

COMPLICATIONS DURING HEMODIALYSIS IN END STAGE RENAL DISEASE PATIENTS OF A TEACHING HOSPITAL

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ABSTRACT

Objective: To determine the frequency of complications during hemodialysis in patients with end stage renal disease in Lady Reading Hospital, Peshawar.

Methodology: A six months cross-sectional study of 219 end stage renal disease patients undergoing hemodialysis was conducted within Departments of Medicine and Nephrology, Lady Reading Hospital, Peshawar, between October 2017 and March 2018. Relevant clinical and laboratory data pertaining to complications were collected and SPSS version 19 was used for data analysis.

Results: Out of 219 patients, 145 (66.21%) were males. The mean age of patients was 55.8 ± 7.67 years (range 25 to 70 years). Complications were common in male patients (66.21%). During hemodialysis, the following complications were noticed; fatigue (80%); neuro-psychiatric complications include anxiety (60%), headache (58%), poor sleep (55%); infections like urinary tract infection (65%), central dialysis catheter infection (41.55%), HCV infection (16%), HBV infection (12%); gastrointestinal complications like deranged liver functions (58.4%), nausea (30%); various cardiovascular complications include pulmonary edema (60%), pericardial effusion (45%), hypertension (40%), sudden cardiac death (34%); hemodialysis equipment related complications (22%); and others like restless leg syndrome (32%) and anemia (20%).

Conclusion: Most of the end stage renal disease patients on hemodialysis present with one or more complications and the most frequent were fatigue and neuropsychiatric complications.

Key Words: End stage renal disease, Hemodialysis, Complications

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INTRODUCTION

End stage renal disease (ESRD) is quite a common chronic disease with higher incidence and prevalence (10%) all over the world¹. Hemodialysis (HD) is a kind of management that is commonly used for ESRD and 90.6% of patients having ESRD eventually need hemodialysis². HD hampers the patient's normal life, limit the day to day regular activities and generally causes physical and psychological issues.

End stage renal disease patients on hemodialysis require some constrains and limitations e.g. diet issues, care of arteriovenous fistula site, frequent hospital visits, mood problems, fatigue and sedentary life related to ESRD³. Complications during hemodialysis are not very uncommon and it has negative repercussions on the patients' health as well as on the meagre resources of our health system. So by evaluating these complications we will be able to find out the need assessment

and prevent these complications and uplift our patient care. End stage renal disease is a complex disease which results in various complications like respiratory distress, sleep disturbance, depressive moods, fatigue, restless legs syndrome (RLS) and increased risk of peptic ulcer bleed⁴⁻⁶. ESRD patients undergoing hemodialysis have a high rates of complications especially cardiovascular morbidities like hypotension, hypertension, pericardial effusion, arrhythmias etc., affecting their quality of life and causing short life expectancy⁷. Hypertension is one of major vascular risk factors within patients on chronic dialysis. Cardiovascular accidents and sudden cardiac death are among the commonest cause of mortality of patients on hemodialysis^{8,9}. Viral hepatitis is also one of the major complications in these patients, with hepatitis C as the more common one followed by hepatitis B infection. These patients have raised hepatic enzyme levels and it has been implicated in the pathogenesis of pruritus in uremic patients undergoing hemodialysis^{10,11}.

Various psychosocial factors like anxiety, depression and low social support are common in these ESRD patients¹²; and have significant correlation with non-compliant behavior and low quality of life in hemodialysis patients. Apart from that, neurological complications decrease life quality and raise mortality¹³⁻¹⁵. Depression is one of the most common psychiatric illnesses in patients with ESRD and is related to high morbidity and mortality¹⁶. Depression has also been associated with increased risk of death, cardiovascular (CV) events and hospitalization in a significant number of these patients. Impaired standard of life has been described in these patients^{14,17}.

End stage renal disease is on the rise in Pakistan because there is increased prevalence of diabetes mellitus, hypertension and other renal illnesses. Hemodialysis is frequently required in ESRD patients. Complications during hemodialysis are quite common and they have negative effects on the patients' health as well as on the health sector. Therefore, this cross sectional study was designed to analyze the different complications during hemodialysis in ESRD patients. By evaluating these complications we will be able to determine its frequency and nature and will help in generation of local data. Moreover, relevant information will be available for caring physicians and will help in detection and prevention of these complications during hemodialysis which will ultimately help in improvement of patient care.

METHODOLOGY

A six months descriptive cross-sectional study of 219 end stage renal disease patients was conducted in the Departments of Medicine and Nephrology, Lady Reading Hospital, Peshawar between October 2017 and March 2018. The sample size was calculated with prevalence (10%)¹, margin of error (4%) and confidence interval (95%) using WHO Calculator. The patients were recruited through consecutive non-probability technique. All ESRD patients on hemodialysis with age between 25 to 70 years of either sex who were admitted in Medicine and Nephrology Departments in this institution and who gave informed written consent, were recruited for this study. Relevant data were gathered from the patient's as well as hospital records via a structured

questionnaire about complications during hemodialysis. Patients with acute renal injury requiring short time hemodialysis, ESRD patients who were on continuous ambulatory peritoneal dialysis (CAPD) or having kidney transplant and ESRD patients not on hemodialysis were excluded from the study. ESRD was operationally defined as CKD grade 5 kidney damage and/or glomerular filtration rate (GFR) <15 ml/min/1.73 m² for three months or more, regardless of cause. Hemodialysis was defined as a process where hemodialysis machine and a specialized filter known as an artificial kidney/ dialyzer are used to purify blood via an access to blood vessels usually in the arm. The Pittsburgh sleep quality index (PSQI) was used to assess individual's sleep quality and those with PSQI score more than 5 were grouped as having poor sleep while with PSQI score less than 5 as having good sleep. The Hamilton depression rating scale was utilized to assess neuropsychiatric problems¹⁷.

Different blood investigations like complete blood test, renal function tests, liver function tests, urinalysis, blood sugar level, ECG, echocardiography, x-ray chest, blood, urine & catheter culture and sensitivity, etc. were performed. Staff of the hemodialysis unit was taken on board and trained so that we can have proper case information and investigations record regarding ERD patients. This study was approved by the Institutional Ethical Review Board (IRB). Informed consent was obtained from patients or their relatives. The data of this project was exclusively used for study purpose. High confidentiality and anonymity was ensured and met. The variables of interest of this study included various demographic variables as well as different complications of hemodialysis as given in Tables 1 & 2. SPSS 19 was used for statistical analysis and data were analyzed via t-test for numerical variables and chi square test for categorical variables. Data obtained were presented in the shape of tables.

RESULTS

The results of our study indicated that 145 (66.21%) were males while the remaining 74 (33.79%) were females. The male to female ratio was nearly 2:1. Only 43 (19.63%) were below 40 years of age while 90 (41.1%) patients were above 60 years age, as shown in Table 1.

Table 1: Age and gender of ESRD patients (n=219)

Age Groups	Males	Females	Total
Less than 40 Years	29 (13.24%)	14 (6.39%)	43 (19.63%)
40-60 Years	52 (23.74%)	34 (15.53%)	86 (39.27%)
More than 60 Years	64 (29.23%)	26 (11.87%)	90 (41.10%)
Total	145 (66.21%)	74 (33.79%)	219 (100%)

Table 2: Frequency of different complications during hemodialysis

Variable	Frequency	Percentage
Neurological Complications	106	48.40%
Infections	91	41.55%
Respiratory Complications	77	35.16%
Miscellaneous Complications	69	31.51%
Cardiac Complications	65	29.68%
Blood Disorders	53	24.20%
Equipment related Complications	48	21.92%

Table 3: Relative frequencies of different complications during hemodialysis

Type of complications	Frequency (%)	Type of complications	Frequency (%)
Fatigue	175 (80%)	Skin Infections	66 (30%)
Urinary Tract Infection	142 (65%)	Chest Pain	65 (29.68%)
Pulmonary Edema	131 (60%)	Altered Sensorium	64 (29%)
Anxiety	131 (60%)	HD Equipment related Complications	48 (22%)
Deranged Liver Functions	128 (58.4%)	Arrhythmias	44 (20%)
Headache	127 (58%)	Anemia	44 (20%)
Poor Sleep	120 (55%)	Convulsions	35 (16%)
Tremors	106 (48.40%)	HCV Infection	35 (16%)
Pericardial Effusion	99 (45 %)	Vomiting	31 (14)%
Central Dialysis Catheter Infection	91 (41.55%)	Hypotension	26 (12)%
Hypertension	88 (40%)	HBV Infection	26 (12%)
Depression	88 (40%)	Heart Failure	20 (9%)
Pneumonia/LRTI	77 (35%)	Cholangitis/Pancreatitis	20 (9%)
Sudden Cardiac Death (SCD)	74 (34%)	Pulmonary Embolism	20 (9%)
Restless Leg Syndrome (RLS)	70 (32%)	Fainting Episodes	18 (8%)
Fluid Overload	66 (30%)	Myocardial Infarction	18 (8%)
Stroke	66(30%)	Reaction to Dialyzer/Drug	07 (3%)
Nausea	66 (30%)		

Fatigability was seen in 175 (80%) patients in our study. One hundred and twenty (55%) patients reported poor sleep quality defined as a global PSQI score >5. More than half (58.4%) of the patients had deranged liver functions. Depression was found in 40% of patients. Other common complications and their frequencies are mentioned in Table 2 and 3.

DISCUSSION

From this study it was evident that frequency of complications in end stage renal disease patients was much more (80.37%) in patients with age more than 40 years as was reported by Yang et al¹⁸ in their study. In this study, complications were more frequent in males (66.21%) and this was supported by previous study of Zhang et al¹⁹, showing greater than 50% prevalence in males.

Fatigue is one of the most commonly occurring complications in our population present in 80% in our study and is also revealed in another study which showed it to be 78.1%²⁰. In a study done by Gulsum et al²¹ on hemodialysis patients reported 29% skin infections and 8.5% cholangitis/pancreatitis. These findings were revealed and supported by our study which had 30% frequency of different skin infections and 9% cholangitis. In our study, 22% of ESRD patients had HD equipment related complications and this was supported by a study which had high prevalence rate of such complications associated with HD equipment²¹. Urinary tract infection, central dialysis catheter infection, pneumonia and skin infections reported to be 65%, 41.55%, 35% and 30% respectively in our study, are in accordance with various international studies^{22,23}. Pulmonary edema, pericardial effusion and fluid overload were seen in 60%, 45% and 30% of our patients as evident in some previous studies²⁴. The reasons for these complications are paucity of hemodialysis due to poor social and insurance system, decreased local dialysis centers, poor ultrafiltration and less dialysis time due to high turnover.

In this study, neuro-psychiatric complications were among the most frequent complications including anxiety, headache, poor sleep, depression, stroke, altered sensorium, convulsions and faint episodes and their corresponding frequencies were 60%, 58%, 55%, 40%, 30%, 29%, 16% and 8% respectively. Similar results are shown in other studies as anxiety, headache, poor sleep, depression, stroke, altered sensorium, convulsions and faint episodes in 63.7%, 55.55%, 50.7%, 49.9%, 29.6%, 25.92%, 14.81% and 7.1% respectively²⁵⁻²⁹. The depression was higher in our study due to poor socioeconomic conditions and because most of our patients were elderly and not financially independent. The gastrointestinal complications like deranged liver functions, nausea, vomiting, cholangitis and pancreatitis were present among 58.4%, 30%, 14% and 9% respectively and these

were supported by other international studies showing nausea 28.3%, vomiting 11.7% and cholangitis 8.5%^{29,30}. Anemia was present in 20% of our patients which is supported by a study showing 16.4% anemia in such patients³¹.

In our study various cardiac and cardiovascular complications included hypertension, sudden cardiac death, chest pain, arrhythmias, hypotension, heart failure, pulmonary embolism and myocardial infarction in 40%, 34%, 29.68%, 20%, 12%, 9%, 9% and 8% patients respectively. These findings are supported by various other studies revealing their frequencies to be sudden cardiac death 33%, hypotension 11.6%, heart failure 7.1%, pulmonary embolism 7.1% and myocardial infarction 7.1%^{29,32-34}. The reasons for higher heart failure might be poorly controlled hypertension, less glycemic control and fewer hemodialysis sessions.

Restless leg syndrome, hemodialysis equipment related complications, HCV infection, HBV infection and reaction to dialyzer/drug were seen in 32%, 22%, 16%, 12% and 3% of patients in this study. These are supported by various other studies in which restless leg syndrome, HCV infection, HBV infection and reaction to dialyzer/drug are seen in 34.45%, 19.2%, 10.6% and 2.37% of patients respectively^{5,10,35}. In our study, there was high prevalence of HCV and HBV infections i.e. 16% and 12% respectively. It was supported by different international studies reporting prevalence of HBV and HCV infections to be 10.6% & 11.5%⁷; and 19.2% & 21% respectively in dialysis dependent patients of ESRD³⁶.

This study results revealed that 35% ESRD patients undergoing hemodialysis were suffering from respiratory tract infections, while in a Turkish study it was reported as 12.8%²¹. The reason for high respiratory complications is paucity of hemodialysis due to poverty of patients, less local dialysis facilities, poor ultrafiltration and less dialysis time due to high turnover.

LIMITATIONS

There are some limitations of this study as it consists of limited numbers of patients for limited time from one health center, therefore we need a multi-centric randomized study with increased number of patients for long duration for detailed assessment and definite conclusion.

CONCLUSION

Most end stage renal disease patients on hemodialysis had one or more complications and the most frequent were fatigue and neuropsychiatric complications. Common neurological complications like headache, stroke, seizures, altered sensorium were observed more frequently.

RECOMMENDATIONS

A multidisciplinary approach need to be adopted by including different departments e.g. neurology, psychiatry, cardiology, pulmonology, infection and hematology, to address these complications more timely and effectively.

REFERENCES

- Horigan AE. Fatigue in hemodialysis patients: a review of current knowledge. *J Pain Symptom Manage* 2012; 44:715-24.
- Sesso RC, Lopes AA, Thomé FS, Lugon JR, Santos DR. 2010 report of the Brazilian dialysis census. *J Braz Nephrol* 2011; 33:442-7.
- Kusumoto L, Marques S, Haas VJ, Rodrigues RAP. Adults and elderly on hemodialysis evaluation of health related quality of life. *Acta Paulista de Enfermagem* 2008; 21:152-9.
- Huang KW, Leu HB, Luo JC, Chan WL, Hou MC, Lin HC et al. Different peptic ulcer bleeding risk in chronic kidney disease and end-stage renal disease patients receiving different dialysis. *Dig Dis Sci* 2014; 59:807-13.
- Pekel NB, Yildiz D, Kahvecioglu S, Kilic AK, Yildiz A, Seferoglu M et al. Restless legs syndrome and related factors in peritoneal dialysis patients. *Acta Medica Madit* 2017; 33:101.
- Perl J, Unruh ML, Chan CT. Sleep disorders in end-stage renal disease: Markers of inadequate dialysis?. *Kidney Int* 2006; 70:1687-93.
- Theofilou P. Non-compliance with medical regimen in haemodialysis treatment: A case study. *Case Rep Nephrol* 2011; 2011:476038.
- Deschamps A, Grunfeld JP, Druke T, Zingraff J, Jungers P. Arterial hypertension and mortality due to cardiovascular complications in patients on chronic hemodialysis. *Arch Mal Coeur Vaiss* 1978 Jul; 71:25-9.
- Chiu DY, Green D, Abidin N, Sinha S, Kalra PA. Echocardiography in hemodialysis patients: uses and challenges. *Am J Kidney Dis* 2014; 64:804-16.
- Luma HN, Halle MP, Eloumou SAFB, Azingala F, Kamdem F, Donfack-Sontsa O et al. Seroprevalence of human immunodeficiency virus, hepatitis B and C viruses among haemodialysis patients in two newly opened centres in Cameroon. *Pan Afr Med J* 2017; 27:235.
- Sun J, Yu R, Zhu B, Wu J, Larsen S, Zhao W. Hepatitis C infection and related factors in hemodialysis patients in China: systematic review and meta-analysis. *Renal failure*. 2009; 31:610-20.
- McKercher CM, Venn AJ, Blizzard L, Nelson MR, Palmer AJ, Ashby MA et al. Psychosocial factors in adults with chronic kidney disease: characteristics of pilot participants in the Tasmanian Chronic Kidney Disease study. *BMC nephrol* 2013; 14:83.
- Teles F, Azevedo VF, Miranda CT, Miranda MP, Teixeira Mdo C, Elias RM. Depression in hemodialysis patients: the role of dialysis shift. *Clinics* 2014; 69:198-202.
- Ibrahim S, El Salamony O. Depression, quality of life and malnutrition-inflammation scores in hemodialysis patients. *Am J Nephrol* 2008; 28:784-91.
- Bossola M, Vulpio C, Tazza L. Fatigue in chronic dialysis patients. *Semin Dial* 2011; 24:550-5.
- Cukor D, Peterson RA, Cohen SD, Kimmel PL. Depression in end-stage renal disease hemodialysis patients. *Nat Rev Nephrol* 2006; 2:678-87.
- Taskapan H, Ates F, Kaya B, Emul M, Kaya M, Taskapan C et al. Psychiatric disorders and large interdialytic weight gain in patients on chronic haemodialysis. *Nephrology* 2005; 10:15-20.
- Yang X, Fang W, Kothari J, Khandelwal M, Naimark D, Jassal SV, et al. Clinical outcomes of elderly patients undergoing chronic peritoneal dialysis: experiences from one center and a review of the literature. *Int Urol Nephrol* 2007; 39:1295-302.
- Zhang J, Zhang P, Ni X, Bao B, Huang C, Wu Y et al. Vitamin D status in chronic dialysis patients with depression: a prospective study. *BMC Psychiatry* 2014; 14:125.
- Bossola M, Di Stasio E, Marzetti E, De Lorenzis K, Pepe G, Vulpio C. Fatigue is associated with high prevalence and severity of physical and emotional symptoms in patients on chronic hemodialysis. *Int Urol Nephrol* 2018; 50:1341-6.
- Gulsum Ozkan & Sukru Ulusoy. Acute Complications of Hemodialysis. *Karadeniz Tech Uni School Med Depart Nephrol Turkey* 2011; 16:251-94. Available at: <http://cdn.intechweb.org/pdfs/24624.pdf>
- Liu J, Yu SB, Zeng XX, Yuan HH, Salerno S, Fu P. Clinical Characteristics of Pneumonia in Chinese Hemodialysis Patients. *Chin Med J* 2018; 131:498-501.
- Khanna D, Singal A, Kalra OP. Comparison of cutaneous manifestations in chronic kidney disease with or without dialysis. *Postgrad Med J* 2010; 86:641-7.
- Ravi V, Iskander F, Saini A, Brecklin C, Doukky R. Clinical predictors and outcomes of patients with

- pericardial effusion in chronic kidney disease. *Clin Cardiol* 2018; 41:660-5.
25. Semaan V, Noureddine S, Farhood L. Prevalence of depression and anxiety in end-stage renal disease: A survey of patients undergoing hemodialysis. *Appl Nurs Res* 2018; 43:80-5.
 26. Lakshman SS, Ravikumar P, Kar G, Das D, Bhattacharjee K, Bhattacharjee P. A comparative study of neurological complications in chronic kidney disease with special reference to its stages and haemodialysis status. *J Clin Diagn Res* 2016; 10:OC01-4.
 27. Bathla N, Ahmad S, Gupta R, Ahmad S. Prevalence and Predictors of Poor Sleep Quality in Patients on Maintenance Hemodialysis. *Sleep Vigil* 2017; 1:31.
 28. Yoong RK, Mooppil N, Khoo EY, Newman SP, Lee VY, Kang AW et al. Prevalence and determinants of anxiety and depression in end stage renal disease (ESRD). A comparison between ESRD patients with and without coexisting diabetes mellitus. *J Psychosom Res* 2017; 94:68-72.
 29. Tzanakaki E, Boudouri V, Stavropoulou A, Stylianou K, Rovithis M, Zidianakis Z. Causes and complications of chronic kidney disease in patients on dialysis. *Health Sci J* 2014; 8:343.
 30. Asgari MR, Asghari F, Ghods AA, Ghorbani R, Motlagh NH, Rahaei F. Incidence and severity of nausea and vomiting in a group of maintenance hemodialysis patients. *J Renal Inj Prev* 2017; 6:49-55.
 31. Covic A, Jackson J, Hadfield A, Pike J, Siriopol D. Real-world impact of cardiovascular disease and anemia on quality of life and productivity in patients with non-dialysis-dependent chronic kidney disease. *Advances in therapy*. 2017; 34:1662-72.
 32. Sarafidis PA, Mallamaci F, Loutradis C, Ekart R, Torino C, Karpetas A et al. Prevalence and control of hypertension by 48-h ambulatory blood pressure monitoring in haemodialysis patients: a study by the European Cardiovascular and Renal Medicine (EURECA-m) working group of the ERA-EDTA. *Nephrol Dial Transplant* 2019; 34:1542-8.
 33. Makar MS, Pun PH. Sudden cardiac death among hemodialysis patients. *Am J Kidney Dis* 2017; 69:684-95.
 34. Kuipers J, Verboom LM, Ipema KJR, Paans W, Krijnen WP, Gaillard CAJM et al. The prevalence of intradialytic hypotension in patients on conventional hemodialysis: A systematic review with meta-analysis. *Am J Nephrol* 2019; 49:497-506.
 35. Esteras R, Martín-Navarro J, Ledesma G, Fernández-Prado R, Carreno G, Cintra M et al. Incidence of Hypersensitivity Reactions During Hemodialysis. *Kidney Blood Press Res* 2018; 43:1472-8.
 36. Chiu YL, Chen HY, Chuang YF, Hsu SP, Lai CF, Pai MF et al. Association of uraemic pruritus with inflammation and hepatitis infection in haemodialysis patients. *Nephrol Dial Transplant* 2008; 23:3685-9.

CONTRIBUTORS

AMK conceived the idea, planned the study, did statistical analysis and drafted the manuscript. RM, MA and MI helped acquisition of data. MARA supervised the study and critically revised the manuscript. All authors contributed significantly to the submitted manuscript.