

The outcome after hemodialysis in patients with complicated end stage renal disease

Khurram Danial, Asifa Khurram, Kamal Ahmed, Zain Ali

Abstract

Object: The objective of our study is to find out the outcome after hemodialysis in patients with complicated end stage renal disease.

Method: The type of study is a cross sectional study, conducted at a tertiary care hospital for a period of one year from October 2014 to October 2015, the study population consisted of 200 patients, who presented to the hospital via the emergency department, data was collected from all patients including but not limited to a complete history and physical examination, laboratory tests and ultrasound of kidneys. Various complication and outcomes were noted for three days after hemodialysis was performed due to advanced uremia and acidemia in the patients.

Results: From a total study population of 200 patient (mean age 45.82 +/- 14.56 years), 28 (14%) of the patients expired and 172 (86%) survived on 72 hours after admission. Hypotension was the most common complication as seen in 40 (20%) of the patients followed by seizures in 31 (15.5%) of patients, Out of the total number of patients 25 (12.5%) patients required ventilatory support. Mortality was high in patients above 50 years of age.

Conclusion: End stage renal disease is associated with a high rate of morbidity and mortality which is a serious concern among the physicians, early referral to nephrology department can prevent the morbidity and mortality before sever acidosis develops in the patient.

Keywords: End stage renal disease, acidemia, dialysis, hemodialysis, uremia, mortality, morbidity, nephrology.

Abbreviations: ESRD= End stage renal disease, RRT= Renal replacement therapy

Introduction:

End stage renal disease is a devastating condition which affects approximately 1.9 million patients worldwide, and such patients require renal replacement therapy, either via hemodialysis or renal transplant, and access to such facilities is primarily based upon the socioeconomic development of the area, as it is a huge burden on the economy of a country. In the third world less than one fourth of the patients have access to renal replacement therapy.¹ According to a study in the year 2010, a mere 58.9% of patients with end stage renal disease received renal replacement therapy. There was a constant disparity in these numbers moving across the globe, the numbers being less than 2% in sub Saharan Africa, and rising to 70% in high income parts of the

world such as north America, Asia and East Asia.² In a country such as Pakistan the prevalence of ESRD is about 100 per 1,000,000 patients³ but the trend is increasing on an yearly basis. Out of these only about 10% of patients ever get RRT.⁴ About 6% of patients with end stage renal disease die in the first 90 days, the mortality rate is very high in the first year after initiation of hemodialysis.⁵ The main culprit has been a delayed referral to the nephrology unit, and in a country like Pakistan 100% of such patients with end stage renal disease presented in emergency and required urgent renal replacement therapy.⁶ According to a recent survey only 69% of general physicians knew when to refer the patient to the appropriate nephrology unit when the patient is having end stage renal disease, this study was

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Karachi Medical and Dental College

K Danial
A Khurram

Liaquat National Hospital

Karachi
K Ahmed

Civil Hospital, Karachi

Z Ali

Correspondence:

Dr Zain Ali
email: drzainali88@gmail.com

Table 1: Descriptive statistics

Variables	Mean \pm SD	Max - Min
Age in years	45.82 \pm 14.56	65 - 15
Body temperature	98.57 \pm 0.95	103 - 98
Hemoglobin levels	7.86 \pm 1.81	11 - 3
Mean arterial pressure	88.04 \pm 20.52	122 - 47
TLC	15.46 \pm 8.21	56 - 1
Platelet count	246.74 \pm 140.05	716 - 5
Serum Potassium	5.40 \pm 1.36	9 - 2
Serum Sodium	135.11 \pm 8.52	168 - 107
pH	7.12 \pm 0.14	7.29 - 6.84
H.ion	79.14 \pm 21.95	144 - 52
Urea	349.05 \pm 77.7	594 - 251
Creatinine	14.45 \pm 4.42	36.9 - 8.0

Table 2: Survived and Expired patients characteristics

Variable	Survival group n= 171	Expired group n=29	p-value
Age	44.56 \pm 14.52	52.34 \pm 12.78	0.019
pH	7.14 \pm 0.10	7.01 \pm 0.10	0.0005
Gender			
Male	114 (66.9 %)	19 (67.9%)	0.918
Female	57 (33.1%)	10 (32.1%)	
Temperature	98.48 \pm 0.79	99.15 \pm 1.61	0.001
Mean arterial pressure	91.61 \pm 18.24	66.95 \pm 20.70	0.0005
Hemoglobin	7.87 \pm 1.84	7.76 \pm 1.78	0.734
TLC	14.62 \pm 7.40	20.45 \pm 12	0.0005
Platelets	246.88 \pm 136.8	245.25 \pm 147.69	0.917
Urea	345.2 \pm 74.01	376.65 \pm 91.88	0.042
Creatinine	14.55 \pm 4.51	14.06 \pm 4.08	0.649
Bicarbonate	7.61 \pm 2.84	5.99 \pm 2.04	0.002
PCO2	14.85 \pm 5.30	21.94 \pm 13.84	0.0005
Serum Sodium	134.75 \pm 8.50	134.19 \pm 8.55	0.74
H ion	75.31 \pm 19.16	101.81 \pm 23.99	0.0005
Adverse events			
Fits	21 (12.7%)	10 (35.7%)	0.002
Hypotension	21 (12.7%)	19 (67.9%)	0.0001
Ventilatory support	10 (6%)	15 (53.6%)	0.0001

conducted in Karachi.⁷ Metabolic acidosis as developed in patients who are referred late for ESRD, is usually greater than 7.2 pH, and is mild and compensated, however a pH of less than 7.2 may be life threatening, in a sense that it may cause hypotension and arrhythmias.⁸ Other factors besides metabolic acidosis may contribute

to the mortality and morbidity.⁹ The mortality for dialysis in first year of disease, is more in the second and third month as compared to the first month.¹⁰ Studying the database of the patients it was noted that patients who were received having advanced uremia combined with metabolic acidosis, and who required urgent hemodialysis and required ventilator support had very high rate of mortality in the initial 72 hours, as such a situation is not commonly seen in the developed countries, data is lacking in this area, as is also the case in our population where data is lacking in cases of advanced uremia and acidemia, in our study we have analyzed the patients data including the demographics, complications and the outcome of patients who presented with advanced uremia and acidemia at our hospital.

Materials and Methods:

The type of study is a cross sectional study, conducted at a tertiary care hospital for a period of one year from October 2014 to October 2015, the study population consisted of 200 patients, between the ages of 15 to 60 years who presented to the hospital via the emergency department, and having a uremia of advanced stage (blood urea level greater than 250mg/dl), the patients were diagnosed as cases of end stage renal disease based on the clinical features, ultrasonography (to rule out obstruction) and laboratory investigations (blood picture, serum urea, creatinine, electrolytes, arterial blood for various factors). Patients who were known cases of chronic renal failure, those with acute renal failure and those who had already had dialysis were excluded from the study. Patient outcome was studied for 72 hours post admission, and various complications were noted like seizures, ventilator requirement and hypotension. A short duration hemodialysis (90 to 120 mins) was done under supervision, information of patients was recorded in a proforma. Data was analyzed with SPSS version 20. For categorical variables (age, gender, outcome, adverse events) frequency and percentage was used. For qualitative data (hemoglobin, TLC, platelet count, age, temperature etc) mean and standard deviations were used, and t test was used to determine significance. A p-value of less than 0.05 was taken

Table 3: Mortality and adverse events

Age	Number	Fits	Hypotension	Ventilatory support	Expired
< 30 years	38	7 (18.42%)	6 (15.78%)	5 (13.1%)	3 (7.89%)
31 to 50 years	64	11 (17.18%)	7 (18.42%)	7 (18.42%)	5 (13.1%)
> 50 years	98	13 (13.26%)	27 (27.55%)	13 (13.26%)	20(20.40%)
Number of adverse events					
Males	140	20 (14.6%)	27 (16.9%)	20 (13.1%)	20 (14.6%)
Females	60	11 (18.8%)	16 (28.1%)	7 (12.5%)	8 (14.1%)
Total	200	31 (15.5%)	43 (21.5%)	27 (13.%)	28 (14%)

as statistically significant. Chi square test was used for categorical data.

Results:

The patient population was 200, out of which 140 were male and 60 were female. All the patients had advanced stage of acidemia and uremia. The average age of patients was 45.82 ± 14.56 . Patients with high mortality rate were usually older as compared to those who survived (52.34 ± 12.78 versus 44.56 ± 14.52) which was statistically significant p-value of 0.019, the mean values of serum urea and creatinine were 349.05 ± 77.7 and 14.45 ± 4.42 . Approximately 40% of patients had increased serum potassium levels. Patients with high mortality rate had a lower level of pH as compared to those who survived (7.01 ± 0.10 versus 7.14 ± 0.10) and it was significant p-value= 0.0005. The various tables given below show various details.

Fits and ventilatory support were observed more in the patients who were younger (30 years of age) and hypotension was observed in comparatively older individuals (50 years of age), frequencies were ventilatory support and fits was common in males and females of the group, $p=0.90$ and $p=0.46$, while the incidence of hypotension was more commonly seen in females. But it was not statistically significant $p=0.007$. Hypotension and ventilatory support was more common in those requiring one session of dialysis versus those who required more than one session of dialysis in 72 hours, $p=0.001$ versus $p=0.0001$. Also these patients had higher mortality rate and severe acidosis. 172 (86%) patients survived, while 28 expired in 72 hours duration. The difference between genders when it

comes to mortality was not found $p=0.918$, and it was 100% in patients who underwent one session of dialysis as shown in table 3.

Discussion:

The average age of patients who presented to us with advanced uremia and acidemia was relatively higher as compared to patients from USA¹¹, but this value was close to other countries in the south asian region.¹² In our study the number of males were more, which is in contrast to another community based study from the city¹³, which was unable to find gender differences when it comes to renal diseases in the general public. The discrepancy might be due to gender bias and deprivation of females. Patients who presented with a severe acidosis pH of less than 7.3, were included, and it patients with the highest mortality rate were those with the lowest pH of the group. Arteriolar dilatation and myocardial contractility are the adverse complications of acidosis.⁸ Diminished cardiac contractility and an increase in ventricular stroke work per minute was noted in animal studies, in which animals were artificially made to undergo acidosis.¹⁴ Various studies have shown the adverse effects of lactic acidosis in patients.¹⁵ We were unable to find any study which looked at effects of severe acidosis in patients with uremia. Greater than 40% of patients had hyperkalemia but it had no effect on mortality of the patients, which can be explained by correction of hyperkalemia with dialysis, in the patients who expired they had a greater TLC and higher temperature, which might be due to an infection, or due to systemic inflammation. Patients who had respiratory acidosis had a higher rate of mortality and those having only metabolic acidosis also have a higher morbidity and mortality, due to the fact that the initial respiratory compensation is fatigued leading to respiratory acidosis.¹⁶ The adverse events observed were in this order hypotension in 20%, fits 16%, need for ventilatory support in 12.9% of the patients, the mortality rate was highest for those requiring ventilatory support, followed by hypotension and fits. Fits are usually due to uremia, metabolic abnormalities or their treatment¹⁷, in patients with chronic renal

failure the incidence of fits is 10% according to Bergen et al¹⁸, the lower incidence in our study was due to the shorter period of observation. According to studies by Rocha et al the need for mechanical ventilation in patients is 26% which is less than our 12.9% of patients¹⁹, which might be due to the fact that in Rocha studies patients had more severe sepsis associated. The mortality rate in the first 90 days of the patients who have dialysis is 6% in USA⁵ and 34.7% in Canada²⁰, in our study 14% patients expired in the first 72 hours. The one year mortality rate in Japan is 6.6%, 15.6% in Europe and 21.7% in USA, the probable explanation is the difference in demographics and co morbid at presentation²¹, cardiovascular and non cardiovascular risk factors are increased in the patients requiring dialysis from the start²².

In patients mortality increases with the increasing age²⁰, which is similar to the results of our study. Bloembergen et al found that males who require dialysis on a long term basis had a mortality rate of 22% higher than their female counterparts, which could be explained by the co existing and predisposing morbidities in males²³, however the mortality rate for both genders was similar in our study. Our study highlights the importance of prompt and accurate referral to the nephrology unit and starting the dialysis early on to prevent mortality in the patients presenting with end stage renal disease, and referral to pre dialysis clinics which mainly facilitate in the formation of the arteriovenous fistula, anemia correction, bone metabolism and malnutrition, ultimately improve the rate of survival.²⁴

Conclusion:

End stage renal disease is associated with a high rate of morbidity and mortality which is a serious concern among the physicians, early referral to nephrology department can prevent the morbidity and mortality before severe acidosis develops in the patient.

Role and contribution of Authors:

Dr Khurram Dania, Assistant Professor Nephrology, Karachi Medical and Dental College,

concept, study design, organizing draft, manuscript writing

Dr Asifa Khurram, Senior Registrar, Department of Nephrology, Karachi Medical and Dental College, Data entry and analysis, layout design.

Dr Kamal Ahmed, Assistant Professor Department of Medicine, Liaquat National Hospital Karachi, Data collection, Final layout, Design of study.

Dr Zain Ali, House officer, Civil Hospital Karachi, Manuscript writing, Data entry

Conflict of Interest: None

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