people thus they present late in emergency situations. DFS was the most common long term indication for diabetes admission in this study as in previous studies in Nigeria<sup>12,13</sup>, but different from reports from America<sup>11</sup>, where cardiovascular complications were the most common long term indications for hospitalisation among diabetics. This may be due to poor patient knowledge concerning foot care in Nigeria. In this study CCF was the least common indication for hospitalisation.

DFS was the most common indication for admission among the elderly patients while no elderly patient was admitted with DKA. HHS was most prevalent among middle age patients while DKA was most prevalent among young patients. These findings may be explained by the epidemiology of the type of diabetes where type 1 diabetes and its attendant complication (DKA) is commoner among young patients and type 2 diabetes and its attendant complications (HHS and DFS) is commoner among middle aged and elderly patients.

Diabetic nephropathy is the leading cause of end-stage renal disease (ESRD) worldwide, and it is estimated that more than 20% of type 2 diabetic patients reach ESRD during their lifetime. In this study, the frequency of renal impairment as suggested by elevated serum creatinine was 33% and these patients had a significantly longer duration of diabetes than patients with a lower concentration of serum creatinine. Other studies in Nigeria found the prevalence of renal impairment among diabetics to be between 23.4 % and 25.7%.<sup>12,13</sup> A previous study from India had reported a high prevalence of diabetic nephropathy (26.9%) and a significant association with duration of diabetes. The prevalence of diabetic nephropathy in Europe and America has been reported to range from 15% to 32%.<sup>20</sup>

Hypertension is a major cardiovascular risk factor and the prevalence of hypertension is higher among diabetic patients than the general public. Previous studies locally and abroad have found the prevalence of hypertension among diabetics to range from 38% to 59%.<sup>12,13,20</sup> This study also found a high prevalence of elevated BP (53.5%) with 26.2% of the patients newly diagnosed.

Diabetes exerts a heavy economic toll on the society. This burden is related to health system costs incurred by society in managing diabetes and indirect cost due to disability, premature mortality and lost time by relatives caring for diabetics. In Africa due to the poorly developed health care system, a huge portion of this huge cost is directly borne by the patient. The level of poor drug compliance among chronic illnesses like diabetes is quite high ranging from 50% to 70%. In this study 69% of the patients had poor compliance with their medications and this may be due to cost of the medications and complexity of the regimen.

Hospital stays for patients with diabetes are longer and more costly than stays for patients without diabetes.<sup>11</sup> In this study the average duration of hospital stay for the patients was 18.7 days with DFS accounting for the longest mean duration of stay. This is in agreement with other studies locally and

internationally.<sup>13</sup>

Most cases of hospitalisation in diabetic patients are potentially preventable and as such should be successfully treated. Majority of the patients in this study were treated and discharged. A large number of them left against medical advice and majority of them were hospitalised for DFS. Ajayi and Ajayi in a previous study of diabetic hospitalisation in Ido Ekiti reported similar findings.<sup>13</sup> The large proportion of DFS patients that left against medical advice may be due to the long duration of hospitalisation, the cost of treatment which may include surgery as well as cultural perceptions of limb amputation.

Diabetes is a chronic disease and hospitalisation is an adverse event and is associated with increased mortality. In this study the mortality was 0.8% with DFS accounting for all the mortality. This is lower than what was reported by Ajayi and Ajayi (3.4%),<sup>13</sup> as well as the figures from Chijioke et al (32.5%). These differences in mortality rates may be due to the high rate of patients leaving against medical advice and possibly severely ill patients seeking alternative modes of healing from the outset (patients may prefer to seek out right cure than endless use of medication and lifestyle restrictions imposed on them by conventional diabetes regimens).

Diabetes and its complications place a high economic burden on the society in terms of hospital admissions, medical manpower and lost productivity. This burden continues to be experienced in spite of the fact that most diabetic complications are preventable. That the prevalence of diabetes will continue to rise is not in doubt, but the impact on the society and the health care system can be ameliorated by careful planning and adequate resource allocation to areas of need.

In conclusion, this study has shown that there is a high prevalence of diabetes complications in our hospital. Poor drug compliance may be due to the high direct cost of treatment to the patient and also to the quest by the patients for an easy and permanent solution to diabetes. This point underscores the issue of poor patient knowledge about the nature of the condition, how to care for themselves and treatment options available. Finally glycaemic control was generally poor and this may be due to poor drug compliance and inadequate disease monitoring by the patient and the physician. Resources should be directed towards addressing these identified contributing factors thereby reducing the impact of the apparent diabetic epidemic on our society.

Findings in this study may not necessarily be generalised to the community as it was hospital based as well as retrospective. Secondly glycated haemoglobin was not routinely assessed for diabetics during the period under review so we had to rely on plasma glucose concentration for assessing glycaemic control.

We recommend that further studies (preferably prospective) should be carried out on the long term outcome among diabetics with complications. Also studies should evaluate patient's perception of diabetes and identify the reasons for patients leaving against medical advice and seeking

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