FREQUENCIES OF ACUTE INTRA-DIALYTIC COMPLICATIONS: A SINGLE CENTRE EXPERIENCE

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ABSTRACT

Objective: To determine frequencies of various acute complications in patients undergoing hemodialysis.
Study Design: Descriptive cross-sectional study.
Place and Duration of Study: Department of Nephrology Military Hospital (MH) Rawalpindi, from Jan 2016 till Mar 2016.
Material and Methods: A total of 150 patients who underwent haemodialysis at MH were enrolled in the study after informed consent on justification of inclusion and exclusion criteria. The patients were evaluated for the frequency of various intra-dialytic complications and data were analysed using SPSS version 19.
Results: Out of the 150 enrolled patients, males were 125 (83.33%) and females were 25 (16.67%). A total of 2520 haemodialysis session were performed. Hypotension was the most frequently observed complication during 318 (12.62%) dialysis sessions, followed by hypertension in 208 (8.25%) and fever in 193 (7.66%) sessions. Other complications were muscle cramps in 116 (4.60%), shivering in 94 (3.73%), headache in 70 (2.78%), nausea / vomiting 60 (2.38%), itching 41 (1.62%), chest pain 37 (1.47%), hypoglycaemia 31 (1.23%), seizures 23 (0.91%) and arrhythmias in 13 (0.52%) dialysis sessions.
Conclusion: Haemodialysis, one of the renal replacement therapies, is a life-saving treatment modality but it is not without complications despite the advances in technology. However frequency with which they occur is low and majority are not life threatening.

Keywords: Complications, Haemodialysis, Hypertension, Hypotension.

INTRODUCTION

Haemodialysis (HD) remains the most widely used renal replacement therapy despite advances in renal transplant and peritoneal dialysis modalities. Haemodialysis partially replaces missing renal functions and is indicated in renal failure and other medical emergencies like fluid overload and hyperkalemia. Current technology provides reliable and flexible treatment strategies guided by patient's well-being and careful evaluation of plasma urea concentrations.

Currently more than 2 million patients are treated with HD in about 28,500 dialysis centres worldwide[1]. Pakistan has an estimated 100 patients with end stage renal disease (ESRD) per million population. About 10% of them receive HD while less than 5% receive renal transplant[2]. At present there are an estimated 195 dialysis centres in Pakistan[3].

Acute complications commonly occur during routine HD treatments. They could be patient related or mechanical in origin (arising due to technical apparatus of dialysis machines). Mechanical complications are less common nowadays due to technical advancements and include dialyzer reactions, blood clotting or leaks, hemolysis, air embolism and contaminated dialysates. Awareness of the potential complications of the procedure should facilitate preventive and remedial interventions.

In our country limited research has been carried out on various complications of dialysis in adult patients. In the western world, national or multi-national ESRD registries regularly provide useful data from well-defined

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geographic areas. In contrast most developing nations have yet to develop such registries. As a result it is impossible to estimate the extent of problems of ESRD in these countries. Extrapolation of data of the industrialized nations on the developing countries is unrealistic because of the differences in the genetic background, ethnic composition, demography and the prevailing socioeconomic conditions of the populations[4]. ESRD patients in the subcontinent are younger as compared to their western counterparts. The median age of patients entering ESRD programs is 44 years in India, as compared to 52–63 years in developed countries[5]. Chronic glomerulonephritis shares the commonest cause of ESRD along with diabetes mellitus in our region[5,6]. Local studies on the topic are scarce and were done a long time ago[7,8]. With advancements in care of ESRD patients, there is a need to update current trends of intra-dialytic complications in our dialysis centres.

Table-I: The important intra-dialytic complications and their frequency.

Complication	Frequency (out of total dialysis sessions)	Percentage (of total dialysis sessions)
Hypotension	318	12.62
Hypertension	208	8.25
Arrythmia	13	0.52
Fever	193	7.66
Nausea / vomiting	60	2.38
Muscle cramps	116	4.60
Itching	41	1.62
Chest pain	37	1.47
Headache	70	2.78
Seizures	23	0.91
Shivering	94	3.73
Hypoglycemia	31	1.23
Total	1204	47.78

Table-II: Summary of studies comparing frequencies of intra-dialytic complications (Percentages).

Complications	Intern-ational studies[9]	2013 local study[7]	Nepalese study[11]	Indian study 2011[12]	Sub-Saharan study[13]	2002 local study[8]	Our study Percentages (Frequencies)
Hypotension	25 to 55	5.84	4.5	26.1	25	36.1	12.62 (318)
Hypertension	8-30	3.54	3.8	10.4	14		8.25 (208)
Arrhythmia				-			0.52 (13)
Fever	<1	1.52		14.4	7	44	7.66 (196)
Nausea / vomiting	5-15	3.22	1.4	32		56.3	2.38 (60)
Muscle cramps	5-20	3.08	0.8	3.1	22		4.60 (116)
Itching	5			-	10	22.8	1.62 (41)
Chest pain	2-5	0.96		13			1.47 (37)
Headache	5	0.9		10.4		14.9	2.78 (70)
Seizures	<10			-			0.91 (23)

The purpose of this study was to determine frequency of complications (non-technical) during HD at our hospital, so that necessary precautionary measures could be taken to avoid them in future. This study will augment existing data from our own country and will help

compare dynamics of our own population as compared to the west and other regions of the world.

MATERIAL AND METHODS

This descriptive cross-sectional study was carried out at the Nephrology Department of Military Hospital (MH) Rawalpindi. All adult patients aged more than 18 years who underwent haemodialysis at MH from Jan 2016 till March 2016 were included in the study. All patients under-went conventional intermittent HD with standard low-flux membranes and a bicarbonate bath. Informed consent was taken from participants of the study. Patients requiring emergency HD sessions having high risk for complications e.g. patients on ventilator, hemodynamic instability were not included in the study, though HD was performed. A standardized proforma was formulated which was to be filled by dialysis staff each time a patient showed signs/ symptoms of any complication.

A total of 150 patients enrolled by non-probability purposive sampling were followed up in 2520 hemodialysis sessions for the study period and any complication during dialysis was recorded. Patient's symptoms, nurses records and physicians interventions were recorded in a proforma and analyzed to sort out the possible complications. Vital signs were checked at the start and then hourly or whenever patient complained of being unwell. We defined hypotension as any recorded blood pressure fall equal or more than 20 mm of Hg in systolic BP from the baseline or systolic blood pressure during the dialysis session of <90 mm Hg with or with-out symptoms[9]. Intra-dialytic hypertension was defined as an increase in mean arterial blood pressure (MAP) ≥15 mmHg during or immediately after HD or an increase in systolic BP (SBP) >10 mmHg from pre to post-dialysis systolic blood pressure[10]. ECG was performed whenever patient complained of palpitations or heart sinking or any abnormality detected during pulse /BP examination. Occurrence of various complications during HD i.e. fever, chest pain, muscle cramps, rigors, vomiting, itching, headache, arrhythmias, seizures, hypoglycemic episodes (BSR <60mg/dL on glucometer) were recorded.

Data Analysis

The data were evaluated by SPSS version 19.0. Descriptive statistics i.e. mean and standard deviation were used to describe the quantitative variables like age while frequency and percentage were calculated for qualitative variables like gender, hepatitis B & C status and intra-dialytic complications.

RESULTS

A total of 2520 sessions were performed in 150 patients over 3 months and observed for complications. Male patients were 125 (83.33%) while 25 (16.67%) were female patients (fig-1). Age ranged from 18 years till 76 years with mean of 43.4 SD ± 12.59 (fig-2). On an average each patient received two dialysis sessions per week

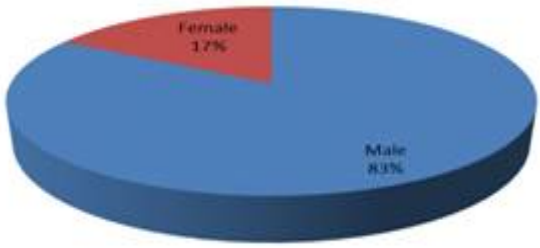

Figure-1: Gender distribution.

and each session was of 2-4 hours of duration. All patients received bicarbonate based dialysis. The mean blood flow, dialysate flow and ultrafiltration rates were 250 ml/minute, 500 mL/minute and 500ml/hour respectively. There were 12 (8.0%) patients HBsAg positive, 76 (50.66%) anti HCV positive, and 62 (41.33%) were having negative serology for hepatitis B & C (fig-3). In total around 1204 (47.78%) complications were noted in 941 (37.34%) sessions. The most common complication observed was hypo/ hypertension followed by fever, muscle cramps, headache, nausea/vomiting, itching, chest pain, seizures, arrhythmias (table-I).

DISCUSSION

The commonest complication seen in our study was haemodynamic instability namely intra-dialytic hypotension. Despite the fact that hypotension during dialysis is a very important and life threatening complication there is no evidence based consensus on its definition[11]. There is a wide variation in its prevalence in different studies; however our study showed slightly less prevalence as compared to international literature. This is consistent with findings in a recent study which identified intra-dialytic hypotension less prevalent as quoted in other studies[12].

In hypertensive patients, intra-dialytic hypertension is independently associated with over a 2.5-fold increased risk of hospitalization or death at 6-months[13]. Treatment of intra-dialytic hypertension should be individualized to the patient and includes lowering of dry weight, changing to non-dialyzable antihypertensive medications which inhibit RAAS or lower Endothelin, considering switching from intravenous to subcutaneous ESA, and altering the dialysis prescription.

One of the two previous local studies showed higher incidence of fever as intra-dialytic complication in our country in contrast to international data and our study also substantiates this finding. Contrary to world-wide literature, febrile reaction was an important complication during hemodialysis in our setups[8]. Most of these reactions occurred in patients having temporary / permanent dialysis catheters. When a patient with a dialysis catheter has fever, catheter infection must always be considered as they are a well-known cause of bacteremia[14].

Staphylococcus aureus, coagulase-negative *staphylococci* and gram-negative rods account for the majority of these infections. The incidence of catheter-related bacteraemia ranges between 0.6 and 6.5 episodes per 1000 catheter days and increases linearly with the duration of catheter use[15,16]. People with lower education may not understand the importance of infection control and poor hygiene results in an increased prevalence of infections in our community. The most important measure to prevent catheter infection is meticulous handling of the catheter at all times. Antibiotic lock solutions have been implicated with less bacterial infections in such

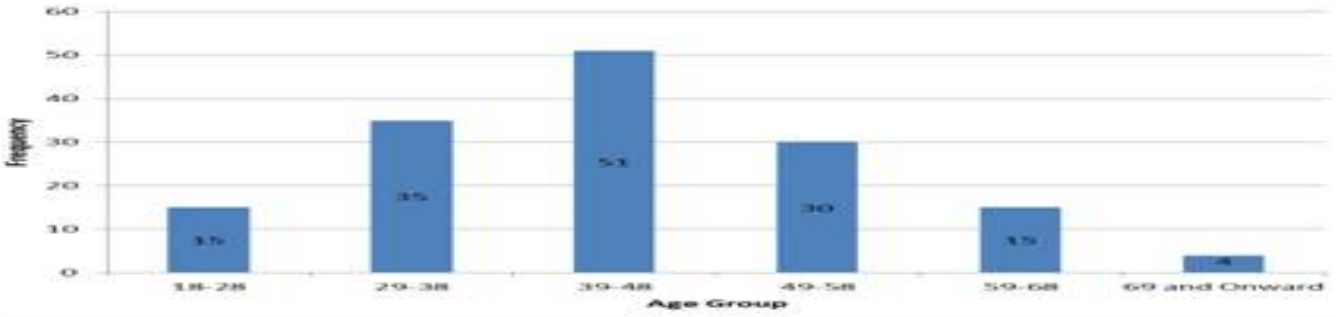

Figure-2: Bar diagram showing distribution of patients according to age group.

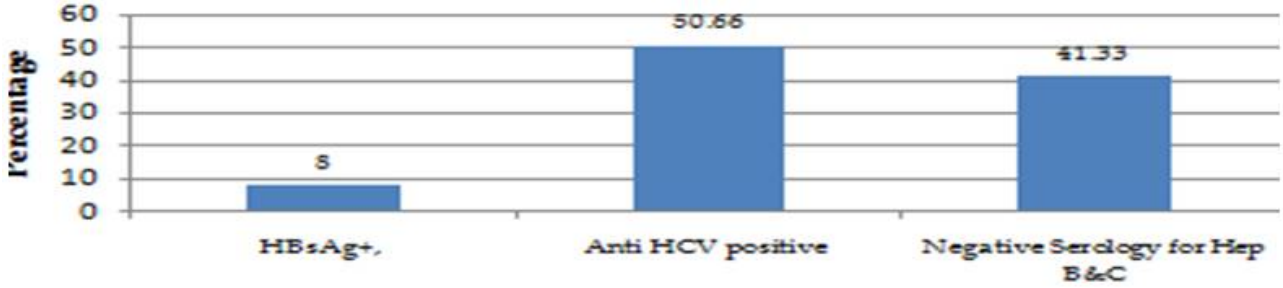

Figure-3: Column diagram showing Hepatitis B&C status in our hemodialysis patients.

patients. As per an estimate, initial vascular access for HD is un-cuffed catheters in 90% of the cases and AV fistula in 10% of the cases[17]. Early formation of AV fistula is another manoeuvre that can help prevent this complication.

Other factors causing fever during dialysis are dialyzer reactions and systemic infections in patients of ESRD.

Muscle cramps are also frequently observed complications during dialysis. They are responsible for 15% of premature discontinuation of HD[18]. Excessive ultrafiltration, intra-dialytic hypotension, electrolyte-mineral disturbances, hypo-osmolality are the most frequent causes. Muscle cramps can be treated by isotonic-hypertonic saline or hypertonic dextrose solutions (table-II).

Headache and nausea/vomiting were next common complications encountered. The International Headache Society (ICHD, 2004) included the hemodialysis headache in the headache classification. Although its exact prevalence is not certain, there exists wide variation in its incidence in different studies. This study observed 2.78% sessions having headache which is slightly less than other studies. Although its physiopathology is not fully clear, factors triggering headache may be hypertension, hypotension, low level of sodium, decreased serum osmolarity, low level of plasma renin, wide fluctuation in pre and post-dialysis BUN values and low levels of magnesium. If hemodialysis headache is suspected, the factors that are thought to trigger the headache should be addressed and necessary electrolyte replacements or a modification in the treatment modality should be made.

Nausea and vomiting is encountered in the hemodialysis patients at rates up to 10%[19]. While nausea and vomiting can be part of dialysis-related complications such as disequilibrium syndrome, hypotension, allergic reactions and electrolytic imbalance, they may also accompany acute coronary syndrome, cerebrovascular events and infections.

Electrocardiographic (ECG) alterations are frequently observed in patients receiving HD, and the incidence of arrhythmias increases during and immediately after the HD session[20]. Atrial fibrillation (AF), the most common supraventricular arrhythmia, was reported to occur more often in dialysis patients than in the general population[21]. It is important to attempt a reduction of the development of structural cardiac disease, particularly left ventricular hypertrophy (LVH) which predisposes the patient to both ischemia and arrhythmias and to optimize the dialysis procedure in terms of hemodynamic stability and electrolyte balance. Treatment with ACE inhibitors is associated with a lower number of new episodes of AF[22]. Less common complications during dialysis observed in this study were itching (1.62%), chest pain (1.47%) and seizures (0.91%). These findings are compatible with findings in other studies.

CONCLUSION

Haemodialysis, one of the renal replacement therapies, is a life-saving treatment modality but it is not without complications despite the advances in technology. However frequency with which they occur is low and majority are not life threatening.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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