ACTA SCIENTIFIC MEDICAL SCIENCES

Volume 3 Issue 1 January 2019

Research Article

Cause of Death in Diabetics at a Referral Hospital; A Retrospective Study of 74 Post mortem Cases of 7 Years Duration

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Received: November 08, 2018; **Published:** December 13, 2018

Abstract

Introduction: Diabetes is almost becoming an endemic in Sub-Saharan Africa and although some studies have been done on the disease, post mortem studies, which reveal the immediate cause of death among diabetics in Ghana, have not been carried out. This research is a retrospective study made on 74 post mortem cases at the Komfo Anokye Teaching Hospital from 2008-2016 to establish the leading cause(s) of death in diabetics.**Methods:** Information on cause of death and other relevant detail as well as demographics were extracted from the Autopsy Day Book of the department of pathology, Komfo Anokye Teaching Hospital where the clinical diagnoses, pathological findings and other relevant data were gathered and kept secured. The data was then analyzed using SPSS version 22.

Results: Findings from the study of 74 cases of diabetic deaths from post mortem established various immediate and major complications and disorders resulting in deaths of the patients. The age ranges from as low as 20 to 89 years with the 70-79 year group recording the highest number of cases, 20(27.03%) and those <20 years together with the 30-39 years recording the least with 2 (2.70%) each. Most of the cases recorded were for those in their late middle years to over 60 years of age. The mean age was 60.78 and modal age was 50. Females accounted for the most cases with 39 (52.70%) of cases and males recorded 35 (47.30%) of the cases. Out of a total of 7 major causes established, renal complications (diabetic nephropathy) accounted for the majority of all diagnoses made with 20 (27.03%) of cases, slightly trailed by circulatory (cardiovascular) complications with 19 (25.68%) of cases. Both Hypoglycemia and Hyperglycemia recorded the least with two cases (4.05%).

Conclusion: Mortality due to diabetes is on the rise and renal complications as well as circulatory complications being the most contributing factors to diabetic deaths. Females are also at a slightly higher risk for diabetes than men. The elderly is at most risk for

Keywords: Diabetes; Complications; Nephropathy; Arteriosclerosis; Atherosclerosis; Post mortem

Introduction

According to the World Health Organization (WHO), Diabetes is the 7th leading cause of death globally and the 6th commonest medical cause of death in Ghana [1], accounting for 2.58% of total deaths with a death rate of 36.81 per 100,000 of the population [2]. The International Diabetes Federation (IDF) report in 2017 last year indicated that over 51,000 people in Ghana have diabetes and according to them, 75% of the cases remained undiagnosed [3], posing an increased danger of complications for people living with the disease. Quite a number of researches have been done on diabetes not only because it is a common disease but also due to the number of deaths ensuing from the disease globally each year. Most of these researches have been limited to bare statistics and pre-mortem suspected complications of the disease with only very few going further to do a post-mortem study to ascertain diagnoses and causes of mortality, no such study, however, has been conducted in our center or even Africa to a larger extent.

Not everyone with diabetes dies from diabetes as the cause of death. Other studies have shown that diabetes is often not documented as an immediate cause of death for people with diabetes [4-6]. A study in 1986 and 1993 revealed that decedents with history of diabetes had diabetes listed on their death certificates only 38% and 36% of the time respectively [7,8].

When diabetes remains undiagnosed, or no proper care and management module is followed, complications are sure to develop that can deteriorate health and eventually lead to death. Diabetes-related chronic complications, particularly cardiovascular and kidney diseases are the leading causes of mortality in diabetic patients in contrast to glycemic-related events. End-stage kidney disease, historically, is the leading cause of death in the midyears of diabetes duration, accounting for more than half of deaths. This trend, however, is changing due to improvements in diabetes management with cardiovascular disease becoming the leading cause, accounting for two-thirds of deaths [9].

Mortality of diabetes differ from region to region due to different lifestyle and diet as confirmed by Morrish., *et al.* [10] and according to them, age and sex, to some extent, have an effect on the mortality rates. Controlling and alleviating diabetic complications may improve the overall quality of life and reduce mortality among diabetic patients.

The main objective of the current research is to ascertain the immediate causes of death in patients diagnosed with diabetes through a review of 74 postmortem reports in our center. This will help clinicians and people managing diabetics to make an informed decision as to the kind of complications to target when treating diabetes. This will also help in monitoring diabetic patients' adherence to management plan, as failure to comply with the plan leads to acute and chronic complications that deteriorates health and can eventually result in death.

Method

This was a retrospective study carried out at the Komfo Anokye Teaching Hospital (KATH), in Kumasi, Ghana. Information on clinical diagnosis and cause of death were extracted from the autopsy daybook of the department of pathology, Komfo Anokye Teaching Hospital. It is a 1000-bed hospital located at the middle part of Ghana. It is the leading tertiary referral hospital that serves the Ashanti, Western, Brong Ahafo and to some extent, the Northern part of the country. Data on demographics, clinical diagnoses and autopsy findings from 2008 to 2016 were recorded. The autopsy findings and complications leading to death were classified according to the criteria of the WHO's International Classification of Diseases version 10 (ICD-10) [11]. The clinical records of the patients were further investigated by accessing their clinical reports from the data book to establish diabetes as the primary clinical diagnosis. Corneal fluid of the deceased was taken at autopsy and diagnosis confirmed for some of the findings to establish diabetes as the underlying cause.

The Committee on Human Research Publication and Ethics of the School of Medical Sciences, Kwame Nkrumah University of Science and Technology, and the Komfo Anokye Teaching Hospital, Kumasi gave approval for the study. Patient records/information were made anonymous throughout the study.

Data on patients' diagnoses and post mortem findings were compiled into Excel and analyzed using the statistical analysis software, SPSS (SPSS v22) for frequency distribution, descriptive statistics and correlation tests.

Results

A total of 74 cases of diabetic deaths from post mortem findings were established and extracted for the study including cases of patients brought in dead.

Age and Sex Distribution for the various causes of death

The age range is from as low as 20 to 89 years with the 70-79 year group recording the highest number of cases, 20(27.03%) and those <20 years and 30-39 years recording the least with 2 (2.70%) each. Most of the cases recorded were for those in their late middle years to over 60 years of age with the exception of those above 80 years. The mean age was 60.78 and modal age was 50. Females accounted for the most cases with 39 (52.70%) of cases and males recorded 35 (47.30%) of the cases as shown in table 1 below.

Immediate Causes of Death and Complications Leading to Death Established from Post mortem Examination

A variety of findings were established after post mortem examination including immediate as well as underlying causes of diabetes complications resulting in death. Renal complications (diabetic nephropathy) accounted for the majority of all diagnoses

made with 20 (27.03%) of cases, slightly trailed by circulatory complications with 19 (25.68%) of cases. Hyperglycemia and hypoglycemia recorded the least with 3 (4.05%) cases each. The variety of diagnoses made is shown in table 2 below.

Age Range	Sex		
	Female	Male	Total
< 29	2	0	2
30 - 39	2	0	2
40 - 49	3	6	9
50 - 59	11	8	19
60 - 69	9	8	17
70 - 79	8	12	20
80 >	4	1	5
Total	39	35	74

Table 1: Age and sex distribution of the diabetic patients.

Complications Resulting in Death of the Diabetics

The study revealed some immediate and underlying complications of diabetes. Circulatory complications included arteriosclerosis (7 cases) and atherosclerosis (12 cases). Renal complications also comprise pyelonephritis (9 cases), renal failure (7 cases) and glomerulonephritis (4 cases). The complications of the respiratory system include bronchopneumonia (5, 6.76%), pulmonary TB, pulmonary edema and pulmonary thromboembolism with 1 (1.35%) each. Septic shock as a result of infections also contributed 15 cases as shown in table 3 below.

Diagnosis	FREQ	%
Hypoglycemia	3	4.05
Hyperglycemia	3	4.05
Diabetic nephropathy	20	27.03
Circulatory Complications	19	25.68
Respiratory Complications	8	10.81
Undiagnosed Diabetes Mellitus	6	8.11
Infections (Septic shock)	15	20.27
TOTAL	74	100

Table 2: Complications of diabetes and their frequencies.

Diagnosis (Immediate)	Complications	Freq. (%)	Frequency	%
Hypoglycemia			3	4.05
Hyperglycemia			3	4.05
Diabetic nephropathy	• Pyelonephritis • Chronic renal failure • Glomerulonephritis (Glomerulosclerosis)	9 (12.16) 6 (9.46) 3 (5.41)	20	27.03
Circulatory (cardiovascular) complications	• Arteriosclerosis • Atherosclerosis	7 (9.46) 20 (16.22)	19	25.68
Respiratory complications	• Bronchopneumonia • Pulmonary TB • Pulmonary edema • Pulmonary thromboembolism	5 (6.76) 1 (1.35) 1 (1.35) 1 (1.35)	8	10.81
Undiagnosed Diabetes mellitus			6	8.11
Infection (Sepsis)			15	20.27
TOTAL			**74**	**100.00**

Table 3: Post mortem findings (immediate causes of death) of the diabetics and sub complications.

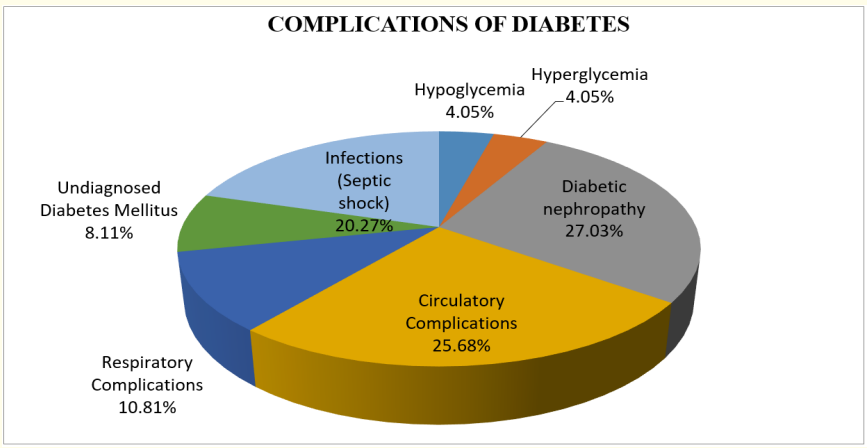

Figure 1: A pie chart showing complications of diabetes recorded for the patients and their prevalence.

Discussion

The study of 74 cases of diabetic deaths from post mortem diagnosis established various major and minor complications and disorders resulting in deaths of the patients. The age ranges from as low as 20 to 89 years with the 70-79 year group recording the highest number of cases, 20(27.03%) and those <20 years and 30-39 years recording the least with 2 (2.70%) each. Most of the cases recorded were for those in their late middle years to over 60 years of age. Patients aged 50 recorded the highest number of cases and the mean age is 60.78. Most of the patients were females with 39 (52.70%) of cases and males accounted for 35 (47.30%) of the cases.

The study showed that renal complications (diabetic nephropathy) and circulatory (cardiovascular) complications are the two most prevalent causes of diabetes mortality with 20 (27.03%) and 19 (25.68%) of all cases respectively and thus agrees with findings from previous study by Secrest., *et al*. [9]. Circulatory (cardiovascular) complications included arteriosclerosis (7 cases) and atherosclerosis (12 cases). These are the major causes of hypertensive heart diseases and cardiac failure. Elevated blood glucose as a result of diabetes causes damage to the vessels (chiefly the coronary arteries and veins) and thus compromise blood supply to other organs and the heart. Congestive heart disease and cardiac arrest comes as a consequence. It is advised then that blood glucose is monitored closely and kept as low as possible to prevent arteriosclerosis and atherosclerosis thus promoting good cardiac health and prevent the other life-threatening complications of diabetes.

Renal complications, otherwise known as diabetic nephropathy also comprise pyelonephritis (9, 12.16% cases), renal failure (7, 9.46% cases) and glomerulonephritis (glomerulosclerosis) with 4 (5.41%) cases. Diabetic nephropathy is usually the major cause of kidney failure and up to 40% of diabetics usually develops kidney disease [16]. The complications of the respiratory system included bronchopneumonia, pulmonary TB, pulmonary edema and pulmonary thromboembolism. Infections that come with diabetes usually results in septic shock (15, 20.27%). Infections are as a result of diabetic ulcers as well as renal infections (UTIs) [17,18] as a consequence of hyperglycemia. Septic shock (septicemia) occurs as a result of bacterial infection of ulcers and also through the urinary tract (which results in nephropathies) and if not managed expertly and quickly could have serious complications and even result in death.

Diabetes comes with a lot of complications and medical care usually focuses on palliative care rather than treating the disease itself. From the results of the study, victims of diabetes usually don't die of diabetes, but a complication related to the disease [7]. The serious thing is that, most of the cases of diabetes remain undiagnosed and many individuals report very late for treatment at a time when the complications have seriously compromised their health and even some are only detected after death. In accordance with previous study, diabetes as a cause of death was recorded only 8% of the total causes of death and complications [7,8].

Hyperglycemia and hypoglycemia are the two extreme immediate complications of diabetes that eventually results in more life-threatening physiological manifestations and disorders [19]. It

is not so clear which of the two has more serious complications, but it is shown that very high blood glucose levels can also lead the more life-threatening condition, diabetic ketoacidosis (DKA), which occurs more frequently in type 1 diabetics and is also the main instigator of stroke, congestive heart failure, nephropathy and neuropathy among others. In the US, DKA accounts for about 500,000 hospital days per year [12] at an annual indirect cost of about $2.4 billion and direct medical expense [12,13].

Hypoglycemia on the other hand is an acute complication of diabetes and mostly occurs in people on insulin injection or oral diabetes medication, which can often result in sudden collapse, coma and death [14,15]. The difference in manifestation of hypoglycemia and that of hyperglycemia is the fact that of hypoglycemia is often sudden and acute and requires immediate medical action to prevent coma or death.

The only minor limitation of the study was the difficulty encountered in ascertaining the type of diabetes from patients' clinical information from folder when retrieving patients' records. So, the study did not provide information on the diabetes type of the patients. Even without that, the immediate manifestation of all cases of diabetes is elevation of blood sugar, which comes with the complications as established in this study.

Conclusion

The study in our center revealed that renal and circulatory complications are the most contributing factors of diabetic deaths with pyelonephritis being the most prevalent renal complication and atherosclerosis being the most prevalent of the circulatory (cardiovascular) complication. It was also established that people from 50 years and above are more prone to the complications of diabetes. Females are also at a slightly higher risk for diabetes than men.

Acknowledgement

The authors wish to acknowledge the immense contribution of Mr Dick of the department of Pathology for making available the autopsy reports and information contained in the Autopsy Day Book.

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