Adequacy of hemodialysis in Nepalese patients undergoing maintenance hemodialysis

Sultania P,[1] Acharya PS,[1] Sharma SK[1]
[1]Department of Internal Medicine, B P Koirala Institute of Health Sciences Dharan, Nepal

ABSTRACT

Introduction: Inadequate dialysis accounts for the high mortality in patients with end stage renal disease (ESRD). In Nepal, due to various factors including financial and logistic limitations, hemodialysis is mostly performed twice-a-week. This study was undertaken to look at adequacy of dialysis in patients undergoing maintenance hemodialysis in Nepal where the patients profile, in terms of diet, body muscle mass, nutritional status etc are different from western world.

Methods: In this cross sectional observational study, 40 patients on maintenance hemodialysis in the dialysis unit were evaluated and enrolled if patients were regularly undergoing twice-a-week hemodialysis in preceding 6 months with each session of dialysis prescription consisting of 4 hours (240 minutes). Patients were excluded if they were admitted in the hospital for some acute problems or had received acute hemodialysis in preceding 6 months. Only 14 patients fulfilled the inclusion criteria. Hemodialysis adequacy was measured using well established urea kinetic modeling.

Results: The mean age of the patients was 49 ± 24 years. Mean predialysis urea and post dialysis urea were 163.7 ± 60.05 mg/dL, and 73.7 mg/dL ± 30.55 respectively. Mean URR was 65.3%. Mean Kt/v as assessed by Jindals equation was 0.99.

Conclusions: Our study showed that twice-a-week of maintenance hemodialysis did not achieve recommended adequacy of hemodialysis in our patients.

Key words: *Adequacy of dialysis, end stage renal disease, hemodialysis.*

INTRODUCTION

Hemodialysis constitutes the most common form of renal replacement therapy (RRT) worldwide.[1] The goal of dialysis in patients with end stage renal disease (ESRD) is to restore body's extracellular and intracellular composition to that of normal to the greatest extent possible. The surrogate marker for this physiological achievement of dialysis in clinical practice is the measurement of 'adequacy of dialysis'.[2] Inadequate dialysis is responsible for the high mortality of patients with ESRD.[3,4] Apart from duration of dialysis and blood flow rate, body surface area of the patient, composition of diet, nutritional status etc may also influence the adequacy of dialysis.[3] To the best of our knowledge, there is no clinical study on adequacy of dialysis in Nepal where the patients profiles are different from that of western world. This pilot study was undertaken to

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Correspondence:
Dr. Sanjib Kumar Sharma
Department of Internal Medicine
B P Koirala Institute of Health Sciences
Dharan, Nepal.
Email: drsanjib@yahoo.com

see the adequacy of dialysis and presumptive factors influencing it in our set up.

METHODS

A cross sectional observational study was undertaken to see adequacy of dialysis in patients with maintenance dialysis at dialysis unit of BP Koirala institute of health sciences. All 40 patients on maintenance hemodialysis in the dialysis unit were enrolled initially and evaluated after informed consent was obtained. A structured predesigned Performa was used to collect data. They were included for the analysis of adequacy of dialysis if each patient was regularly undergoing twice a week hemodialysis in preceding 6 months with each session of dialysis prescription consisting of 4 hours (240 minutes). To complete the study the patients also had to undergo at least 8 sessions of dialysis in the given period of the study from February 11th to March 11th 2007. Following patients (number = 26) were excluded from the study a) patients with acute illness, b) patients who received acute dialysis during last 6 months in more than one occasion, excluding the study period, d) patients shifted from continuous ambulatory peritoneal dialysis therapy, f) patients who underwent acute dialysis during the study period and e) patients not willing to participate in the study.

After a detailed clinical history and examination, relevant investigations were performed. Parameters that were looked for and recorded were delivered dialysis treatment time per session, pre and post dialysis treatment blood urea (to measure the dose of dialysis delivered) and serum creatinine level, hematocrit, serum albumin, whether the patient is on erythropoietin therapy or not and received blood transfusion. The blood sampling for the measurement was performed as per K/DOQI Guideline.[5] Briefly, the pre dialysis sample was taken immediately after cannulation of the fistula with a dry needle and before the dialysis started. The post dialysis sample was taken by the stop flow method, that is, the dialysate flow is stopped for 5 minutes leaving the blood pump running before sampling from the port in the arterial blood line to allow time for the blood in access to equilibrate with the central circulation, but not enough time to equilibrate from the tissue pool. The biochemical parameters were measured in the Central Laboratory of the institute.

Hemodialysis adequacy was measured using the percent reduction in the blood urea nitrogen concentration during a single dialysis treatment -urea reduction ratio-, one of the two well-accepted (urea kinetic modeling) method.[5] URR is calculated with the formula 100 x (1 - [post dialysis blood urea/pre dialysis blood urea]).[6] URR was compared with another well accepted urea kinetic modeling method (Kt/V_{urea}) with the help of Jindal's equation.[7] Both the equations have the advantage of being easy and could be calculated at the bedside. SPSS version 10 was used for analysis of data.

RESULTS

Out of 40 patients registered in the dialysis registry (on maintenance hemodialysis) of the institute, 14 patients (8 males, and 6 females) fulfilled the inclusion criteria for the study. The characteristics of the 14 patients with their mean URR and Kt/v are shown in Table 1.

The mean age of the patients was 49 ± 24 years. 38% of the patients were ≤45 years and 46% were ≥60 years. Average time since the diagnosis of CKD was 36.6 months (13-48 months), while mean duration of hemodialysis of 13.5 ± 8.5 months.

Seven cases were diagnosed as chronic glomerulonephritis with ESRD. Mean heamtocrit was 29.4 ± 10.5%. Only 38% of patients were on erythropoietin therapy and 7 patients were on whole blood transfusion to maintain targeted hemoglobin label. The average time on dialysis per sessions was 210 ± 30 minutes with mean weekly dialysis time being 420 minutes (07 hours). Mean predialysis urea was 163.7 ± 60.05 mg/dL and mean post dialysis urea was 73.7 mg/dL ± 30.55. Mean URR was 65.3%. Mean Kt/v as assessed by Jindals equation was 0.99.

DISCUSSION

A central issue in the management of patients undergoing hemodialysis is the assessment of adequacy of hemodialysis. Quality of life is also affected by adequacy of dialysis. National co-operative Dialysis study (NCDC), a prospective randomized controlled trial provided data concerning the relationship between the fractional clearance of urea and patient outcome.[8] Reanalysis of the primary data from the NCDC showed that Kt/V <0.8 was associated with a relatively high rate of patient morbidity, whereas Kt/V values between 1.0 and 1.2 were associated with better outcome.[9] In this study adequacy of hemodialysis, as recommended by various international organizations was not achieved. The mean Kt/V in our study was 0.99. This was in spite of the strict inclusion criteria i.e. all the patients were regularly undergoing twice a week hemodialysis, a commonly performed practice for treatment of ESRD patients in Nepal. There could be many explanations accounting for this poor adequacy of hemodialysis. Average time of dialysis treatment received by patients was actually less than the prescribed treatment time. Reasons for discrepancy between prescribed time and delivered time may vary for various reasons. Patients (N = 5) coming from long distance like Ilam, Bhadrapur, and Dhankuta could not reach dialysis unit in scheduled time or had to leave before the completion of prescribed time due to fear of missing the transportation of the day. Unless satellite dialysis centers are available in various places in the country this situation is likely to remain unchanged. Changing the modality of dialysis from hemodialysis to continuous ambulatory peritoneal

Table 1. Characteristics of patients included in the study

Serial No.	Pre dialysis urea (mean)	Post dialysis urea (mean)	Hematocrit (mean)	Pre dialysis BP (mean)	URR (mean)	Kt/V (mean)
1. RPB	171.6	70.6	30.6	140/70	58.82	1.15
2. SS	126.4	66.4	23.1	168/108	47.4	0.69
3.PMG	144.16	65.8	39.9	152/76	54.3	0.97
4. SR	218.5	99.6	36	180/108	54.3	0.97
5. BD	182.6	87.2	22.2	174/106	52.2	0.88
6. KG	139.5	62.8	30.9	126/76	54.9	0.996
7. CS	128.6	64.0	19.5	172/94	50.2	0.808
8. MML	162.2	57.8	34.8	160/80	64.3	1.372
9. MKR	174.3	75.6	31.8	164/84	56.5	1.06
10. JBA	111.6	48.3	28.8	134/80	56.7	1.068
11. MBA	146.6	74.3	28.8	118/78	49.3	0.772
12. RC	223.7	104.2	24.0	130/70	53.4	0.936
13. KS	198.0	81.7	32.1	155/98	58.7	1.148
14. SR	211.0	80.0	34.0	160/100	60.2	1.2

BP: Blood Pressure, URR: Urea Reduction Ratio

dialysis (CAPD) in this group of patients might be a solution. One patient persistently requested for premature discontinuation of dialysis due to backache in spite of, many a time, dialysis being done under analgesic coverage. One patient had to be prematurely discontinued frequently due to recurrent hypotension as patient had diabetic autonomic neuropathy and cardiomyopathy with poor left ventricular function.

In HEMO Study, the average time on dialysis was 190 ±23 minutes in the low-dose group and 219±23 minutes in the high-dose group.[10] Both the groups had similar outcome in terms of adequacy of dialysis. However, it needs to be emphasized that delivery of less time of effective dialysis in this group is certainly due to different reasons than our patients on hemodialysis. Moreover, all the patients on HEMO study were on thrice a week hemodialysis. Inadequate dose delivered in this study is, therefore, not a surprising finding as our patients were receiving twice-a-week hemodialysis. This indicates that twice a week hemodialysis – a common practice in treatment of ESRD patients in Nepal - is likely to be inadequate in terms of adequacy of dialysis as recommended by various authorities.[3,4] Twice-weekly hemodialysis is usually inadequate unless there is a reasonable amount of residual kidney function (GFR 15 mL/min). However, it is highly unlikely that our patients can be initiated on dialysis while significant residual renal function exist, as most of our patients present with full blown complications of uremia due to ESRD.[11] Lack of awareness about the disease, late referral and financial constraints plays significant role in this regard. Apart from the limitations related to human resources (doctors and nurses) and machinery, the financial burden of the dialysis in our patients and their family is also one of the main reasons making most of them unable to undergo thrice- a-week hemodialysis. Many patients (n=11) in the study were non earning members of the family reflecting the difficulties of financing for dialysis. For the same reason about 60% ESRD patients drop out within three months of initiation of hemodialysis.[11]

Inaccurate estimation of dialyzer performance, inadequate dialyzer reprocessing related to reuse of dialyses may be other factor that may lead to inadequacy. Studies have also shown that low hematocrit may also affect adequacy. One third (29%) of our patients were anemic and that might have contributed to inadequacy.

To ensure that ESRD patients treated with chronic hemodialysis receive adequate treatments, the delivered dose of hemodialysis needs to be measured monthly. Hemodialysis centers should have a continuous quality improvement and patient review system in place that recognizes patients who are receiving suboptimal dialysis adequacy, identify the cause, and rectify it, if possible.

CONCLUSIONS

Our study shows that patients of ESRD undergoing regular twice-a-week maintenance hemodialysis have poor adequacy of dialysis. As studies have shown that the adequacy of dialysis determines morbidity and mortality in patients undergoing hemodialysis, strategies should be implemented to achieve adequacy of hemodialysis.

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