
ORIGINAL ARTICLE

Adequacy of Dialysis Among Patients on Thrice Weekly Hemodialysis: Are we Reaching Minimum Standards?

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ABSTRACT

Background: Severe chronic kidney disease requires renal replacement therapy in shape of Dialysis or Transplant. An adequately treated Hemodialysis (HD) patient is physically active, well nourished, not anemic, and not hypertensive with a maintained quality of life and life expectancy that is not inferior to that of healthy subjects. Worldwide the minimum standards of adequate HD are thrice weekly dialysis; single pool Kt/V (spKt/V) of 1.2 per dialysis and Urea reduction ratio (URR) of 65%.

Objective: The objective of the study is to determine the frequency of adequacy of dialysis among patients on thrice weekly dialysis in a tertiary care hospital.

Methodology: A descriptive case series study was conducted in dialysis center of Sir Ganga Ram Hospital for Six month period on Sample size of 72 patients who were receiving thrice weekly hemodialysis. URR and sKt/V were measured as markers of adequacy of dialysis along with other variables like Hemoglobin, Serum Calcium and Serum Phosphorus.

Results: Regarding age distribution, majority of the patients 24 (32.0%) were between 41-50 years of age and minimum patients were 31-40 years old. Mean age was 48.60 ± 12.87 years. Out of 72 patients, 46 (31.3%) were male while remaining 26 patients (38.7%) were female. Only 41.3% were receiving adequate dialysis in terms of Kt/V and URR. Target of adequate Hemoglobin levels were achieved in 46.7%. Serum calcium and Serum phosphorus were maintained by 50.7% and 61.3% of patients respectively within recommended range.

Conclusion: Our study shows that majority of patients of ESRD undergoing regular thrice weekly maintenance hemodialysis are unable to attain the recommended adequacy of dialysis in terms of variables like URR, Kt/V and hemoglobin.

Key Words: Hemodialysis, adequacy, Kt/V, URR

INTRODUCTION

Chronic kidney disease (CKD) is a progressive loss of renal function over period of months or years. Severe chronic kidney disease requires renal replacement therapy in shape of Dialysis or Transplant⁽¹⁾ In U.S.A the Centers for Disease Control and Prevention found that CKD affected an estimated 16.8% of adults aged 20 years and older, during 1999 to 2004⁽²⁾. In United States: The magnitude of chronic kidney disease is increasing in our part of world day by day⁽³⁾

From an idealistic clinical approach, an adequately treated Hemodialysis (HD) patient is physically active, well nourished, not anemic, and not hypertensive with a maintained quality of life and life expectancy that is not inferior to that of healthy subjects⁽⁴⁾ Worldwide the minimum standards of adequate HD are thrice weekly dialysis ; single pool Kt/V (spKt/V) of 1.2 per

dialysis and Urea reduction ratio (URR) of 65%.⁽⁵⁾ There are certain dialysis related factors which affect the quality of life of patients on hemodialysis which include dose of dialysis and primary disease leading to renal failure etc.⁽⁶⁾

It is strongly suggested that adequacy of dialysis is linked with low mortality, better blood pressure control and less diet restriction resulting in superior nutritional status. Less adverse consequences of anemia, bone mineral metabolism and restores fairly good physical activity^(7,8) Since review of previous literature is unable to clearly define whether to dialyze patients twice or thrice weekly according to set standards of adequacy of dialysis as highlighted in KDOQI guidelines 2006 on the basis of survival, quality of life score and nutritional status.^(9,10) One study on the subject of adequacy of dialysis was conducted by a team of nephrologists from Sheikh Zayed

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Medical Complex, Lahore in 2003 among patients undergoing hemodialysis. In their study they enrolled 94 patients and the parameters they looked for were; Kt/V, URR, Calcium, Phosphorus and Hemoglobin; only 40%, 39.7%, 45.7%, 77% and 19.1% of patients achieved target of adequate dialysis respectively⁽¹¹⁾. We now know that KDOQI guidelines over this period have been improved and recommend a thrice weekly hemodialysis.

The aim of the present study is to determine that patients who undergo dialysis thrice weekly are receiving adequate dialysis in light of KDOQI guidelines 2006 as will be observed by findings based on results of achieving required Kt/V and URR and other variables like Hemoglobin, Serum calcium and Serum Phosphorus. The study will enable us to bring changes in our treatment plan i.e. dose of dialysis in our population.

OBJECTIVE

The objective of the study was to determine the frequency of adequacy of dialysis in terms of Urea reduction ratio, Kt/V, Hemoglobin, calcium and phosphorus concentrations among patients on thrice weekly dialysis in a tertiary care hospital.

OPERATIONAL DEFINITION

Adequacy of dialysis will be measured in following parameters.

Kt/V: Is a way of measuring dialysis adequacy

1. Kt the top part of fraction is clearance multiplied by time, representing the volume of fluid completely cleared of urea during single treatment.
2. V the bottom part of fraction is the volume of water a patient's body contains.

Adequacy will be labeled when target level is 1.2 -- 1.4 per dialysis.

URR: Is urea reduction ratio, meaning the reduction in urea level as a result of dialysis. The amount of urea removed is expressed as a percentage of the pre-dialysis level. Target value is 65%--70%.

Hemoglobin (Hb): Target Hb of 11gm/dl, caution when >13gm/dl.

Corrected Serum Calcium: Target level of 8.4—9.5mg/dl

Serum Phosphate: Target value of 3.5—5.5mg/dl

MATERIALS & METHODS

Setting: The study was conducted in Nephrology department, Dialysis center, Medical Unit 1, Sir Ganga Ram Hospital, Lahore.

Duration of study: Six month period from June 2013 to December 2013.

Sample size: Sample size estimated using 95% confidence level, 9% margin of error with an expected adequate Hemoglobin level in 19.1% is 72.

Sampling Technique: Non- Probability purposive sampling.

Study Design: Descriptive case series study.

SAMPLE SELECTION

Inclusion Criteria:

1. All the patients of ESRD on thrice weekly maintenance dialysis at SGRH/FJMC dialysis center.
2. Patients more than 20 years and less than 70 years were included in this studies that were on thrice weekly dialysis for at least 3 months.

Exclusion Criteria

1. Patients of acute renal failure getting dialyzed.
2. Patients non-compliant to treatment plan of thrice weekly dialysis.

Data Collection and Analysis

Patients, either male or female, who had end stage renal disease and on thrice weekly dialysis, were enrolled in dialysis unit. After informed consent, their blood samples were drawn by the same technician before and after dialysis and were tested for Hemoglobin, Urea, Creatinine, Calcium, and Phosphorus by the same laboratory to reduce the bias. Using the test values, result of calculations were analyzed by the researcher. Data was analyzed on SPSS version 10.0.

RESULTS

A total of 72 patients of ESRD on thrice weekly maintenance dialysis were included in this study during the study period of six months from 10-06-2013 to 09-12-2013. Regarding age distribution, majority of the patients 24 (32.0%) was between 41-50 years of age and minimum patients were 31-40 years old. Mean age of the patients was 48.60±12.87 years (as shown in table 1). Out of 72 patients, 46 (31.3%) were male while remaining 26 patients (38.7%) were female. Adequacy in different parameters was as follows: Hemoglobin 46.7%, Urea reduction ratio 41.3%, Kt/V 41.3%, serum calcium 50.7%, serum phosphorus 61.3% (Table-2).

Table 1: Distribution of patients by age n=72

Age (year)	Number	Percentage
20-30	10	13.4
31-40	09	12.0
41-50	24	32.0
51-60	19	25.3
61-69	13	17.3
Total	72	100.0
Mean±SD	48.60±12.87	

Table 2: Distribution of patients by adequacy of dialysis: total no=72

Factors of adequacy	Number of patients	Adequacy achieved (%)
Haemoglobin	35	46.7
Urea reduction ratio	31	41.3
Kt/V	31	41.3
Serum calcium	38	50.7
Serum phosphorus	46	61.3

DISCUSSION

There is a strong correlation between the adequacy of hemodialysis and patient mortality and morbidity. Generally there are two methods used to assess dialysis adequacy; URR and Kt/V⁽¹²⁾. The important method in assessing adequacy is measuring Kt/V; in this measurement (K) stands for dialyzer clearance expressed in (ml/min) and the lower case (t) stands for time and (V) stands for volume of distribution of urea in patient body⁽¹²⁾. Kt/V values of < 1.0 have been associated with higher rates of morbidity and mortality than values >1.0⁽¹³⁾. Recent data, however, suggest that values greater than 1.0 has been an underestimate, and that a Kt/V>1.2 or 1.3 is ideal⁽¹⁴⁾. Urea reduction ratio (URR) it is a percentage based on how much urea removed during treatment. URR is calculated by subtracting the post dialysis urea from the pre dialysis urea and dividing this figure by the pre dialysis urea to get the ratio and then multiply by 100 to get the percentage URR should be above > 65%. Clinical practice guidelines recommend monthly monitoring of these adequacy measures to ensure optimal patient care. Measurements that are more frequent have been suggested for patients who are non-compliant with the dialysis prescription or under dialyzed or who have frequent problems with dialysis delivery, such as poor access blood flow⁽¹⁵⁾.

In present study, all the patients were receiving internationally recommended minimum of thrice weekly hemodialysis. When we calculated the adequacy of dialysis among these patients; to our surprise; only 41.3% were receiving adequate dialysis in terms of Kt/V and URR. Target of adequate Hemoglobin levels of 11-13g/dl (without need of blood transfusion) were achieved in 46.7%. Serum calcium was maintained by 50.7% of patients within recommended range (8.4-9.5mg/dl). Serum phosphorus was adequate (range 3.5-5.5 mg/dl) in 61.3% patients. In short less than 50% of patients are receiving adequate hemodialysis in term of standards set by developed world.

CONCLUSION

Our study shows that majority of patients of ESRD undergoing regular thrice weekly maintenance hemodialysis are unable to attain the recommended adequacy of dialysis in terms of variables like URR, Kt/V and hemoglobin. So we emphasize that further studies are required to explore the causes of inadequacy of dialysis, strategies should be designed and implemented to achieve minimum standards of dialysis.

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