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Influence of co-morbid conditions on mortality in chronic kidney disease patients in Telangana region

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Abstract
Chronic kidney disease (CKD) is a condition characterized by a gradual loss of kidney function for a long period of time. It is a worldwide public health problem with an increasing incidence and prevalence. If chronic kidney disease gets worse it may develop complications like high blood pressure, anaemia, lung disease and cardiovascular problems. The objective of this study was to find out mortality rate in nephrology department and to observe the major co-morbid conditions leading to progression of chronic kidney disease and end stage renal disease. A total of 480 patients diagnosed with CKD were enrolled in the study and we observed mortality in 80 patients (16.6 %) and the highest prevalence was observed in age group of 51- 60 years. In our study, majority of the mortality cases were observed in patients with diabetes and hypertension. 85 % of patients were on haemodialysis; among them most of the patients were rural residents. This study concludes that CKD is also one of the leading causes of mortality. Central and state authorities must take necessary steps in creating awareness and increase dialysis centres at the rural level, which will significantly reduce the mortality rate and improve quality of life.
Keywords: *Chronic kidney disease (CKD), Mortality, Haemodialysis, Co-morbid conditions.*

Introduction

CKD is defined as the presence of kidney damage, manifested by abnormal albumin excretion or decreased kidney function, quantified by measured or estimated glomerular filtration rate (GFR).[1] CKD is classified by eGFR from stage 1 to stage 5, stage 1 eGFR being more than 90 ml/min and with other renal abnormality such as proteinuria. Stage 2 eGFR is between 60 - 90 ml/min, stage 3 (30 - 60 ml/min), stage 4 (15 - 30 ml/min), and in stage 5 (below 15 ml/min) respectively.[2] Diabetes mellitus, hypertension,

polycystic kidney disease, systemic infections, urinary tract infections, urinary stones, lower urinary tract obstructions and drug toxicity are the causative factors.[3] Uncontrolled diabetes if left untreated causes capillary and tubular basement membrane thickening, glomerular changes include loss of endothelial fenestrations, mesangial matrix expansion, and loss of podocytes with effacement of foot processes.[4] Uncontrolled hypertension leads to high intra-glomerular pressure, impairing glomerular filtration. Damage to the glomeruli lead to an increase in protein filtration, resulting in increased amounts of protein in the urine (microalbuminuria or proteinuria).[5] There are 3 types of renal replacement therapy haemodialysis, peritoneal dialysis, renal transplantation. Haemodialysis is needed when the glomerular filtration rate falls below 15 ml/min/1.73m^2.[6]

In 2015 Global Burden of Disease Study, kidney disease was the 12th most common cause of mortality, accounting for 1.1 million deaths worldwide. Overall CKD mortality has increased by 31.7 % over the last 10 years, making it one of the fastest rising major causes of death alongside diabetes and dementia.[7] 10 % of the population worldwide is affected by CKD and millions die each year because they do not have access to affordable treatment.[8] In another 112 countries, many people cannot afford treatment at all, resulting in the death of over 1 million people annually from untreated kidney failure.[9]

Objective

The objective of the study was to find out mortality rate in nephrology department and to observe the influence of major co-morbid conditions leading to progression of chronic kidney disease.

Materials and Methods

This study is conducted in a total of 480 patients for a period of 6 months in a multispecialty hospital. It is a Prospective observational study conducted to find out the mortality rate in nephrology department.

Inclusion criteria: Patients age above 10 years. Patients with CKD and co-morbid conditions are included.

Exclusion criteria: Out-patients, pregnant women and patients not diagnosed with kidney disease are excluded.

Study procedure: Data is obtained through direct communication with patients, care takers and collecting their past medical history, family history, social history, compliance behaviour to haemodialysis.

Results

Of 480 patients with CKD mortality rate was found to be 16.6 %. We observed that the most affected age group was 51-60 years (25 %) followed by 41-50 years (23.75 %) and the mean age was 57.87±15.1 (fig 1). Highest prevalence of mortality was observed in CKD with diabetes and hypertension (22.5 %) followed by CKD with hypertension (21.25 %). Among them, majority of the patients were above 61 years (42.5 %) as shown in (table 1). Mortality associated with sepsis was found to be 61.25 % (fig 2). Of 80 patients, 85 % were on haemodialysis (47.5 % were irregular to dialysis followed by 37.5 % were regular) and 15 % were without dialysis as shown in (fig 3). The highest prevalence of mortality was observed in 3 to 6 months period (33.75 %), followed by 7 months to 1 year (31.25%) (table 2).

Gender wise distribution: Out of 80 patients, 50 (62.5 %) were male and 30 (37.5 %) were female.

Area wise distribution: Of 80 patients, prevalence was higher among rural area 47 (58.75 %) than urban 33 (41.25 %).

GFR wise distribution: The mean GFR of 80 mortality patients was found to be 12.06 ± 4.08 ml/min

Social history wise distribution: Of 80 mortality, we observed that 27.5 % were alcoholic and 11.25 % were smokers.

Table 1: Mortality wise distribution according to co-morbid conditions as per age group

| CKD with co-morbidities	Age (in years)						
	10-20	21-30	31-40	41-50	51-60	>61	Total
DM, HTN	0	0	1	3	3	11	18
DM, HTN, PULMO	0	0	1	4	3	5	13
Obstructive nephropathy	0	0	1	1	0	1	3
Hypertension	0	1	2	4	4	6	17
HTN, DM, CARDIO	0	0	0	1	2	5	8
HTN, DM, NEURO	0	0	0	2	5	2	9
ARF with Sepsis	0	2	0	1	1	2	6
Diabetes mellitus	0	0	0	0	1	1	2
ADPKD	0	0	0	0	1	1	2
Nephrotic syndrome	1	1	0	0	0	0	2
Total	1	4	5	16	20	34	80

List of diseases in each division:

Pulmo – Bronchopneumonia, pulmonary edema, pleural effusion, tuberculosis.

Cardio – Left ventricular dysfunction, coronary artery disease.

Neuro – Cerebrovascular disease.

Table 2: Mortality after initiation of haemodialysis as per age group
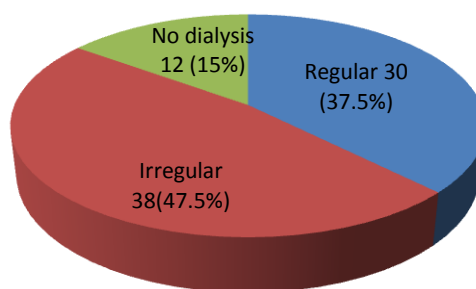
Initiation of Haemodialysis	Age (in years)						
	20-30	31-40	41-50	51-60	61-70	71-80	>80	Total
No haemodialysis	1	0	3	0	5	2	1	12(15%)
<3 months	0	2	1	3	3	0	0	9(11.25%)
3 – 6 months	1	1	8	6	8	3	0	27(33.75%)
7 months – 1 year	0	1	5	7	4	9	0	25(31.25%)
>1 year	1	0	0	1	4	1	0	7(8.75%)
Total	3	4	16	17	24	15	1	80

■ Total No of patients
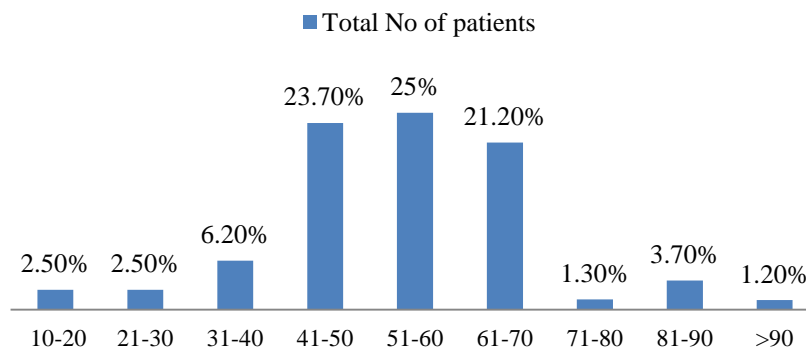
Fig 1: Age-wise distribution
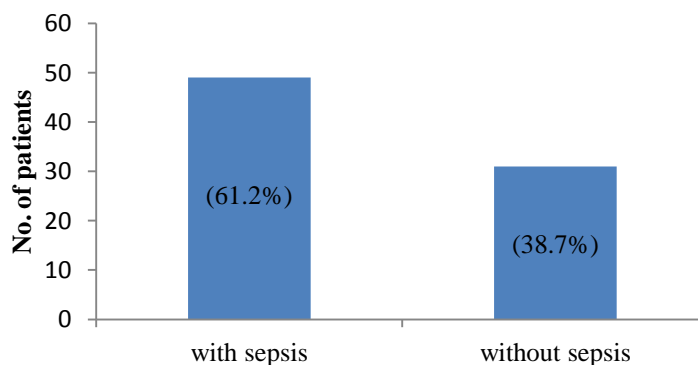
Fig 2: Distribution of data based on Mortality associated with Sepsis

Fig 3: Distribution of data based on adherence to dialysis

Discussion

Of 480 study population, major cause of death was CKD in 80 patients, followed by other diseases and co-morbid conditions. Maria do Sameiro-Faria et al 2013, stated that mortality rate was 18.5 %.[10] that was nearly similar to our study which was found to be 16.6 % and in contrast another study conducted by Mohamed Elhafiz Elsharif et al 2011, they stated that the mortality rate was 7.44 %.[11] Major reasons for mortality were multiple co-morbid conditions, rural residents and irregular haemodialysis.

Age: A study conducted by Anna J Dare et al 2017, stated that mortality rate was observed among the age group of 45- 69 years.[12] Mohamed Elhafiz Elsharif et al 2011, stated that mean age of mortality was 50.44 ±14.17.[11] Similarly, in our study majority of mortality rate was among the age group of 51-60 years (25 %) followed by 41-50 years (23.75 %) and the mean age was 57.875±15.1. Highest mortality was observed in 51-60 years because they were suffering from multiple co-morbid conditions compared to other age groups.

Gender: A study conducted by Tamiru Shibiru et al 2013, stated that males were 46.4 % and female were 42.9 %.[13] Percy Herrera-Anazco et al 2014, stated that males were 63.14 % and females were 36.86 %.[14] Similarly, in our study mortality was high in males 62.5 % than females 37.5 % because of their social habits like Smoking and alcohol consumption.

Co-morbid conditions: A study conducted by Al Wakeel JS et al 2002 stated that the leading cause

of death was the cardiovascular disease in 51.7 % followed by unknown/sudden death in 27.5 %, fluid overload, gastrointestinal hemorrhage, septicemia.[15] Another study conducted by Anna J Dare et al 2017, stated that the leading cause of mortality was diabetes-34 %, hypertension- 23 %.[12] In contrast, to our study CKD with DM, HTN 22.5 % followed by CKD with HTN 21.25 % and CKD with DM, HTN, pulmonary diseases 17.5 %. Highest prevalence of mortality was observed in the age group above 61 years (42.5 %) followed by 51 to 60 years (25 %). As the age increases, functioning capacity of the kidneys decrease and elderly age group people are more prone to infections because of haemodialysis. It is previously evident that uncontrolled diabetes causes mesangial expansion, podocyte effacement and intimal hyaline thickening in the blood vessels. This progresses to arterial hyalinosis of the afferent and efferent arterioles resulting in glomerular hyper filtration as stated by Stephanie TM et al 2015. Uncontrolled Hypertension leads to increased blood pressure on kidney vasculature leading to intra-glomerular pressure, impairing Glomerular filtration.[16]

Sepsis: A study conducted by Tamiru Shibiru et al 2013, stated that the frequently registered causes of death were septicemia 34.1 % and cardiovascular diseases 29.3 %.[13] Another study conducted by Mohamed Elhafiz Elsharif et al 2011, stated that the leading cause of death was infections 45 % and cardiovascular diseases 22 %.[11] The national US Renal Data System (USRDS) registry reports that septicemia accounts

for >75 % of infectious deaths.[17] similarly, in our study septicemia accounts for 61.25 %. Type of vascular access (Jugular catheter, femoral catheter), co-morbid conditions (DM, HTN, CVDs and lung diseases), old age, and irregular dialysis were the major reasons for mortality in patients with sepsis.

Mortality after initiation of haemodialysis: Tamiru Shibiru *et al* 2013, stated that 45.1 % deaths occurred during dialysis treatment and 23.1 % of patients death occurred within the 3 months of initiation of dialysis.[13] Another study conducted by Percy Herrera-Anazco *et al* 2014, stated that the 3rd-month mortality was 37.7 % and 49.5 % at 7 months.[14] Similarly, in our study 33.75 % mortality was observed in 3-6 months period and 31.25 % during 7 months to 1 year. Highest mortality was seen between 3–6 months due to increased frequency of dialysis sessions, 3 times a week which might have lead to higher risk of infections.

GFR: A study conducted by Kim *et al* 2009, stated the mean eGFR as 5.8 ml/min/1.73m^2.[18] another study conducted by Chang JH *et al* 2012, stated that mean eGFR was 8.68 ml/min/1.73m^2.[19] In contrast to our study the mean GFR of mortality patients was found to be 12.06 ± 4.80 ml/min. The decreased GFR was due to end stage renal disease (ESRD) condition of the patients and irregular dialysis.

Based on adherence to haemodialysis: In our study, of 80 mortality patients, highest prevalence of mortality was found among irregular dialysis 47.5 % patients compared to regular haemodialysis 37.5 % and without any haemodialysis patients 15%. Irregular to dialysis is due to the lack of awareness regarding the disease condition and knowledge regarding the importance of dialysis.

Area: A study conducted by Anna J Dare *et al* 2017, stated that of total renal failure deaths in 2010-13, 68 % were rural residents and 32 % were urban residents.[12] similarly, in our study 58.7 % were rural residents and 41.25 % urban residents among dialysis patients, Lack of transport facility

and awareness were the reasons for irregular dialysis in rural patients.

Social habits: A study conducted by Anna J Dare *et al* 2017, stated that of total renal failure deaths in 2010-13, 38 % of the males were smokers and 38 % were alcoholic.[12] In contrast to our study, we observed that 27.5 % of males were alcoholic and 11.25 % were smokers. Smoking may also injure the kidneys by damaging the renal microvasculature through oxidative stress, reduced nitric oxide generation, and increased endothelin plasma concentration. Smoking-induced tubular cell dysfunction may further contribute to tubulo-interstitial injury and progression of CRF.[20]

Conclusion

Mortality rate was found to be 16.6 % in the present study. Mortality was high in male than female, DM and HTN was the most associated co-morbid condition with mortality of CKD patients. Rural residents were found to be more compared to urban; this is may be due to lack of awareness and transportation facilities for haemodialysis.

Availability of the clinical pharmacist in the hospital and providing services such as patient education, counseling about the renal disease, identifying the patients at risk of developing CKD, detecting it in early stages, raising the awareness in the general public and health care workers will significantly reduce the prevalence, economic burden on patients, reduce hospital stay, reduce mortality rate and improve the quality of life among CKD patients. Government must take necessary steps in creating awareness and increase dialysis centers at the rural level, which will significantly reduce the mortality rate.

Acknowledgements

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Abbreviations

ADPKD: Autosomal Dominant Polycystic Kidney Disease

ARF: Acute Renal Failure

CKD: Chronic Kidney Disease

DM: Diabetes Mellitus

eGFR: Estimated Glomerular Filtration Rate

GFR: Glomerular Filtration Rate

HTN: Hypertension

ml/min: Millilitres/ Minute