Dialysis and its management in younger age children in Pakistan

Abstract

Introduction: Pakistan is a developing country that lacks the critical infrastructure to support optimal care of patients with chronic kidney disease (CKD) and end-stage kidney disease (ESKD). **Objectives:** The basic aim of the study is to analyze the dialysis and its management in younger age children in Pakistan. **Material and methods:** This cross sectional study was conducted at Sheikh Zayed Medical College Raheem Yar Khan during 2021. There were 40 children who was selected for this study. At the time of the study, all the patients were on regular three dialysis sessions per week; each time for 3–4 h (total 12 h weekly) for more than 3 months with polysulfone dialyzing membranes, after creatinine clearance had fallen below 8–12 mL/min and/or pharmacological treatment and diet had proved inadequate to control clinical symptoms. **Results:** We collected all the demographic data of patients. The data was collected from 200 participants (from OPD, medical wards, dialysis center and kidney transplant OPD). The analysis of the demographic data found reveals the following results regarding age, sex, educational and marital status of the respondents: The mean (SD) age of the participants is 43.95 (1.68) years among the participants. **Conclusion:** The prevalence of CKD would have been much higher than the result obtained by this study, had the research used current level of creatinine.

Introduction

Pakistan is a developing country that lacks the critical infrastructure to support optimal care of patients with chronic kidney disease (CKD) and end-stage kidney disease (ESKD). Only 0.9% of Pakistan's gross national product is spent on health care, compared with nearly 18% of the gross domestic product in the U.S. Costs of dialysis and kidney transplantation are often paid by patients and families, who typically cannot afford health insurance [1]. Chronic kidney disease

(CKD) is associated with a severely increased risk of cardiovascular morbidity and mortality. Numerous structural and functional alterations of the cardiovascular system, e.g. endothelial dysfunction, arterial stiffening, left ventricular hypertrophy (LVH) and remodeling of the vessel wall with hyperplasia and calcification occur early in the course of CKD (stage 2-4 CKD) and contribute to the overt risk of ischemic cardiovascular disease (CVD) and sudden cardiac death [2]. While an impaired renal function has the potential to aggravate "traditional" risk factors like hypertension, dyslipidaemia, inflammation, and oxidative stress, the concomitant deterioration of mineral homeostasis and thus also bone metabolism is probably the key player leading to accelerated CVD [3]. To highlight the central role of mineral metabolism for both, cardiovascular and skeletal integrity, the term chronic kidney disease-mineral bone disorder (CKD-MBD) was coined recently [4].

CKD is associated with a wide range of life threatening diseases. CKD is considered as one of the major risk factors for developing cardiovascular disease. A study conducted in 2003 reported that patients having Glomerular filtration rate (GFR) between 15 and 59 ml/min/1.73 m^2 are at 38% higher risk of development of cardiovascular disease than patients having GFR 90 and 150 ml/min/1.73m^2. Along with the impact on individual health, CKD also affects the social life and responsible for loss of productivity [5]. The most common form of social impact due to CKD is financial burden [6]. CKD patients are at higher risk to develop end-stage renal disease (ESRD) which requires costly management like dialysis and kidney transplantation. A study conducted in USA revealed that the treatment cost for CKD and ESRD imposes a huge financial burden to the health care system and the average annual cost for end-stage renal disease without transplantation was near 75 billion US dollar in 2001. CKD needs to be given priority because it

is the consequence of uncontrolled diabetes and hypertension that are considered as world wide epidemic now a days [7].

Objectives

The basic aim of the study is to analyze the dialysis and its management in younger age children in Pakistan.

Material and methods

This cross sectional study was conducted at Sheikh Zayed Medical College Raheem Yar Khan during 2021. There were 40 children who was selected for this study. At the time of the study, all the patients were on regular three dialysis sessions per week; each time for 3–4 h (total 12 h weekly) for more than 3 months with polysulfone dialyzing membranes, after creatinine clearance had fallen below 8–12 mL/min and/or pharmacological treatment and diet had proved inadequate to control clinical symptoms. The mean dialysis duration was 2.18±1.36 years (range: 1–7 years). All patients were on dietary protein restriction, 1 g/kg body weight per day.

Blood samples (5 mL) with and without EDTA/sodium fluoride as anticoagulant were obtained via venipuncture after the participants had fasted overnight, and serum and plasma were separated and aliquot frozen at −80°C till used. In HD patients, venous blood samples were drawn immediately before and after hemodialysis session. Baseline laboratory investigations were carried out for all patients and controls including complete blood count, serum urea and creatinine, arterial pH, arterial blood gases and infection screening, which included blood and urinary cultures by standard methods.

Statistical analysis

A chi-square test was used to examine the difference in the distribution of the fracture modes (SPSS 19.0 for Windows, SPSS Inc., USA).

Results

We collected all the demographic data of patients. At before-dialysis session, duration of disease positively correlated with HIP-1α (r = 0.677, *P* <0.001) but negatively correlated with VEGF (r = −0.486, *P* < 0.001); VEGF positively correlated with each of pyruvate (r = 0.316, *P* <0.047) and HIF-1α (r = 0.374, *P* <0.018), and, OSI positively correlated with TPX (r = 0.969, *P* <0.001), but, negatively correlated with TAC (r = −0.469, *P* <0.002). The data was collected from 200 participants (from OPD, medical wards, dialysis center and kidney transplant OPD). The analysis of the demographic data found reveals the following results regarding age, sex, educational and marital status of the respondents: The mean (SD) age of the participants is 43.95 (1.68) years among the participants.

Almost all patients complained about long time of schedule to started dialysis before coming complicated of their kidney. The history of diabetes, hypertension and cardiovascular disease of respondents among kidney patients in public hospital and crude and adjusted odd ratio of factors associated with CKD of respondents among kidney patients in public hospital, Addis Ababa has been shown in data.

Table 01: Analysis of collecting data from 200 patients

Variables	Frequency	COR (95% CI)	AOR (95% CI)	P-value
Age				
	73	1.00	1.00	1.00

18-28	137	1.29 (0.95, 1.75)	1.46 (1.05, 2.03)	0.02
29-38	50	1.62 (1.08, 2.43)	1.50 (0.95, 2.36)	0.08
39-48	57	2.11 (1.44, 3.09)	2.40 (1.59, 3.65)	0.01
49-58	59	0.91 (0.62, 1.32)	0.77 (0.49, 1.23)	0.28
59-68	38	1.02 (0.67, 1.56)	1.40 (0.85, 2.32)	0.19
>68	8	2.89 (1.29, 6.45)	3.16 (1.36, 7.35)	0.07
Sex				0.01
Female	191	1.00	1.00	
Male	231	1.52 (0.55, 0.84)	0.62 (0.50, 0.78)	
History of HTN				0.08
No	69	1.00		
Yes	353	0.78 (0.60, 1.02)	1.26 (0.97, 1.64)	
History of DM				0.03
No	345	1.00	1.00	
Yes	77	1.16 (0.94, 1.43)	0.70 (0.51, 0.96)	
History of cigarette smoking				0.75
No	349	1.00	1.00	
Yes	73	0.81 (0.62, 1.07)	1.05 (0.76, 1.45)	
History of non-steroid anti-inflammatory medicine				0.01
No	170	1.00	1.00	
Yes	252	0.65 (0.53, 0.81)	0.48 (0.37, 0.61)	
Habitual of prescribed medication				0.01
No	75	1.00	1.00	
Yes	347	1.73 (1.32, 2.27)	2.22 (1.65, 2.98)	
History of renal stone				0.79

No	346	1.00	1.00	
Yes	76	1.76 (1.34, 2.31)		

Discussion

The large disparity in prevalence among those with stage 1 CKD might be explained in part by racial/ethnic differences in micro albumin urea among non-Hispanic blacks and Mexican Americans [8]. By using CKD EPI equation, prevalence of CKD has been found to be 38.6% by the respective equations. Stage (1-2) prevalence of CKD is 27.2%, (15.6% and 11.6%) respectively [9]. Whereas stage (3-4) prevalence of CKD is 34.1%, (19.4% and 14.7%) respectively by CKD EPI equation. Even though the difference is not statistically significant CKD EPI underestimates the prevalence compared to Cockcroft Gault. Among the 15.5% participants with CKD by MDRD equation found in the study conducted in Canada 80% had eGFR 30-60 (Stage 3 CKD) which is comparable with this research finding but over 10% had ESRD which is 5.4% in this research finding by the same equation [10]. The different between this study and the Canadian are the population and the methodology. That's why my study higher than those. The study done in Tanzania shows the prevalence of CKD among adult diabetic patients by Cockcroft Gault equation was 24.7% [11]. The Tanzanian researcher focused on only prevalence of diabetic patients from CKD that's why higher different between this study and there. The research done in Ethiopia among diabetic patients by using similar equations with this study have found the prevalence of CKD to be 18.8% and 23.8% by MDRD and Cockcroft Gault equation respectively [12-13].

Conclusion

The prevalence of CKD would have been much higher than the result obtained by this study, had the research used current level of creatinine. The various strategies needed to be considered to

reduce this burden include improving patients quality of life, caregivers appraisal, coping strategies, addressing interpersonal relationship issues and psychosocial support. Treatments such as control of high blood pressure in the early stages of CKD can prevent progression to end-stage renal disease.

References

1. Morton RL, Tong A, Howard K, Snelling P, Webster AC. The views of patients and carers in treatment decision making for chronic kidney disease: systematic review and thematic synthesis of qualitative studies. BMJ 2010; 340: c112.
2. Hasan, M., Sutradhar, I., Gupta, R.D. *et al.* Prevalence of chronic kidney disease in South Asia: a systematic review. *BMC Nephrol* **19,** 291 (2018). https://doi.org/10.1186/s12882-018-1072-5
3. Szakszon K, Csízy I, Szabó T. Early introduction of peritoneal dialysis may improve survival in severe sepsis. Pediatr Emerg Care 2009; 25: 599-602.
4. Iqbal Q, Younus MM, Ahmed A, Ahmad I, Iqbal J. Neonatal mechanical ventilation: Indications and outcome. Indian J Crit Care Med 2015; 19: 523–7.
5. Inwald DP, Tasker RC, Peters MJ, Nadel S. Emergency management of children with severe sepsis in the United Kingdom: the results of the Pediatric Intensive Care Society sepsis audit. Arch Dis Child 2009; 94: 348-53.
6. Oluyombo R, Akinsola A, Ayodele O, Onayade A, Arogundade F, et al. (2011) Prevalence, risk factors and patterns of chronic kidney disease in a rural community in South West Nigeria. J Epidemiol Community Health 65: P1-271.
7. Wanigasuriya KP, Peiris-John RJ, Wickremasinghe R (2011) Chronic kidney disease of unknown etiology in Sri Lanka: Is cadmium a likely cause? BMC Nephrol 12: 32.

8. James MT, Hemmelgarn BR, Tonelli M (2010) Early recognition and prevention of chronic kidney disease. Lancet 375: 1296-1309.

9. Athuraliya NT, Abeysekera TD, Amerasinghe PH, Kumarasiri PV, Bandara P, et al. (2006) Towards understanding of chronic kidney disease of North central province. In proceedings of annual scientific sessions of Sri Lanka medical association.

10. Jayasekara JM, Dissanayake DM, Adhikari SB, Bandara P (2013) Geographical distribution of chronic kidney disease of unknown origin in north central region of Sri Lanka. Ceylon Med J 58: 6-10.

11. Athuraliya NT, Abeysekera TD, Amerasinghe PH, Kumarasiri PV, Bandara P, et al. (2011) Uncertain etiologies of proteinuria-chronic kidney disease in rural Sri Lanka. Kidney Int 80: 1212-1221.

12. Chandrajith R, Nanayakkara S, Itai K, Aturaliya NT, Dissanayake CB, et al. (2011) Chronic kidney diseases of uncertain etiology (CKDue) in Sri Lanka: Geographic distribution and environmental implications. Environ Geochem Health 33: 267-278.

13. Torres C, Aragón A, González M, López I, Jakobsson K, et al. (2010) Decreased kidney function of unknown cause in Nicaragua: A community-based survey. Am J Kidney Dis 55: 485-496.