

Spectrum of Chronic Kidney Disease in the Elderly and Factors Governing In-Hospital Mortality in a Tertiary Care Hospital in India

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Abstract

With increasing geriatric population in India more number of elderly patients with chronic kidney disease (CKD) are now requiring hospitalization and renal replacement therapy (RRT). However, no study has specifically looked at the etiology of CKD and factors determining in-hospital mortality among these patients. Identifying these factors can help in planning strategies for management of these cases and a more rational use of expensive therapeutic modalities.

We retrospectively analyzed data of 158 patients aged \geq 60 years admitted with CKD in a tertiary care super-specialty hospital in North India from July 2003 - December 2004. Data regarding their demographic profile, renal diagnosis, associated co-morbidities, requirement and type of RRT given were retrieved. The study parameters between survivors and non-survivors were analyzed by univariate and multivariate analysis. Type of RRT opted for by the patient at discharge was also noted.

Average age of study population was 67.09 years (60-88 years) with 69% being males. Diabetic nephropathy was the commonest cause accounting for 41.8% cases followed by hypertensive nephrosclerosis (24.1%) and obstructive nephropathy (16.3%). 21 patients (13%) had acute on chronic renal failure with volume

depletion being the most common acute insult followed by infection. 77.7% patients required RRT at admission due to uremic complications. Acute peritoneal dialysis was the most frequent initial dialysis given (62%). Only 18 (14.5%) patients had a prior follow-up with a nephrologist of ≥ 3 months and only 10 had an arteriovenous fistula. 60.8% had one or more co-morbidity with infection and cardiovascular disease being most common while 17.6% patients were requiring inotropic/ventilatory support.

We had an in-hospital mortality of 22.2%. On univariate analysis age ≥ 80 years, diabetic nephropathy, late referral, presence of infection, need for inotropic/ventilatory support and need for RRT were found to be significantly associated with increased mortality. On multivariate analysis however, only diabetic nephropathy and need for inotropic/ventilatory support were found to be significant. Of the 78 patients who were discharged requiring long-term dialysis, 42 (53.7%) opted out of RRT due to financial constraints and lack of social support.

To conclude, diabetic nephropathy is the commonest cause of CKD among our hospitalized elderly patients. Most of our patients present to referral hospital in advanced azotemia and with significant co-morbidities. They have a high in-hospital mortality that correlates with presence of diabetic nephropathy and cardiovascular or respiratory failure.

Keywords : Geriatric patients, developing world, late referral, organ failure, CKD

Introduction

India is now facing an emerging geriatric challenge. The Indian aged population of 7.6 million is second largest in the world and its projected to increase to 137 million by 2021 (1). Structural and functional changes in the kidney associated with aging make elderly more prone for chronic kidney disease (CKD) (2). The current epidemic of end stage

renal disease (ESRD) requiring dialysis in most of the developed world is fuelled mainly by an increase in number of patients over 65 years requiring dialysis. The median age of starting dialysis is now around 65 years in most of the western world, including the USA, UK and Japan (3). Thus the increasing geriatric population can be associated with increasing number of such patients

requiring admission under nephrology and renal replacement therapy (RRT) in our country as well. The knowledge of spectrum of CKD among the elderly in our country can help in planning strategies for management of such patients. Unfortunately, no such data is available at present. The issue of increased mortality among elderly CKD patients due to associated co-morbidities and poorer survival on RRT (2) also needs to be addressed in these patients. Knowing factors associated with increased mortality in such patients can help in a more rationale utilization of sparse and expensive therapeutic modalities especially in a developing country like ours. This study was therefore undertaken to evaluate the etiology and spectrum of CKD among the elderly population hospitalized in a tertiary care referral hospital and to identify the factors predicting poorer in-hospital outcome in such patients.

Patients and Methods

This study was carried out in a state-run hospital in North India, providing all specialty and super-specialty care. Medical records of all patients aged 60 years or more who were admitted in department of Nephrology from July 2003- December 2004 were retrieved. In case of multiple admissions only the first admission during study period was considered. Demographic profile, primary renal diagnosis, details of associated co-morbid conditions, presence of any reversible factor, need of RRT, type

of RRT given and complications during hospitalization were recorded. Record of type of RRT opted for at discharge was also kept. RRT was started whenever needed on clinical grounds. Acute intermittent peritoneal dialysis (IPD) was performed initially, if there was no specific contra-indication for it. The peritoneal access was established by using a trocar guided acute PD catheter (Peritocat, B.Braun, Germany), which was inserted after creating therapeutic ascitis. On an average 40 hourly PD exchanges of 2 liter were used. Hemodialysis (HD) was performed in hemodynamically stable patients using volumetrically controlled, bi-carbonate based machines with biocompatible dialyzers. Hemodynamically unstable patients in whom IPD was contraindicated or failed due to technical reasons were subjected to continuous veno-venous hemodiafiltration (CVVHD).

Definitions

CKD was defined as a documented raised serum creatinine of > 1.3 mg/dl for more than 3 months. In the absence of documentation of a previously raised serum creatinine, historical and clinical features, ultrasonography and failure of normalization of serum creatinine after stabilization were taken as evidence of chronicity along with renal biopsy documentation whenever available.

Statistical Analysis

Results were expressed as mean \pm standard deviation wherever applicable.

To see association between various study variables among the survivors and non-survivors a chi-square test was applied for all variables. Multi-variate analysis was done using step-wise logistic regression analysis. P value of < 0.05 was taken as statistically significant.

Results

During the study period 184 elderly patients were admitted of whom 158 (85.9%) were diagnosed as having CKD. Table 1 shows the demographic profile of the study population and number of

Table 1

Demographic profile of study population

| Characteristic | Profile |
|---------------------------------|--------------------------|
| Mean age (mean \pm SD, years) | 67.09 \pm 6.69 (60-88) |
| Male : Female | 109:49 (2.2:1) |
| Age group (years) | |
| 60-69 | 120 (75.8%) |
| 70-79 | 29 (18.4%) |
| ≥ 80 | 9 (5.7%) |

patients in age group interval of 10 years. The mean age of these CKD patients was 67.09 ± 6.69 years (range 60-88 years). 109 of these patients were male and 49 female (2.2:1). Table 2 summarizes the presumed etiological cause of CKD in these patients. Diabetic nephropathy (DN) was the commonest disorder accounting for 41.8% of patients, followed by hypertensive nephrosclerosis

Table 2

Presumed etiological causes of chronic kidney disease among study population

| Cause | Number of Patients (%) |
|------------------------------|------------------------|
| Diabetic nephropathy | 66 (41.8%) |
| Hypertensive nephrosclerosis | 38 (24.1%) |
| Obstructive nephropathy | 26 (16.3%) |
| Chronic glomerulonephritis | 10 (6.2%) |
| Unknown | 18 (11.4%) |

(24.1%), obstructive nephropathy (16.3%, of which 4.3% had renal stone disease) and chronic glomerulonephritis (6.2%). In 18 patients (11.4%) the cause of renal failure was unknown. Of the 158 patients, 123 (77.7%) patients required dialytic support. The indications for dialysis were gastro-intestinal symptoms in 40 (32.4%), fluid overload in 32 (26%), advanced azotemia in 23 (18.7%), hyperkalemia and/or metabolic acidosis in 20 (16.3%), encephalopathy and pericarditis in 4 (3.3%) patients each. Only 18 (14.5%) patients had a prior follow-up with a nephrologist of ≥ 3 months and only 10 (8.1%) had a working arteriovenous fistula at admission.

21 patients (13.3%) had presented with acute deterioration of renal function on underlying CKD. The commonest acute renal insult was dehydration following gastro-intestinal and renal

losses in 10 (47.5%) patients, followed by infection/sepsis in 6 (28.6%) patients, use of contrast media in 3 (14.3%) patients and use of angiotensin converting enzyme inhibitors (ACEi) and non-steroidal anti-inflammatory drugs (NSAIDs) in one (4.8%) patient each. Of these 21 patients, 15 patients required dialytic support initially. 13 patients had partial renal recovery and did not require maintenance dialysis, 4 had irreversible renal failure requiring dialytic support and 4 expired during hospital stay. Acute peritoneal dialysis (IPD) was the most frequent initial RRT started in 76 (62%) cases, 43 patients (35%) were given only HD and 51 (41.5%) had HD subsequent to one session of IPD. 4 patients (3%) were initiated on continuous ambulatory peritoneal dialysis (CAPD) electively. None of the patients were given CVVHD.

96 (60.8%) patients had one or more co-morbidities. Among the co-morbid conditions 71 (44.8%) had evidence of infection, 58 (36.6%) had cardiovascular disease (including congestive heart failure), 19 (12%) had cerebrovascular disease, 7 (4.3%) had chronic liver disease and 6 patients (3.8%) had malignancy. Among infections, bacterial pneumonitis was the commonest (34 patients, 47.9%) followed by urinary tract infection (24 patients, 33.7%). 28 patients (17.6%) were requiring ventilatory and/or inotropic support at the time of admission.

35 patients (22.2%) died during hospital stay. Of the 78 patients who

were discharged requiring long-term dialysis, 29 (37.2%) opted for maintenance HD, 7 (8.8%) took up CAPD and 42 (53.7%) opted out of RRT. Financial constraints and lack of social support were most common causes for withholding dialysis in these patients. Table 3 compares the study parameters among the survivors and non-survivors. The factors which on univariate analysis correlated significantly with increased mortality were; age \geq 80 years, diabetic nephropathy, follow-up with a nephrologist of <3 months, presence of infection, need for ventilatory and/or inotropic support and need for RRT patients. On multivariate analysis only presence of underlying diabetic nephropathy (adjusted odds ratio 2.96) and need for inotropic and/or ventilatory support (adjusted odds ratio of 4.12) were found to be statistically significant.

Discussion

We in this study have looked at the etiology and spectrum of CKD among the elderly (\geq 60 years) being admitted in a tertiary care referral hospital in North India and have also looked at the factors predicting in-hospital mortality among these patients. Most of the studies from developed world have classified elderly as those who are \geq 65 years of age. Since the life expectancy in India is 61 years as compared to 72-82 years in the developed world, the cut off 60 years was taken in the present study. The observation of male preponderance in our

Table 3

Presence of predictor variables for outcome between survivors and non-survivors in study population and P value on univariate analysis

| Variant | Survivors (123) | Non-Survivors (35) | P value |
|-------------------------------------------------------------------------|----------------------------|-------------------------------|----------------|
| Age group | | | |
| 60-69 years | 98 | 22 | NS |
| 70-79 years | 22 | 7 | NS |
| ≥ 80 years | 2 | 7 | P<0.01 |
| Gender (Male/Female) | 86/37 | 23/12 | NS |
| Basic Renal Disease | | | |
| Diabetic Nephropathy | 46 | 20 | P <0.01 |
| Hypertensive Nephrosclerosis | 33 | 5 | NS |
| Obstructive nephropathy | 22 | 4 | NS |
| Chronic Glomerulonephritis | 8 | 2 | NS |
| Unknown | 14 | 4 | NS |
| Need for RRT (Not required/ Required) | 32/91 | 3/32 | P<0.01 |
| Follow-up with nephrologist (≥ 3 months /< 3 months) | 16/107 | 2/33 | P<0.01 |
| Co-morbid condition | | | |
| Cardiovascular disease | 55 | 3 | NS |
| Cerebrovascular disease | 18 | 1 | NS |
| Infection | 54 | 17 | P<0.01 |
| Chronic Liver disease | 6 | 1 | NS |
| Malignancy | 5 | 1 | NS |
| Ventilatory and/or Inotropic support (Not required/required) | 115/8 | 15/20 | P<0.01 |

study could be due to the bias in our society of providing expensive, tertiary care treatment preferably to its male members. Nearly all the previous studies looking at CKD from our country have also recorded male preponderance with percentage of male patients varying from 67.8% - 84.7% (4-7). Majority of the patients presented in an advanced stage of CKD with life-threatening co-morbid conditions and only a few had a regular follow-up with a nephrologist prior to admission. As such problem of delayed referral of CKD patients is quite prevalent in our country, with one study noting that 66% patients seeing a nephrologist for the first time required dialytic support (8). The problem of late referral to a nephrologist among elderly CKD can also be due to non-specific nature of symptoms and attribution of these symptoms to increasing age or other concomitant illnesses. At our center, acute peritoneal dialysis was the most frequently used initial RRT (62% cases). In a recently published study from Scotland (9), Ronsberg *et al* noted that 90% of their patients aged more than 80 years had hospital HD as their first mode of RRT. This difference in the use of dialysis modalities could be due to the difference in economy and health care policies. Acute IPD is more economical and requires less technical back-up and infrastructural support and therefore is a practical approach in a country like ours, where due to scarcity of hemodialysis equipment and

technicians, starting emergency HD is neither feasible or cost-effective in most cases. Encouragingly, there was no added mortality in patients being initiated in acute PD and none of these patients had any serious complication related to the procedure.

Very little data is available regarding the etiology of CKD among the elderly from our country. Prakash *et al* (7) looked at 200 elderly patients admitted with renal problem at their center. Of the 85 who had CKD, mean age was 68.3 years and diabetic nephropathy was the commonest cause (49.4%) followed by obstructive uropathy (20%). In a study from Northern India, Mittal *et al* (4) looked at 835 cases of CKD at their center and found that in patients more than 40 years of age, diabetic nephropathy was the commonest cause (36.8%). In another study from Northern India, Sakhuja *et al* (5) found that in patients aged more than 40 years; diabetic nephropathy was the commonest cause of CKD accounting for 20.97% cases, while hypertensive nephrosclerosis accounted for 10.6% cases. Thus from the limited data which is available it can be concluded that with increasing age the burden of diabetic nephropathy increases in our country. Regular screening of these high-risk patients at the primary care level and their prompt referral to a nephrology unit can significantly decrease the morbidity and subsequent mortality of CKD in these patients. The relatively higher incidence of CKD

attributable to renal stone disease in our study (4.3%) could be due to the fact that our region is a well-known stone belt and similar findings have been observed in other studies looking at CKD from this region (4). The high number of cases in which no cause for CKD could be found (11.4%) could be due to presentation of these patients with advanced azotemia, lack of previous medical records and shrunken renal size.

21 patients (13.3%) had acute on chronic renal failure with volume depletion being the most common acute insult followed by infection and contrast media use. Of these 13 patients recovered renal function partially and were dialysis independent at discharge. The susceptibility of aging kidney to volume depletion and nephrotoxic insult is well established (10,11) and therefore such reversible factors should always be looked for in elderly patients initially presenting with renal failure.

We could not come across any other study looking at in-hospital mortality among elderly CKD patients. Mignon *et al* (12) noted a 90-day mortality of 19% in patients initiated on dialysis who were aged >65 years. They found that early mortality increased with age, presence of diabetes mellitus, coronary artery disease, malnutrition and late referral to dialysis unit. Though in our study age more than 80 years was associated with increased mortality on univariate analysis, it was not significant on

multivariate analysis. Thus, age alone should not be used as a barrier to initiate dialysis. However, the lack of association of other co-morbidities specially cardiovascular and cerebrovascular disease with mortality needs to be interpreted with caution. We by using the simple classification of presence or absence of co-morbidity would have underestimated the effect of co-morbidity, as this did not take into account the severity of co-morbidity and its association with mortality.

One of the major limitations of this study is that since it was conducted on the patients admitted to nephrology unit of a tertiary care institute, we may have over-estimated the associated co-morbidities and severity of illness relative to what could be expected across institutions providing mainly primary and community based care.

To conclude, diabetic nephropathy and hypertensive nephrosclerosis together accounted for 66% of elderly hospitalized CKD patients in our study. Most of the patients presented late with advanced azotemia and severe co-morbidities and very few had a regular follow-up with a nephrologist prior to admission. Majority of patients opted out of RRT due to social and financial constraints. In-hospital mortality was significantly increased with diabetic nephropathy and requirement of inotropic/ventilatory support at admission.

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