EFFECT OF AGE AND GENDER ON ACUTE COMPLICATIONS OF HEMODIALYSIS IN PATIENTS WITH CHRONIC KIDNEY DISEASE SECONDARY TO DIABETES MELLITUS

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ABSTRACT

Objective: To determine the effect of age and gender on acute complications of hemodialysis in patients with chronic kidney disease (CKD) secondary to diabetes mellitus.

Study Design: Cross-sectional study.

Place and Duration of Study: Department of Medicine, Ayub Teaching Hospital Abbottabad, from Jan 2015 to Oct 2016.

Methodology: Only patients who were diagnosed cases of diabetes for the last 10 years, and were aged between 30 and 65 years were included in the study. Any patient who was suspected to have chronic kidney disease due to any other cause e.g. glomerulonephritis, Polycystic Kidney Disease, analgesic abuse, atherosclerosis, Obstructive nephropathy and chronic hypertension were excluded to control confounding and bias.

Results: Out of these 202 patients, 92 patients (45.54%) patients developed acute complications of hemodialysis. Hypotension was the commonest complication followed by atrial fibrillation, fever and headache. When the acute complications of hemodialysis were stratified according to sex, age and duration of chronic kidney disease, the results were statistically not significant (*p* 0.28, 0.34 & 0.085 respectively).

Conclusion: This study showed that hypotension is the most common acute complication of hemodialysis followed by atrial fibrillation and fever. The effect of age and gender on acute complications of hemodialysis was statistically insignificant.

Keywords: Atrial fibrillation, Chronic kidney disease, Diabetes mellitus type 2, Hemodialysis, Hypotension.

INTRODUCTION

The prevalence of chronic kidney disease (CKD) is increasing in many parts of the world and it is becoming a common public health problem. CKD affects more than 50 million people across the globe, and more than 2 million of patients require hemodialysis as a renal replacement therapy. The prevalence in the developing countries in not well known but in USA about one million people are living with CKD and this figure is on the rise. The disease is responsible for considerable mortality and morbidity[1]. The recent rise in prevalence of CKD can be attributed to the ever increasing prevalence of hypertension and diabetes mellitus[2]. In a country like Pakistan where there is no screening program, most of the people are unaware whether they are hypertensive, or having diabetes mellitus and CKD or not. Significant number of asymptomatic individuals was found to be suffering from diabetes mellitus, CKD and hypertension when screened in a study conducted in Karachi[3]. Hemodialysis is commonly used lifesaving treatment for patients with end stage renal disease but its long term use and cost is associated with affordability issue for the patient as well as the families and the healthcare setup[4]. Therefore finding a way to make it affordable for every patient of end stage renal disease has become a socioeconomic imperative.

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Like all other treatment modalities, hemodialysis is also associated with certain complications. Although with the recent advances in technology, the prevalence of complications due to the dialysis machine itself and the water system has been significantly reduced, complications originating from other causes are still a common occurrence. A recent study reported the most common complications observed were hypotension, muscle cramps, shivering, fatigue, hypertension, vomiting, headache, allergic reactions, backache and hypoglycemia[5].

In addition to the cardiovascular complications which are the commonest complications of hemodialysis, it is also associated with neurological complications[6]. These include dialysis dementia, disequilibrium syndrome, Wernicke encephalopathy, central pontine myelinolysis (rapid correction of hyponatremia), uremic encephalopathy, headache, cerebrovascular disorder, and autonomic dysfunction in addition to numerous other complications[6].

Exact prevalence of cardiac complications varies in different studies. The prevalence of hypotension is somewhere between 20%-50% and the hemodialysis associated cardiac rhythm disturbances have been reported from 5%-75% in patients on hemodialysis[2].

Complex ventricular arrhythmias (35%), atrial fibrillation (27%) and sudden cardiac death (62%) are among other acute complications of hemodialysis[2]. Muscular cramps, headache, itching and nausea/vomiting are not lethal but they do impair the quality of life in patients on hemodialysis[7].

In medical literature, very limited data is available which shows the effect of sex difference on treatment gaps. Data from medical studies in Africa shows that as compared to men, women were less likely to receive renal replacement therapy[8]. In Japan the incidence of females who received renal replacement therapy for chronic kidney disease were less than half of males[9]. Data from one US study shows very high odds ratio of 1.70 in women for delay in start of hemodialysis compared to men[10].

Studies also show that as compared to men, women are generally unaware of past history of kidney disease which may contribute to delay in initiation of hemodialysis.

The aim of this study is to determine the effect of age and gender on acute complications of hemodialysis patients with CKD due to diabetes mellitus. We also tried to determine the spectrum of various acute complications of hemodialysis in patients with CKD due to diabetes mellitus. This study will serve as the basis of future studies that may focus on finding the possible risk factors that lead to development of acute complications during hemodialysis in patients with chronic kidney disease due to diabetes mellitus and will help us to take measures to minimize or prevent them.

METHODOLOGY

This cross sectional study was performed on patients with chronic kidney disease and on regular dialysis for the last 3 months, admitted to the department of Medicine at Ayub Teaching Hospital Abbottabad. The period of study was from January 2015 to October 2016, and permission was taken from the Research Ethics Committee of the hospital. Sampling technique used was non probability consecutive sampling. Sample size was calculated by using World Health Organization Sample size calculator.

Only patients who were diagnosed cases of diabetes for the last 10 years, and were aged between 30 and 65 years were included in the study. Patients with age less than 30 and more than 65 were also excluded from the study. Any patient who was suspected to have CKD due to any other cause e.g. glomerulonephritis, Polycystic Kidney Disease, analgesic abuse, atherosclerosis, Obstructive nephropathy and chronic hypertension were excluded to control confounding and bias. The purpose of the study was explained to the patients and confidentiality of the patients were given due respect.

Detailed history of their illness was recorded and a complete physical examination was done. The patients were monitored during their hemodialysis session for the occurrence of acute complications. Patients were monitored with cardiac monitor and with blood pressure cuff on. If blood pressure noted on cardiac monitor was low it was confirmed by mercury sphygmomanometer. Similarly if there was any doubt about cardiac rhythm on cardiac monitor, 12 lead ECG with long lead 2 was taken. Fever was defined by axillary temperature of 99.60F measured by mercury thermometer. Hypotension was defined as blood pressure of less than 90/60 (systolic/diastolic) measured by mercury blood pressure sphygmomanometer. Atrial fibrillation was diagnosed by 12 lead ECG with long lead 2. All the treatment procedures and inpatient assessments were carried out under strict supervision of a consultant physician having minimum of 5 years of experience. Variables like age, gender and any complications occurring during the dialysis were recorded.

All the data was stored and analyzed in SPSS version 17. Mean ± SD was calculated for numerical variables like age, duration of chronic kidney disease and diabetes mellitus in years. Frequencies and percentages were calculated for categorical variables like gender and the acute complications of hemodialysis e.g., atrial fibrillation, fever, headache and hypotension. Acute complications of hemodialysis were stratified by age, gender and duration of chronic kidney disease to see the effect modifications. Chi-square test at 5% significance levels was used to know significant difference among different age and gender groups. All results were presented in the form of tables and graphs.

RESULTS

There were a total of 202 study participants. The mean ± SD age of study participants was 45.19 ± 5.10 years. The age of the youngest study participant was 38 years while the oldest study participant was 53 years old. There were 98 (48.51%) males and 104 (51.49%) females.

The mean ± SD duration of diabetes of diabetes mellitus was 17.95 ± 1.97 years. The shortest duration of diabetes among study participants was 15 years while the longest duration was 21 years.

The mean ± SD duration of chronic kidney disease in the study population was 8.98 ± 2.78 months, with 5 months being the shortest duration of chronic kidney disease and 14 months being the longest duration was 14 months.

Table-I: Baseline demographic and clinical characteristics of study population.

Parameters	Frequency / Mean ± SD
Age (Years)	45.19 ± 5.1
Duration of diabetes mellitus (years)	17.95 ± 1.97
Gender	
Male	98 (48.51%)
Female	104 (51.49%)
Frequency of Complications	
Present	92 (45.54%)
Absent	110 (54.46%)
Frequency of Different Complications	
Hypotension	36 (17.82%)
A trial Fibrillation	24 (11.88%)
Fever	22 (10.89%)
Headache	10 (4.95%)

Table-II: Acute complications of hemodialysis with gender, age and duration of chronic kidney disease.

Parameters	Present	Absent	*p*-value
Gender			
Male	50	48	<0.28
Female	42	62	
Age			
36 to 45 yrs	54	54	<0.33
46 to 55 yrs	38	56	
Duration of chronic kidney disease.			
<10 months	50	78	<0.085
>10 months	42	32	

Acute complications of hemodialysis were observed in 92 (45.54%) patients. These complications were, in descending order, hypotension (17.82%), atrial fibrillation (11.88%), fever (10.89%) and headache (4.95%).

When acute complications of hemodialysis were stratified according to sex, age and duration

of chronic kidney disease, the results were found to be insignificant (*p* 0.28, 0.33 & 0.085 respectively).

DISCUSSION

Hemodialysis, is a life-saving treatment in end stage renal disease and also in life threatening complications of acute kidney injury. Without this therapy, more than a million patients worldwide would have lost their lives within weeks[11-12]. Hemodialysis was successfully performed for the first time in 1945 by Willem Kolff in 67-year old woman in uremic coma who regained consciousness patients after 11 hours of continuous hemodialysis. Hemodialysis is associated with various complications. During the initial years following the start of hemodialysis as treatment modality, technical drawbacks associated with the dialysis machines and water systems were the main reasons for dialysis associated complications. In this modern era particularly those in the last 20 years, advance technology have reduced the complications due technical drawbacks associated with dialysis machines. However, complications caused by hemodialysis due to homeostasis imbalance and infection acquired during dialysis remain as a major cause of morbidity and mortality in hemodialysis patients. This cross sectional study was conducted at the Department of Medicine, Ayub Teaching Hospital, Abbottabad. The objective of the study was to determine the effect of age and gender on acute complications of hemodialysis in patients with chronic kidney disease secondary to diabetes mellitus. This study was also aimed to determine the spectrum of various acute complications of hemodialysis in patients with chronic kidney disease secondary to diabetes mellitus.

The correlation between age,gender and acute complications of hemodialysis in CKD patients secondary to diabetes mellitus is not well established. Study conducted in US showed that Mortality rates are similar in men and women on hemodialysis but incidence of some dialysis associated complications is more in female than male[13]. In this study data of 111,653 patients undergoing maintenance hemodialysis revealed that as compared to men, hospitalization rates and risk of 30 days readmissions were higher in women. Researchers also concluded that unadjusted hospitalization rates were higher in younger patients less than 44 or elderly more than 75 years.

Researches have also concluded that due to various reasons, incidence of using arteriovenous fistula for hemodialysis which is lower among female than male hemodialysis patients[14]. In women due to average smaller total body water than men, evaluation of dialysis dose by kt/v may result in under-dialysis. It is also reported that various clinical parametersincluding anemia, nutrition and quality of life in women receiving hemodialysis were worse as compared to men[15].

This present study shows that out of 202 patients, complications were developed in 92 patients. When acute complications of hemodialysis were stratified according to sex, age and duration of chronic kidney disease, the results were found to be insignificant.

Limitation of our study is that we only use Data of CKD patients secondary to diabetes mellitus and other causes of CKD including autoimmune diseases, vasculitis and hypertension are not included. However despite this limitation, our study open way for future research relating to this topic. Focused studies on the interaction of sex hormones and other physiology, is required to improve our knowledge regarding CKD and hemodialysis complicationsin female patients. Further studies on Immunological conditions such as pregnancy and other autoimmune conditions such as systemic sclerosis common in women may also lead to break throughs in understanding and paradigms. This study also shows various spectrum of acute complications of hemodialysis in CKD patients secondary to diabetes mellitus which is explained below.

The most common complication of hemodialysis currently are cardiovascular complications. Among these complications, hypotension

during dialysis remains an important problem and its incidence ranges between 25% to 55%[16]. Rate of dialysis-associated arrhythmias was reported to be 5% to 75%[2] and it is also another major concern. Ventricular arrhythmias and ectopic were found to be the common and lethal dialysis associated arrhythmias. The rate of ventricular arrhythmia secondary to hemodialysis is around 35%. The rate of the atrial fibrillation, which is the second most common arrhythmias reported in hemodialysis patients is 27%. Arrhythmias carry the greatest risk for Sudden cardiac death which accounts for 62% of cardiac-related deaths[17].

Other complications which do not result in mortality but deteriorate quality of life include nausea, vomiting with a rate of 5%-15%, headache with a rate of 5%-10% and itching with a rate of 5%-10%[18].

A recent study from Nepal reported that the frequency of intra-dialysis complications is low[19]. The authors conducted a cross sectional study over a period of six months and studies 28 patients with end-stage renal disease. Patients with acute renal failure or acute on chronic renal failure were excluded from the study.

They recorded the episodes of intra-dialysis complications in the study population and noted that hypotension was the commonest complication occurred 56 times followed by hypertensive episodes were 58 (3.8%). Other problems encountered were 23 episodes (1.5%) of transfusion reactions, 13 episodes (0.8%) of non transfusion related rigors, 20 episodes (1.4%) of nausea/vomiting, 12 episodes (0.8%) of muscle cramps and 6 episodes 5 (0.4%) of hypoglycemia.

Similarly, a prospective study from Hyderabad, Pakistan also reported that hypotension was the commonest complication during hemodialysis[20]. The authors studied 176 patients with end-stage renal disease over a period of 27 months. Out of 2171 hemodialysis sessions that were performed over this period, hypotension was most common complication observed during 126 (5.84%) dialysis session followed by hypertension which was observed in 77 (3.54%) session. Among other complications, Vomiting was observed in 70 (3.22%) and muscles cramps in 67 (3.08%). The authors concluded that the most frequent acute complication of hemodialysis was hypotension followed by hypertension, vomiting and muscle cramps.

Another study from Bangladesh also reported that hypotension was the commonest complication during hemodialysis[21]. In this study, the authors observed 500 consecutive hemodialysis sessions of 50 patients over a period of 4 months. The authors concluded that common complications in end stage renal disease were hypotension, muscular cramps, pruritus, nausea and vomiting.

Our study shows that the overall observed frequency of acute complications of hemodialysis was 45.54% with hypotension being the most common complication.

CONCLUSION

This study showed that there is no statistically significant effect of gender on acute complications of hemodialysis in patients diagnosed with chronic kidney disease secondary to diabetes mellitus. Hypotension was the most frequent complication occurring in the study population.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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