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Review of the Causative Factors and Comorbidities on Chronic Kidney Disease at Ndola Teaching Hospital from 2016 to 2020

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Abstract

The kidney is an organ whose role in the human body is to eliminate toxic substances among other functions. These toxins if accumulated can cause harm to human health by disturbing metabolic processes as one of the harmful effects. Kidney or renal failure refers to the loss of kidney tissue function. The cause of such a condition is varied and the prevalence differs from place to place. This research particularly centers on the associated causative factors and comorbidities in renal failure at NTH for 2016 and 2020. It seeks to establish the magnitude of renal failure as a health challenge, its causes, comorbidities and whether and they influence patient outcome. The data will be collected from the hospital records at NTH. There is likely to be a rise in number of patients with increase in age. In addition, a similar rise is likely to be observed among the hypertensive and the HIV infected patients. The causes are expected to range from congenital abnormality to neurotoxicity. The information to be obtained will be analyzed and the conclusion drawn from the analysis will be used in the formulation of measures on how best kidney failure can be prevented or will be used as basic information in future research as efforts being made to combat renal failure.

Keywords: Kidney • Human body • Neurotoxicity • Hypertensive

Introduction

The attention being paid globally to chronic kidney disease is attributable to five factors: the rapid increase in its prevalence, the enormous cost of treatment, recent data indicating that overt disease is the tip of an iceberg of covert disease, an appreciation of its major role in increasing the risk of cardiovascular disease, and the discovery of effective measures to prevent its progression.

Non communicable diseases, among which Kidney failure is categorized, are the leading cause of the death in the world [1]. Over twenty million people suffer from renal failure worldwide and are receiving renal replacement therapy.

Chronic Kidney disease has five stages. The first shows normal kidney function evaluated with respect to GFR. Second stage shows mild decrease and the third signifies moderate decrease in kidney function. Furthermore, the fourth shows severe decrease in kidney function while the fifth stage is kidney failure.

According to the National Institute of Diabetes, Digestive and Kidney Disease (2016), 14% of the general population in the United States of America suffered from Chronic Kidney Disease,661 000 of Americans had Kidney failure and among these 468 000 were on dialysis while 193 000 had Renal transplant. The main causes were Hypertension and Diabetes Mellitus. 117 162 Americans had End Stage Renal Disease or Kidney Failure. Among Children, the most common cause of Kidney failure were congenital/hereditary disorders which account for 33% of the children, Glomerular disease-24.6%and 12.9% were due to secondary causes of glomerulonephritis.

American 2017 national kidney disease data is culminated in a factsheet. According to this document, 15% of the US is estimated to have CKD [2]. Out of these 48% were aware though not on dialysis and 96% of people with kidney damage or mildly decreased kidney function and not aware of having CKD.

Chronic Kidney Failure is 3 to 4 times more frequent on the African continent than in developed countries.Causes of CKF in tropic and East Africa include, chronic Glomerulonephritis, Diabetes Mellitus, Obstructive Uropathy and Hypertension. Hypertension affects 25% of adult populace and causes CKD. Estimated Diabetic Nephropathy reveals that 14-16% in South Africa, 23.8% in Zambia, 12.4% in Egypt and 9% in Sudan. Chronic glomerulonephritis, hypertension lately diabetes mellitus are the major etiological factors in chronic kidney disease.

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Materials and Methods

This research will be done at Ndola teaching Hospital, Ndola, Zambia. The study population included all patients suffering from kidney failure attended at Ndola Teaching Hospital referrals inclusive. This is a retrospective study to determine the prevalence and causative factors of kidney failure during the years 2016 and 2020 using hospital records. The target people are all the patients with kidney failure during this period. Due to the fact that it is a retrospective study, it inevitably included all the patients that suffer from kidney failure during the period 2016-2020.

Data was collected manually from medical records at the renal unit. The collected data was therefore used to fill in the questionnaire on page 26 of this document.

Ethical approval was obtained from TDRC. This was achieved in consideration and agreement of the fact that ethical principles will be utilized in obtaining the required information. The information would be used for the good of the community and to better the operations of the Renal Unit at NTH, hence no harm would be done. Permission to access this information was obtained from NTH administration as the data records are a property of the hospital. Participants were deidentified, and the collection and analysis of data would not lead to re identification. Data collection was very objective.

Result

A total of 280 files were recruited into this study, of which 62.5% were male and 37.5% were female. The ages ranged from 16 to 90 years, with the mean age of 44.46 ± 14.77 years with the majority (66.4%) being of the age group 30 to 59 years. Of the files reviewed 54.3% were married and 1.4% divorced. Regarding origin, 85% were of African origin and 0.4% Caucasian. As for socioeconomic status, 38.9% had no indication of their socio-economic status, 22.5% were unemployed and3.6% Retired. Their education level went up to tertiary in 22.5% and in 1.8% up to Primary. The levels of proteinuria, 39.1% showed proteinuria of more than 1+ 31.8% proteinuria was Nil or trace and 28.9% were not indicated. There was no association between proteinuria and the cause (p=0.393) or comorbidities such as Stroke (p=.423), Cardiac Disease (p=0.104), Cancer (p=0.114) and Anemia (p=0.316) (Figure 1).

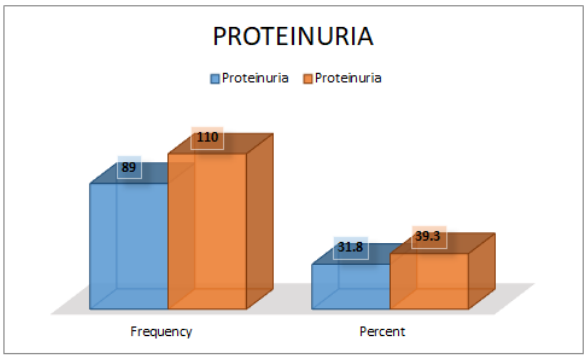

Figure 1. Levels of proteinuria.

Biochemical markers that can be used in evaluating renal abnormality. Hypercholesterinemia was recorded in 2.9%, 7.5% hypocholesteremia and 2.9% recorded a normal cholesterol range reading. Albumin levels were above normal in 21% as so were triglyceride levels in 2.1%. Serum urea levels were higher than the normal in 82.5% and less than the lower limit of normal in 0.7%. As for creatinine, the levels were above the upper limit of normal in 86.8% and lower than the lower limit in 0.4%.

Liver enzyme AST recorded higher than normal levels in 30.7%, ALT in 15.7% and ALP in 2.5%. Hyperpathyroidemia was recorded in 7.5% and hypoparathyroidemia in 0.4%.

The bar graph below shows the hematological readings as obtained from the reviewed files. Hemoglobin, white cell count, Platelet Count and Neutrophil/Lymphocyte ratio were lower than normal in 81.4%, 8.2%, 13.2% and 2.1% respectively and above normal in 3.2%, 17.9%, 13.9% and 43.9% respectively.

The serum electrolyte levels for the files reviewed. Hypocalcemia was recorded in 13.9% and hypercalcemia in 1.1%. Increased Magnesium levels were recorded in 4.6% and lower than the lower limit in 7.5%. Hyperphospotemia was recorded in 3.2% and hypophosphatemia in 6.4% (Table 1).

Variable	Indicator	Frequency	Percent
Calcium	0-8.4	39	13.9
	8.4-10.3	12	4.3
	10.3-12	3	1.1
Magnesium Range	0-1.7	21	7.5
	1.7-2.2	10	3.6
	2.2-10	13	4.6
Phosphate Range	0-2.5	18	6.4
	2.5-4.5	19	6.8
	4.5-10	9	3.2

Table 1. Serum electrolyte levels for the files reviewed.

Discussion

In this retrospective study, we reviewed 280 renal hospital files .Our results indicated that the majority 66.4% of cases were within the age range 30-60 years Notable gender variation in the kidney damage was observed, with a higher occurrence significantly tilted toward the male gender. On the contrary, a Chinese study done to evaluate the prevalence of kidney disease among the elderly concluded that the majority were above 60 years of age with a tilt to the female gender [3]. A majority of the files reviewed were of African descent with married category represent the major fraction of the population. It was also noted that most files had no information on socioeconomic status and educational level.

Proteinuria is one of the most common signs of renal disease and detection is primarily by Stix testing. Of the files reviewed ,71.1% had urinalysis done and the obtaining were that 39.3% had proteinuria 1+ and more whereas 31.8% had trace or no proteinuria. There was no association between proteinuria and gender (p=0.901). This is consistent with the findings of the study done in Eastern China (p= . 20).

Much of the increased burden of chronic disease in CKD is due to increased prevalence of both traditional and nontraditional cardiovascular disease risk factors. Traditional risk factors are those factors identified as conferring increased risk of cardiovascular disease in the general population [4]. These traditional risk factors include older age, diabetes, and hypertension, all of which are highly prevalent in patients with CKD. Nontraditional risk factors are defined as those factors that increase in prevalence as kidney function declines and that have been hypothesized to be cardiovascular disease risk factors in patients with CKD. These include anemia, inflammation, and abnormal calcium and phosphate metabolism. This study however focused on the actual causes as it was retrospective. In this study we identified an association between age and cause.

CKD may result from disease processes in any of the three categories: prerenal (decreased renal perfusion pressure), intrinsic renal (pathology of the vessels, glomeruli, or tubules-interstitium), or postrenal (obstructive). In this study seven independent causes of CKD were identified.it must be noted that in some files a combination of two caused were picked. There was no case in which 3 causes were identified in one patient. According to the data obtained 50.7% of CKD cases were caused by HTN and 8.9% by HTN and DM whereas Chronic Gastroenteritis and Polycystic Kidney disease were responsible for 0.7% and 0.4% respectively. This does not corelate precisely with global statistics that majority of cases are due to DM type one.

Chronic Kidney Disease (CKD) is associated with poor outcomes, perhaps due to a high burden of comorbidity. According to a retrospective study done in Canada between 2003 to 2011, comorbidities were classified into three categories: Concordant, mental health/chronic pain, and discordant. Concordant comorbidities, are those that cause CKD (such as hypertension and diabetes) or often accompany CKD (such as heart failure or coronary disease). In this study there was an association between the comorbidity classes and increased disease burden and outcome. However, in the current study there was an association between disease outcomes, in this case mortality, and anemia. There was no association with the other comorbidities evaluated.

Hematological parameters are shown to be commonly affected in CKD. This study recorded an increase in WCC in 17% as opposed to the 8.3% in whom the count was less than normal. Platelet was high in 13.9% and low in 13.2%, Neutrophil/Lymphocyte ratio was higher than normal in 43.2%. As for the hemoglobin, 81.4% recorded a lower than normal hemoglobin was recorded whereas only 3.2 recorded above normal. The findings of our study are similar to those obtained in a study done in West Africa, Nigeria. The subjects comprised of a total of one hundred (100) subjects, 50 subjects were chronic kidney disease patients aged 50-70years (20 females and 30 males) and 50 (25 females, 25 males) subjects were apparently healthy individuals aged matched as the control. The results showed significant increase in total white blood cell, neutrophil, monocyte, eosinophil of the Chronic Kidney Disease (CKD) of the subjects (6.2± 0.5 X109/L, 71.0 ± 6.1%, 3.0 ± 0.2%, 2.0 ± 0.1%) compared to the control (4.6 ± 0.2 X109/ L,57.0 ± 4.1%, 1.0 ± 0.1%, 0.1 ± 0.1%), significant decrease in hemoglobin of the chronic kidney disease subjects (11.0 ± 0.8g/ dl,) compared to the control (15.3 ± 0.5g/dl,)(Obeagu 2017).

A study was conducted in AL-Zahraa general hospital in Al-but city/ Iraq. To assess serum urea, creatinine, lipid profile (cholesterol, TG, DHL and LDL) in CKD patients, it included 50 patients, 29 were males and 21were females aged between 20 and 60. The controls were 30 and were free from signs and symptoms of renal disease, lipid disorders, and thyroid hormone [5]. The study shows that the Serum urea and creatinine concentrations in CKD patients were found to be significantly high compared with control group (P<0.001), Serum triglycerides concentrations in CKD patients were found to be normal or no significantly increase compared with control group (P> 0.05), Serum cholesterol, HDL and LDL concentrations in CRF patients were found to be no significantly lower compared with the controls. The findings on this study are similar to what was recorded in our research. Creatinine and urea were increased above normal in 86.8% and 82% respectively. Optimum Triglyceride levels were recorded in 7.5%, with slight elevation in 3.9% and substantial increase in 2.1%.

As kidneys play a pivotal role in the regulation of electrolyte and acid–base balance, progressive loss of kidney function deranges electrolyte and acid-base balance contributing to poor patient outcomes. This is consistent with the serum electrolyte level findings of this study. Calcium, Magnesium and phosphate were reduced in 13.9%, 7.5% and 6.4% respectively.

Conclusion

In summary, 280 CKD patient files were reviewed with ages ranging from 16 to 90 years. This study showed that the majority of the cases were due to Hypertension. An association was established between age and cause. Of the comorbidities evaluated only anemia was found to have an association with the mortality as a disease outcome. The biochemical and electrolyte derangements were consistent with those of renal pathology hence were anticipated.

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