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PREVALENCE OF CHRONIC KIDNEY DISEASE AMONG DIABETIC SUBJECTS ADMITTED IN A MULTI-SPECIALTY HOSPITAL IN SOUTH INDIA

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ABSTRACT

Introduction: Chronic Kidney disease has become a major public health issue with the steep rise in the incidence of diabetes in the last few decades even among developing countries. We attempted to identify the prevalence of chronic kidney disease among diabetic subjects admitted in the hospital during an 18- month period in a multi-specialty hospital in South India. **Methods:** The study was a retrospective study where the data was obtained from the Medical records department of the hospital during the period from January 2015 to July 2016. All basic demographic characteristics, clinical and laboratory characteristics were obtained from the hospital records in an anonymous fashion. The study was approved by the Institutional Ethics Committee. **Results:** A total of 297 patients were identified to have been admitted with a diagnosis of diabetic kidney disease during the study period of 18 months. This comprised of 1.7 % of the hospital admissions during the study period. The total number of patients with a diagnosis of chronic kidney disease was 649. The majority of the patients (88%) were in the latter stages of CKD. (Stage 3-5), CKD stage 5 being the most common among them. Fifty-two patients were on renal replacement therapy. The most common reason for admission to the hospital was acute worsening of CKD (38.1%), urinary tract infections (10.5%), sepsis (5.1%), lower respiratory tract infections (6.5%), pulmonary oedema (5.1%) and hypoglycaemia (5.4%). **Conclusion:** There is a definite need to perform large scale screening programmes among the large cohort of subjects that are located within the catchment area of our centre so as to detect CKD at an earlier stage and offer intervention that could reduce burden and progression of the disease.

KEYWORDS: chronic kidney disease, prevalence, retrospective study, south india, admissions.

INTRODUCTION

There is an increasing burden of chronic diseases in India and account for up to 50% of deaths.[1] Chronic kidney disease (CKD) is a world-wide health problem. CKD is the 12th leading cause of death.[2] This global prevalence of CKD, however, may be grossly underestimated for a number of reasons. The population of India exceeds one billion with an increasing burden of chronic diseases like diabetes and hypertension and a decline in communicable diseases, all of which may not be recorded. Most epidemiological data (prevalence, incidence, patient demography, morbidity, and mortality) on CKD are derived from renal registries but this is limited in India. Indeed less is known about the prevalence of the earlier stages of the CKD. A previous study involving 4972 urban patients from Delhi found a prevalence of CKD, defined as a serum creatinine more than 1.8 mg/dL (158 micromol/L) of 0.79 %.[3] A more recent survey of the Indian Council of Medical Research (ICMR), estimated that the prevalence of diabetes in adults was 3.8% and 11.8% in rural and urban areas, respectively.[1]

However, there is little data on the burden of CKD due to diabetes that attends secondary care hospitals and the degree of CKD present. In this current study we examined the demographics of a cohort of 297 patients with a diagnosis of diabetic CKD seeking medical attention at a single centre (Hindu Mission Hospital) over an 18 month continuous period from July 2015-December 2016 to establish the prevalence of diabetic CKD, their co-morbidities and degree of renal dysfunction among hospital admissions.

MATERIALS AND METHODS

The study protocol was approved by the Institute Ethics Committee of Hindu Mission Hospital. We included, in this retrospective observational study, all patients who presented to the hospital with a diagnosis of both chronic kidney disease (dialysis and non-dialysis) and diabetes

during the period from July 1, 2015 to December 31, 2016. The data included in the analysis was obtained from the hospital records of patients. These records were stored at the Medical Records Department. The primary diagnosis for every admission is coded and maintained on a computerized hospital information system, therefore all patients with a primary or concomitant diagnosis of CKD and associated diabetes were chosen without any omissions. Patients who were admitted on more than one occasion were included in the study only once at their first visit. All demographic characteristics of the patients including age, gender, smoking status, alcohol intake, tobacco use and staging of CKD were collected. Clinical details and comorbidities were also collected. These included hypertensive status, presence of anaemia; coronary artery disease (CAD); asthma; peripheral vascular disease (PVD) and chronic obstructive pulmonary disease (COPD). Other clinical parameters included, symptomatology and relevant glomerular filtration rate (GFR), full blood count (haemoglobin) and biochemistry (urea, creatinine, sodium, potassium, chloride, bicarbonate, calcium, magnesium, phosphorous) and liver function tests (bilirubin, total protein, albumin, globulin, liver enzymes, lipid profile). Urinalysis was also recorded. Data were collected in an anonymised fashion to ensure confidentiality of all study subjects.

Statistical analysis

The continuous variables were recorded as means ± standard deviation (SD) or median with inter quartile range. The categorical variables were recorded as frequency with percentages. The data were stratified based on gender and comparison was made with respect to each of the variables. Comparison was also made between the different stages of kidney disease using one-way ANOVA, Kruskal Wallis test or chi square test. Correlation was done between eGFR and other demographic variables. A p value of less than 0.05 was considered statistically significant. Data was analysed using SPSS v.16.0.

RESULTS

A total of 297 patients were identified to have been admitted with a diagnosis of diabetic kidney disease during the study period of 18 months. This comprised of 1.7 % of the hospital admissions during the study period. The total number of patients with a diagnosis of chronic kidney disease was 649. This constituted approximately 4% of the total admissions. Among the CKD patients, diabetes was the leading cause present in 45.8% of patients with CKD. Males constituted 60% (n=180 male) of the total number of diabetic CKD admissions. The mean age of the patients was 64 years and males were significantly older than females (65.13±10.12 years vs 62.45±11.53 years; p=0.036) (Table 1).

The majority of the patients (88%) were in the latter stages of CKD. (Stage 3-5), CKD stage 5 being the most common among them. Fifty-two patients were on renal replacement therapy but apart from a higher systolic blood pressure their biochemical characteristics were similar. Hypertension was common with 82% suffering from it and 25% with coronary artery disease (Table 1). Co-morbidities were similar between males and females.

Table 1: Gender-wise comparison of baseline characteristics of patients admitted:

Category	Male (n=180)	Female (n=117)	p Value
Demographic details			
Age(years)	65.13±10.12	62.45±11.53	0.036
Parents with diabetes (%)	2(1.1)	2(1.7)	0.64
Smoking (%)	42(23.6)	2(1.7)	0.001
Alcohol (%)	42(23.6)	0(0)	0.001
Tobacco chewing (%)	2(1.1)	2(1.7)	0.65
Symptoms			
Breathlessness (%)	57(31.8)	57(48.7)	0.005
Constipation (%)	15(8.4)	9(7.7)	1.00
Headache (%)	4(2.2)	9(7.7)	0.039
Fever (Fahrenheit)	24(13.5)	13(11.1)	0.59
Cellulitis (%)	4(2.2)	0(0)	0.156
Hiccups (5)	2(1.1)	0(0)	0.52
Bladder distension (%)	2(1.1)	2(1.7)	0.64
Abdominal discomfort (%)	21(11.7)	24(20.5)	0.04
Generalised tiredness (%)	25(13.4)	29(24.8)	0.019
Pedal oedema (%)	52(29.1)	43(36.8)	0.20
Chest discomfort (%)	10(5.6)	10(8.5)	0.35
Cough (%)	21(11.7)	19(16.2)	0.29
Loose stools (%)	2(1.1)	2(1.7)	0.64
Blood stained urine (%)	1(6)	0(0)	1.00

Chest discomfort (%)	10(5.6)	10(8.5)	0.35
Clinical examination			
Systolic BP (mmHg)	142.95±32.7	145.56±26.92	0.476
Diastolic BP (mmHg)	86.36±16.33	87.77±15.26	0.457
Concomitant condition			
Hypertension (%)	145(81.5)	99(84.6)	0.532
Coronary artery disease (%)	49(27.5)	25(21.4)	0.273
Asthma (%)	15(8.4)	8(6.8)	0.66
Peripheral Vascular Disease (%)	3(1.7)	0(0)	0.28
Anaemia (%)	35(19.6)	26(22.2)	0.66
Chronic lung disease (%)	6(3.4)	1(9)	0.25
Treatment and Medications			
Dialysis (%)	27(15.1)	25(21.4)	0.21
Anti-diabetic medications	74(41.6)	45(38.5)	0.62
Insulin (%)	61(34.3)	42(35.9)	0.80
ACEi (%) or ARB (%)	4 (2.3)	8(6.9)	0.28
α-1 adrenergicblockers (%)	22(12.4)	15(12.8)	1.00
β-blocker (%)	26(14.6)	19(16.2)	0.74
Calcium channel (%)	102(57.3)	66(56.4)	0.90
Potassium sparingdiuretics (%)	80(44.9)	63(53.8)	0.15
Potassium supplements (%)	58(32.6)	23(19.7)	0.01
Loop diuretics (%)	5(2.8)	4(3.4)	0.74
Statins (%)	51(28.7)	35(29.9)	0.89
Thiazides (%)	1(0.6)	0(0)	1.00

The most common reason for admission to the hospital was acute worsening of CKD (38.1%), urinary tract infections (10.5%), sepsis (5.1%), lower respiratory tract infections (6.5%), pulmonary oedema (5.1%), hypoglycaemia (5.4%) and other non-specific reasons. The mean creatinine was significantly lower among patients older than 65 years of age. There was a positive correlation between haemoglobin concentration and the glomerular filtration rate (r=0.303); within a significant fall in haemoglobin over the 5 stages of CKD (p=0.001) (Table 2).

Table 2: Characteristics of patients across the staging of CKD:

Characteristic	Stage 1 (n=4)	Stage 2 (n=12)	Stage 3 (n=64)	Stage 4 (n=66)	Stage 5 (n=131)	p value
SBP(mmHg)	145.00±17.3	146.67±27.08	135.47±26.54	140.15±30.55	149.62±32.77	0.034
DBP(mmHg)	97.5±17.01	86.6±14.3	82.8±15.2	85.1±13.6	89.23±17.3	0.051
GFR(%)	79±35.6	56.5±28.6	35.1±13.1	21.8±9.02	10.5±10.0	0.001
Haemoglobin(g/dl)	10.7±1.4	10.05±1.93	9.8±2.1	9.4±2.2	8.4±1.8	0.001
Urea (mg/dl)	26.6±7.7	52.4±34.7	56.1±39.8	71.3±30.4	118.1±60.1	0.001
Creatinine (mg/dl)	0.8±0.058	1.6±1.38	2.02±1.32	2.7±0.70	6.7±3.47	0.001
Age (years)	65.75±12.1	63.00±8.4	64.93±10.2	64.45±12.4	63.50±9.90	0.890
Potassium (mEq/l)	4.35±1.11	4.15±0.80	4.82±5.92	4.14±1.02	4.99±1.33	0.41
Bicarbonate (mEq/l)	21.66±1.52	21.24±2.61	21.52±4.61	23.98±12.14	22.17±3.46	0.32
Calcium (mg/dl)	-	7.80±0.70	8.30±0.70	8.52±0.64	8.43±0.57	0.45
Magnesium (mg/dl)	-	1.50±00	1.80±00	2.01±0.82	1.86±0.49	0.86
Phosphorous (mg/dl)	-	4.40±00	4.60±00	3.70±0.51	3.72±1.21	0.78
Total protein (g/dl)	6.86±0.54	7.03±0.05	7.06±0.72	6.71±0.87	6.60±1.46	0.54
Albumin (g/dl)	3.33±0.15	3.23±0.24	3.658±0.58	3.55±0.42	3.54±0.39	0.35
HbA1c (%)	5.96±1.07	6.12±2.30	10.48±13.66	7.44±1.10	7.07±1.31	0.49
Uric acid (mg/dl)	-	-	3.7±00	4.40±1.55	5.06±1.27	0.57

The commonest presentation was breathlessness (38%) and oedema (32%) suggesting fluid retention and anaemia, while 18% complained of generalised tiredness and 15% abdominal discomfort. Interestingly both these was more common in females who were on average 3 years younger (Table 1). This perhaps suggests the

possibility of poor compliance with fluid balance or insufficient treatment in females. This could also possibly relate to attendance for follow-up.

The mean haemoglobin was 9.05g/dL, while the mean serum creatinine was 4.27mg/dL (376 micromol/L) but 17.5% of patients were on renal replacement therapy. Few patients were on angiotensin converting enzyme inhibitor (ACEi) or angiotensin receptor blocker (ARB) therapy or loop/thiazide diuretic therapy (table 1) which might have accounted in part for the increased symptoms of breathlessness. Interestingly 48% and 29% of patients were on potassium sparing diuretics or potassium supplements respectively. The mean potassium concentration was below 5 mmol/L (27% of patients were on potassium supplements) and the average bicarbonate level was 22.4 mmol/L.

DISCUSSION

Our study has shown that the prevalence of diabetic kidney disease during the study period among in-patients with diabetes was 9.2 %. This is more than double the prevalence of overt nephropathy, which was 4% as observed in the Chennai Urban Rural Epidemiology Study.[4] The overall incidence of CKD in India is purported to be around 800 per million populations.[5] A cross sectional study performed in Saudi population from the National Diabetic Registry showed that the prevalence of diabetic nephropathy was 10.8 %.[6] Our study was a single centre study performed in a small group of subjects, who were admitted in the hospital with diagnosis of CKD and diabetes, which raises possibility that we have overestimated the frequency of CKD in our population. In addition to this, the hospital has a dedicated dialysis unit that could attract more patients with kidney ailments from the surrounding regions and smaller hospitals without a renal service.

The mean age of the total population was 64 years. This is in agreement to a cross sectional study carried out at Spain in 1145 patients where the mean age of the patients was 66.8 years.[7] However, in a multi centric study by Rajput *et al*, which was carried out nationwide across 30 different centres with 3000 subjects, the mean age was 53.4 years.[8] In the Indian CKD Registry that utilized data from 52,273 patients, the mean age among patients with diabetic nephropathy was 52.3 years. Thus our patient population appeared older compared to other centres in India. One potential reason for this could be the higher number of senior citizens visiting our centre due to the fact that this was a mission hospital. It is intriguing to note that an older age at presentation is reported in Caucasian population as seen with our centre. We cannot rule out, if a study with larger cohort could have an older mean age of presentation.

Our study has shown that 88% of the study population had stages 3 to 5 CKD. This is in resonance with the Indian Registry study which showed that 93 % of CKD patients belonged to Stage 3 to 5. It is not surprising that a fewer number of patients were detected in earlier stage of CKD as this was a hospital based study. Since a significant number of the patients of the study were on regular haemodialysis at our centre this could potentially influence the disproportionate number of cases with end stage renal disease. In contrast the SEEK study, (screening early evaluation of kidney disease) that was carried out in thirteen medical centres across India, showed a higher prevalence of patients with early stage CKD as compared to end stage renal disease (prevalence of CKD stages 1, 2, 3, 4 and 5 was 7% 4.3% 4.3% 0.8% and 0.8% respectively).[9] This study included patients of all aetiologies of CKD. In a study by Trivedi *et al* performed in the community in a semi urban population of western India showed that the majority of CKD subjects were in the earlier stage of the disease.[10]

There was a positive correlation observed between mean haemoglobin and GFR in our study. Similar findings have also been reported in an earlier study. In a retrospective cross-sectional study performed among patients in Veterans Affairs Integrated Service Network (VISN), Cleveland USA lower GFR was significantly associated with anaemia. [11] In a study performed among 2258 Chinese subjects at a tertiary care centre in Beijing, haemoglobin concentration was found to deteriorate with worsening GFR.[12] Anaemia is an important complication of CKD that arises due to a contribution from the reduction in erythropoietin production as a result of kidney disease, iron deficiency from reduced absorption, mobilisation and increased loss, uraemic toxins that are produced and other metabolic products of renal dysfunction.[13-15]

Our study showed that the most common cause of CKD admissions was an acute on chronic CKD (27%). In a study done in the Nigerian population, that included 1113 CKD subjects over 5 years, 93% of subjects had an acute deterioration of chronic kidney disease. Some of the precipitants of acute-on- chronic kidney disease included sepsis, hypertension and heart failure.[16] In a retrospective study performed using data records in the UK, a strong graded association was observed between lower eGFR and infections. Among infections, sepsis was strongly associated with low eGFR.[17]

The main limitation of our study was the setting in which the study has been conducted. Since our centre has a dialysis unit, that could affect the demographics of the study population. We had included only in-patients in the hospital. The prevalence of the CKD observed could have been different had we also taken patients from the out-patient department, but for logistic reasons this was not performed.

CONCLUSION

The increase in prevalence of diabetes has led to a proportionate surge in the number of cases diagnosed as CKD. The mean age of CKD subject was 64 years and majority of them had advanced CKD. There is a definite

need to perform large scale screening programmes among the large cohort of subjects that are located within the catchment area of our centre so as to detect CKD at an earlier stage and offer intervention that could reduce burden and progression of the disease.

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