Original Research Article

Determination of the causes of ESRD among patients receiving hemodialysis

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Abstract

Background: This study presents the main causes of End Stage Renal Diseases (ESRD) among patients who have been receiving hemodialysis. The study has also evaluated the adequacy of hemodialysis provided to these patients using a Urea Reduction Ratio (URR). **Materials and methods:** This is a retrospective study of 110 patients with ESRD. After identification of the causes of ESRD the study evaluated the dialysis adequacy using Urea Reduction Ratio (URR). Correlation was done to determine the association between dialysis dose and patient outcomes. **Results:** The mean age of patients was 53.9 %. Male patients who underwent hemodialysis for their end stage renal diseases are three times more than females. Diabetes Mellitus alone (DM) is the leading cause of ESRD among patients receiving hemodialysis with 34.5 % followed by diabetes mellitus plus hypertension covering 29.1 %. 87 % of the patients have shown 65% and above URR while only 13 % of the patients who received hemodialysis were found to have URR of 65%. The average URR was 66.6 %. The mean hemoglobin after hemodialysis was found to be 8.5 g/dl. There is a negative correlation between URR and hemoglobin with a P value of 0.0484. Out of all the patients who received hemodialysis 29.1 % showed clinical improvement. **Conclusions:** The study found that the urea reduction ratio (URR) after hemodialysis was adequate. The outcome of patients with adequate URR was associated with decreases mortality. Diabetes Mellitus is the leading cause of ESRD among patients receiving hemodialysis followed by diabetes mellitus plus hypertension

Key Word: End stage renal disease, hemodialysis, Urea reduction ratio

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INTRODUCTION

The rapid increase of non-communicable diseases (NCDs) represents one of the major health challenges to global development[1]. Non-communicable diseases (NCDs) are the most common causes of premature death and morbidity and have a major impact on health-care costs, productivity and growth[2]. For instance, chronic kidney disease (CKD) is increasing worldwide at an annual growth rate of 8%[3]. Figures on end stage renal diseases (ESRD) for much of the developing world are unknown but are believed to be higher than those in the developed world[4]. In developed countries, ESRD is a major cost driver for health-care systems, with annual growth of dialysis programs ranging between 6% and 12% over the past two decades and continuing to grow, particularly in developing countries[5]. Today, over 2 million people require renal replacement therapy to sustain life worldwide, but this likely represents less than 10% of those who need it. By 2030, more than 70 percent of patients with ESRD will be residents of developing countries, whose collective economies will account for less than 15 percent of the total world economy[6]. Though there are no studies conducted to measure the prevalence of the end stage renal diseases in Palakkad, the non-communicable diseases like hypertension and diabetes, which are major causes of end stage renal diseases, have shown dramatic increase in the last two decades. This

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being the fact, the looming growth of chronic kidney disease (CKD) worldwide at an annual growth rate of 8% is also going to affect us because as mentioned above ESRD is more common in developing counties than developed countries when the underlying causes of ESRD is growing steadily[3,6]. This study tried to find out the causes and distribution of end stage renal diseases among patients who underwent hemodialysis, thus measure the adequacy of hemodialysis and determine the outcome of hemodialysis.

MATERIALS AND METHODS

The study was conducted in Palakkad, Kerala, India and all patients who received hemodialysis from 2016 January to March were included in the study. After the patients' cards had been gathered from the MRD of each hospital, it was systematically arranged in alphabetical order. Data on patients' identification causes of renal failure, clinical presentations, baseline and follow up laboratory investigations and outcome of hemodialysis were recorded. All these information was transferred into an excel sheet and patients who underwent hemodialysis for acute renal failure, hyperkalemia and other intoxication were excluded from the study.

Type of study: A retrospective review of 110 patients with end stage renal diseases, who were on chronic hemodialysis in Palakkad region. The data collected from the patients' cards was initially transferred into an excel sheet. Based on the criteria mentioned above exclusion and inclusion of study subjects were conducted. To describe the data into meaningful information, percentages and graphical presentation of the data was developed and utilized. Correlation of different variables was used to determine any statistical significance. Statistical inference was utilized to determine the adequacy of hemodialysis by calculating the mean confidence interval of indicators of dialysis adequacy like Urea Reduction Rate (URR). Conclusions were made at 95% confidence levels. That is, differences and relationships were considered statistically significant when the probability value, *p*, was less than 0.05 ($p<0.05$). This study was designed to determine dialysis adequacy using urea reduction ration (URR) and determine the relationship between dialysis adequacy and patients' outcome and to determine the main causes of ESRD among patients undergoing hemodialysis

RESULT

To get a better picture of the patients' age distribution, a 10 years interval was utilized. From our study, the mean age of patients was 53.9 %. Nearly half 25 (45.5%) of the patients were greater than 60 years old. Less than 3.6 % are below 21 years of age. The second greater percentage (20%) of patients falls between 51 to 60 years of age.

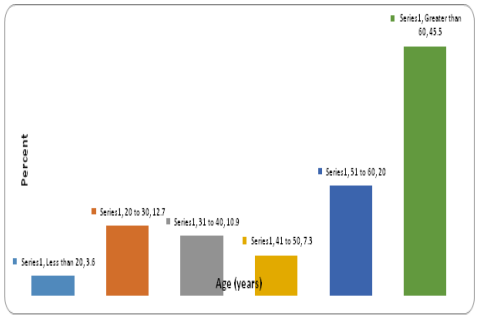

Figure 1: The percentage distribution of patients with ESRD by age

To determine the most affected gender, the study reviewed the distribution of male and female patients. Male patients who underwent hemodialysis for their end stage renal diseases are three times more than females.

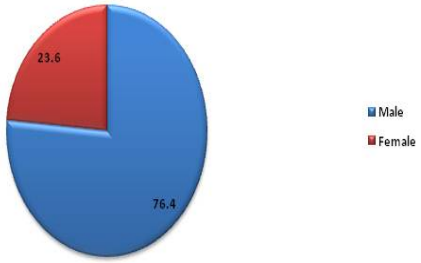

Figure 2: Gender wise percentage distribution of patients with ESRD who received hemodialysis

Diabetes Mellitus alone (DM) is the leading cause of ESRD among patients receiving hemodialysis with 34.5 % followed by diabetes mellitus plus hypertension covering 29.1 % 20 % of patients with ESRD were found to have hypertension alone. The remaining 9 % and 3.6 % of patients with ESRD were found to have obstructive uropathy and glomerulonephritis (GN) respectively.

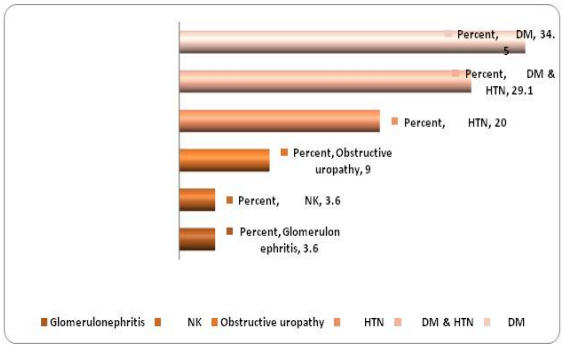

Figure 3: Causes of ESRD in patients under chronic hemodialysis

Determination of the adequacy of renal diseases was one of the key purposes of this study. Based on the

availability of data, Urea Reduction Ration (URR) was utilized to measure the adequacy of Hemodialysis. A record of Blood Urea Nitrogen (BUN) before and after dialysis was measured and reduction ratio was calculated. 87 % of the patients have shown 65% and above URR while only 13 % of the patients who received hemodialysis were found to have URR of 65%. The average URR was 66.6 %.

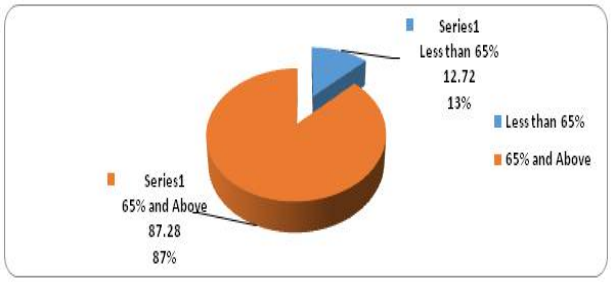

Figure 4: Percentage Distribution of URR in Patients Who Received Hemodialysis

Correlation between URR and Hemoglobin

The mean hemoglobin after hemodialysis was found to be 8.5 g/dl. As it is shown in fig 5, there is a negative correlation between URR and hemoglobin with a P value of 0.0484 which is statistically significant. The hemodialysis unit has not yet started erythropoietin as supplement treatment along with hemodialysis therefore this could be the factor for the negative correlation and the consistent lower value of hemoglobin in these patients with ESRD.

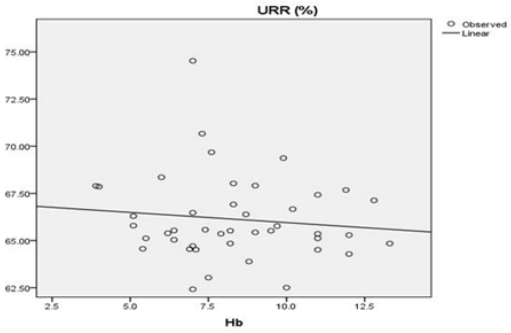

Figure 5: Correlation of URR and Hemoglobin

DISCUSSION

The majority of patients (45.5 %) with ESRD in our study were greater than 60 years of age while the mean age of the patients was 53.9 %. 20% of patients in our study lay between 51 to 60 years of age. Similar study carried out in South Africa reported that the mean age of the patients with ESRD receiving hemodialysis was found to be 40.02 years. The mean age of the patients in study was 13 years older than those in South Africa[10] To determine the most affected gender, the study reviewed the distribution of male and female patients. Male patients (76.4%) who underwent hemodialysis for their end stage renal diseases were three times more than the females (23.6%). Similar study conducted in Nigeria found preponderance of male 70.3 % which is very similar finding to our study[11]. To ensure that patients with ESRD receive a sufficient amount of hemodialysis, the delivered dose should be measured and monitored routinely by every hemodialysis unit; the NKF-DOQI (National Kidney Foundation Kidney Disease Outcomes Quality Initiative) guidelines recommend an assessment of the hemodialysis dose once per month. For stable patients hemodialysis of thrice weekly for at least four hours per session is adequate[10]. Diabetes Mellitus alone (DM) is the leading cause of ESRD with 34.5 % followed by diabetes mellitus plus hypertension covering 29.1 %. 20 % of patients with ESRD had hypertension as a presumed cause. Unlike other studies the leading cause of ESRD in Palakkad is Diabetes Mellitus alone[12,13,15]. Determination of the adequacy of renal diseases was one of the key purposes of this study. Based on the availability of data, Urea Reduction Ration (URR) was utilized to measure the adequacy of Hemodialysis. A record of Blood Urea Nitrogen (BUN) before and after dialysis was measured and reduction ratio was calculated in percentage. Eighty seven per cent of the patients have shown 65% and above URR while only 13 % of the patients who received hemodialysis had less than 65 % URR. The average URR was 66.6 %. Majority of the patients in the hospital receive three times per week hemodialysis. Three times per week hemodialysis have shown efficient urea reduction which contribute to the better survival of patients[16]. Thrice-weekly treatment time with 3 hours per hemodialysis session compared with 3.5 hours hemodialysis duration was associated with increased death risk independent of Kt/V dose. The greatest survival gain of higher hemodialysis dose was associated with a Kt/V approaching the 1.6-1.8 range, beyond which survival gain was minimal, nonexistent, or even tended to reverse in African American men and those with 4-5 hours of HD treatment. In non-Hispanic white women, Kt/V of 1.8 continued to show survival advantage trends, especially in time-dependent models[17]. The duration of hemodialysis session in our Hospital is between 2 to 3 hours. The adequacy of hemodialysis in terms of creatinine clearance (Kt/V) is still adequate if we assess it indirectly using URR. A 65 % URR correspondence to Kt/V value of 1.2 which is a required target by many centers[18]. South African study concluded that in terms of URR (urea reduction ratio) a Kt/V of 1.3 corresponds to an average URR of 70%. However the URR corresponding to a Kt/V of 1.3 can vary substantially as a

function of ultrafiltration. And different target values are needed for patients who are dialyzed more or less frequently[19]. The mean hemoglobin after hemodialysis was found to be 8.5 g/dl. As it is shown in fig 5, there is a negative correlation between URR and hemoglobin with a *p* value of 0.0484 which is statistically significant. The hemodialysis session of have not yet started erythropoietin treatment along with dialysis therefore this could be the factor for the negative correlation. Observational study conducted in the states found out that mortality descended with increasing hemoglobin concentrations up to a level of 10-11 g/dl [20]. The mean hemoglobin (8.5 g/dl) in our study is in the lower range, this could be a potential risk factor for bad outcome. Out of all the patients who received hemodialysis 29.1 % showed clinical improvement. In one Nigerian study 38(6.8%) survived on hemodialysis for longer than three months and the median duration of survival after diagnosis for all the patients was 2 weeks (range 0-50 months)[11]. Our study did not measure the median duration of survival but 10 % of the patients in our study population died despite regular hemodialysis. Mortality remains high even in high settings area despite three times hemodialysis per week, the US renal data system for instance indicated that the morbidity and mortality rate of patients receiving three times per week hemodialysis (HD) remain unacceptably high[21].

CONCLUSION

In this study where patients with end stage renal diseases who received hemodialysis from January –March 2016 were included, we found that the urea reduction ratio (URR) after hemodialysis was adequate. The outcome of patients with adequate URR was associated with decreases mortality. ESRD is very prevalence among the elderly greater than 60 years of age. And our study reached that men are worst affected by ESRD than women. The frequency of hemodialysis in our hospital is not adequate though the percentage of URR per dialysis session is very adequate. A three times a week hemodialysis session, which is a widely accepted frequency by international standards; need to be maintained by Hospital. Diabetes Mellitus is the leading cause of ESRD among patients receiving hemodialysis in Palakkad region followed by Diabetes Mellitus plus hypertension. The prevalence of anemia in all patients with ESRD under hemodialysis is very high. A negative correlation was identified between adequacy of hemodialysis determined through URR and hemoglobin, thus despite the adequacy of hemodialysis, anemia remains high.

REFERENCES

1. World Health Organization. The World Health Report 2002: Reducing Risks and Promoting Quality Life. Geneva: WHO; 2013.
2. Couser WG, Remuzzi G, Mendis S, Tonelli M. The contribution of chronic kidney disease to the global burden of major noncommunicable diseases. Kidney Int. 2011 Dec; 80(12):1258-70.
3. Alebiosu CO, Ayodele OE. The global burden of chronic kidney disease and the way forward. Ethn Dis. 2005 Summer; 15(3):418-23.
4. Bamgboye EL. End-stage renal disease in sub-Saharan Africa. Ethn Dis. 2006 Spring; 16(2 Suppl 2):S2-5-9.
5. Eggers PW. Has the incidence of end-stage renal disease in the USA and other countries stabilized? Curr Opin Nephrol Hypertens. 2011 May; 20(3):241-5.
6. Barsoum RS. Chronic kidney disease in the developing world. N Engl J Med. 2006 Mar 9; 354(10):997-9.
7. Mufunda J, Mebrahtu G, Usman A, Nyarango P, Kosia A, Ghebrat Y, Ogbamariam A, Masjuan M, Gebremichael A. The prevalence of hypertension and its relationship with obesity: results from a national blood pressure survey in Eritrea. J Hum Hypertens. 2006 Jan; 20(1):59-65.
8. Abolfotouh MA, Abu-Zeid AH, Aziz MA, *et al*. Prevalence of hypertension in western Saudi Arabia. East Mediterr Health J. 1996; 2(2):211–218.,
9. Kabahizi J., (2005), Impact of Dialysis Adequacy on Patient Outcomes, Faculty of Health Sciences,University of the Witwatersrand
10. Arogundade FA, Sanusi AA, Hassan MO, Akinsola A. The pattern, clinical characteristics and outcome of ESRD in Ile-Ife, Nigeria: is there a change in trend? Afr Health Sci. 2011 Dec; 11(4):594-601.
11. Soyibo AK, Barton EN. Report from the Caribbean renal registry, 2006. West Indian Med J. 2007 Sep; 56(4):355-63.
12. Ojogwu LI, Ukoli FA. A follow up study of adult nephrotic syndrome in Nigerians: outcome and predictors of endstage renal failure. Afr J Med Med Sci.1993 Jun; 22(2):43-50.
13. Diallo AD, Niamkey E, Beda Yao B. [Chronic renal insufficiency in Côte d'Ivoire: study of 800 hospital cases]. Bull Soc Pathol Exot. 1997; 90(5):346-8.French.
14. Veriava Y, du Toit E, Lawley CG, Milne FJ, Reinach SG. Hypertension as a cause of end-stage renal failure in South Africa. J Hum Hypertens. 1990 Aug; 4(4):379-83.
15. Plange-Rhule J, Phillips R, Acheampong JW, Saggar-Malik AK, Cappuccio FP, Eastwood JB. Hypertension and renal failure in Kumasi, Ghana. J Hum Hypertens. 1999 Jan; 13(1):37-40.
16. Tentori F, Zhang J, Li Y, Karaboyas A, Kerr P, Saran R, Bommer J, Port F, Akiba T, Pisoni R, Robinson B. Longer dialysis session length is associated with better intermediate outcomes and survival among patients on in-center three times per week hemodialysis: results from the Dialysis Outcomes and Practice Patterns Study (DOPPS). Nephrol Dial Transplant. 2012 Nov; 27(11):4180-8.
17. Miller JE, Kovesdy CP, Nissenson AR, Mehrotra R, Streja E, Van Wyck D, Greenland S, Kalantar-Zadeh K. Association of hemodialysis treatment time and dose with

mortality and the role of race and sex. Am J Kidney Dis. 2010 Jan; 55(1):100-12.
18. Kerr P, Perkovic V, Petrie J, Agar J, Disney A; Caring for Australians with Renal Impairment (CARI). The CARI guidelines. Dialysis adequacy (HD) guidelines. Nephrology (Carlton). 2005 Oct; 10 Suppl 4:S61-80.
19. Jules Kabahizi, Impact of Dialysis Adequacy on Patient Outcomes, Johannesburg 2005
20. Foley RN, Parfrey PS, Harnett JD, Kent GM, Murray DC, Barre PE. The impact of anemia on cardiomyopathy, morbidity, and mortality in end-stage renal disease. Am J Kidney Dis. 1996 Jul; 28(1):53-61.
21. Collins AJ, Foley RN, Gilbertson DT, Chen SC. United States Renal Data System public health surveillance of chronic kidney disease and end stage renal disease. Kidney Int Suppl (2011). 2015 Jun; 5(1):2-7.

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