FREQUENCY OF ACUTE COMPLICATIONS OF HEMODIALYSIS IN ADULT AGE GROUP AT A TERTIARY CARE CENTER

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ABSTRACT

Objective: To determine the frequency of acute complications of hemodialysis in adult age group at a tertiary care centre.

Study Design: Descriptive study.

Place and Duration of Study: Department of Medicine, Combined Military Hospital Lahore, from Apr 2012 to Oct 2012.

Patients and Methods: We included 100 consecutive patients of chronic kidney disease on hemodialysis with age more than 12 years. Personal profile, comorbidities, intravenous access type and duration, hemodialysis parameters were recorded for each patient. Monitoring of blood pressure, temperature, pulse and history of palpitations, headache, nausea, vomiting, muscle cramps, fever, shivering, chest-pain, bleeding, fits, itching was recorded before and up till one hour post hemodialysis session.

Results: In our study population fever was the commonest complication with frequency of 37%, followed by nausea and vomiting in 36%, muscle cramps in 28%, hypotension in 24%, headache in 23%, shivering in 22%, chest Pain in 15%, itching in 14%, hypertension in 10%, cardiac arrhythmias in 8%, hemorrhage in 7% and Seizures in 7% of patients.

Conclusion: Infection related complications were more common in our set up as compared to international statistics which depicts that we should improve our antiseptic techniques.

Keywords: Acute complications, Hemodialysis, Infection.

INTRODUCTION

Hemodialysis is a life saving procedure in treatment of patients of acute and chronic renal failure but it is associated frequently with complications that are challenging to physicians[1,2]. Recognizing frequency of these complications and comparing with international statistics helps the dialysis team in keeping checks over quality of services delivered to the patients. As per international statistics hypotension (25-55%)[3,4] is the commonest complication followed by muscle cramps[3,4] (5 to 20%), nausea and vomiting[3,4] (5-15%), headache[3-5] (6.6%), cardiac arrhythmia, chest pain (5- 75%)[3,6,7], fever[3,4] with chills occurring in 1 to 4% cases. While working at nephrology unit of Combined Military Hospital Lahore frequency of complications of hemodialysis were observed much more as compared to international statistics. The local data search revealed availability of literature for frequency of the complications in children[8], but not for adult age group. Moreover few effect modifiers i.e. dialysis flow rate, ultrafilterate, duration, indication (emergency or routine), comorbid conditions like viral hepatitis, diabetes, hypertension, ischemic heart disease, gender and age were suspected for increased frequency of complications but study evidence was not available from literature[3,4,9-12]. The observations necessitated for comprehensive research work to identify the reasons for high frequencies of complications then addressing them to improve

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quality of dialysis care in the set up. Thus the study was conducted to determine frequency of acute complications of hemodialysis in adult age group in tertiary care set up of Combined Military Hospital of Lahore. The effect modifiers were also included in the study and results were stratified to upgrade literature.

PATIENTS AND METHODS

This descriptive study was conducted in department of Medicine at Combined Military Hospital Lahore from April 2012 to October 2012. Patients of acute and chronic kidney disease of age more than 12 years and of either gender coming for hemodialysis either as indoor or outdoor case were included in the study. In order to remove confounding factors following category of patients were excluded from the study i.e. patients with acute myocardial infarction, with existing cardiac arrhythmias, with left ventricular ejection fraction less than 30%, with systolic blood pressure less than 100 before start of session, with platelet count less than 50,000/ per ml, with double lumen catheter duration more than three weeks and hemoglobin less than 8 g/ dl. Sample size had been calculated through WHO calculator using 95% confidence level, 5% margin of error and taking expected percentage of muscle cramps i.e. 12.5% (least amongst all common variables as per international statistics)[3]. As per the calculated sample size, 100 patients were included in the study through non-probability sampling with informed written consent from patients and permission from hospital ethical committee. To avoid repetition, each patient was included only once in the study. Patient's complete demographic profile and past medical history including name, age, gender, and comorbidities i.e. ischemic heart disease, diabetes mellitus, hypertension, hepatitis B and C were recorded. Details of indication of dialysis as routine session or emergency session, hemodialysis flow rate, duration, quantity of ultrafiltrate removed were noted. Each patient was monitored before, during and up till one hour post hemodialysis for vital signs and complications.

Table-I: Frequency of complications of hemodialysis in adult age group at Combined Military Hospital Lahore and international data.

Outcome variables	Our study (n=100)	International data[3]
Hypotension	24%	25-55%
Muscle cramps	28%	5-20%
Nausea and vomiting	36%	5-15%
Headache	23%	6.6%
Cardiac arrhythmias	8%	5-75%
Itching	14%	50%
Chest pain	15%	5-75%
Hemorrhage	7%	10-15%
Fever	37%	1-4%
Hypertension	10%	<1%
Shivering	22%	1-4%
Seizures	7%	<1%

Data had been analyzed using SPSS version 17. Descriptive statistics were used to describe the results i.e. mean and standard deviation (SD) for quantitative variables while frequency along with percentages for qualitative variables. To study the effect of baseline characteristics on complications of hemodialysis, logistic regression was applied. A p-value <0.05 was considered as significant.

RESULTS

Hundred patients were included in the study with average age of 56.23 years (SD=16.1) including 67 (67%) males. Majority (60%) of patients came for routine maintenance sessions while 40% patients were brought for emergency dialyses.

Average duration of dialysis was 2.95 hours (SD=0.687), average ultra filterate was 1.035 liters (SD=0.664) and average flow rate was 217.5 ml/ min (SD=34.36). Major comorbidity observed was hypertension (64%) followed by diabetes mellitus (40%), hepatitis C virus (23%), ischemic heart disease (18%) and hepatitis B virus (4%). Most frequent complication occurred was fever (37%), nausea and vomiting (36%), muscle cramps (28%), hypotension (24%), headache (23%), shivering (22%), chest pain (15%), itching (14%), hypertension (10%), cardiac arrhythmias (8%), hemorrhage (7%)and Seizures (7%) (table-I & while hemorrhage was significantly higher in females.

DISCUSSION

The major renal replacement therapy worldwide is hemodialysis for end stage renal disease (ESRD)[1-4]. The Haemodialysis improves quality of life, though it is associated with complications[3,4] which affects compliance of the patients. Haemodialysis services at Combined Military Hospital Lahore are offered free to patients of armed services and on payment to non-entitled patients. The patients undergo

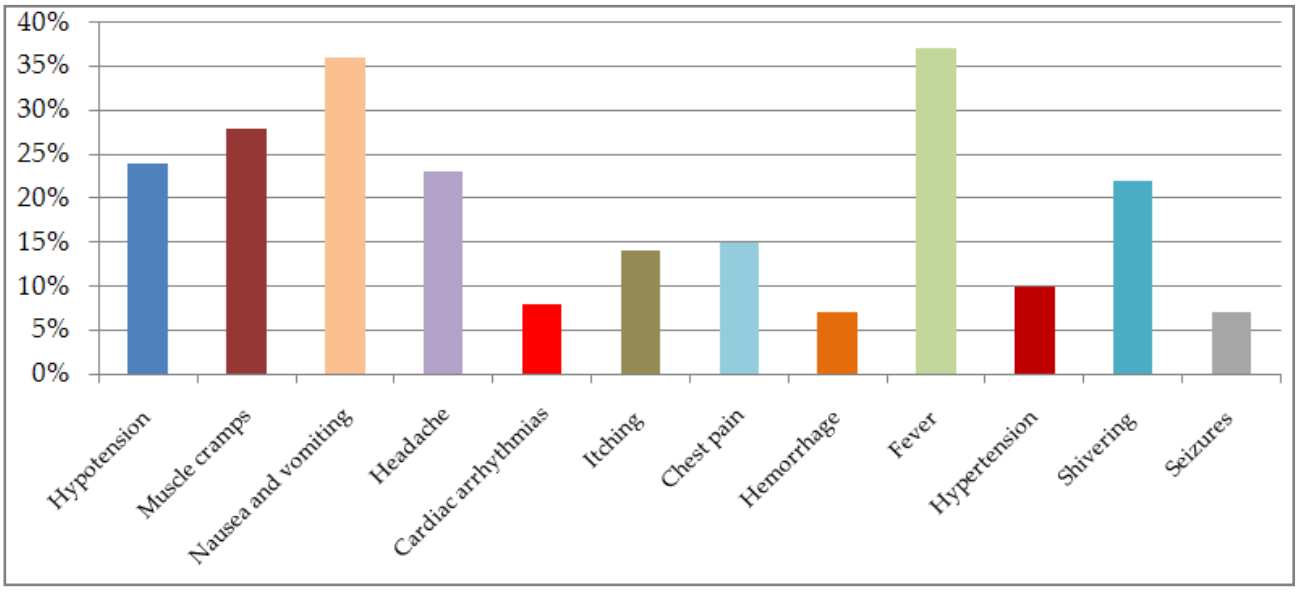

Figure: Description of acute complications during Hemodialysis in adult age group (n=100).

figure). Effect of confounders i.e. gender, age, indication of dialysis, duration of dialysis, ultra-filterate removed, flow rate, viral hepatitis C & B, ischemic heart disease, diabetes mellitus and hypertension on complications had been studied. Results of regression analysis revealed that these factors simultaneously effect only hypotension, muscle cramps, itching and hemorrhage (table-II). Hypotension was significantly higher in patients came for emergency dialysis and also those with longer duration of dialysis. Muscle cramps are significantly higher in patients with emergency dialysis. Itching was significantly higher in females, young patients, in patients with hypertension and ischemic heart disease,

Haemodialysis either in emergency situations or routinely for maintenance purpose[4]. Dialysis duration varies from two to four hours[4], Flow rate[4] ranges from 200ml/min to 400ml/min and ultrafilterate removal[4] varies from nil to 3 liters in a session. Intravenous access in earlier phase achieved through placement of double lumen catheter[13] and later permanent arterio venous fistula[14] is created surgically. This study of 100 patients revealed high frequency of complications of Haemodialysis at Combined Military Hospital Lahore. Comparing results with international statistics[3], high frequencies of fever, nausea vomiting, muscle cramps, hypotension, headache and shivering in our set up were

detected as shown in table-I. Frequency of fever found in 37% of patients as compared to 4% worldwide. This is feature of infections[4,13,14]. The risk of infection is minimized through Aseptic techniques for placement of double lumen catheter and dialysis procedure. Other measures include maintenance of hygiene of dialysis centre, good immune status and personal hygiene of patients[4,13,14]. Nausea and vomiting found in 36% of patients as compared to 5-15%[3] in western world. Nausea and Vomiting arise due to infections, uremic gastropathy and dialysis disequilibrium syndrome. Preventive strategy includes antiseptic measures, anti emeticand antacids[4]. Muscle cramps found in 28% of our patients as compared to 5-20%[3,4] in western world. Contributory factors for muscle cramps include Subnormal muscle metabolism[4], Hypotension, changes in plasma osmolarity, hyponatremia, carnitine deficiency, hypomagnesemia and tissue hypoxia. Hypertonic glucose, saline and mannitol are useful in treatment of cramps[4,15,16]. Preventive measures[4,15] include avoidance of intradialytic hypotension and osmolarity changes. Hypotension found in 24%patients match able to worldwide statistics 25-55%[3]. In patients with hypotension[4], ultrafiltrate is closed, the patient is brought to a Trendelenburg position and given bolus of Intravenous fluid i.e. normal saline[4,15]. Preventive measures[16,17] for hypotension include avoidance of Antihypertensive drugs, correction of anemia, preference for bicarbonate-based dialysate and dialysate with high calcium content. Headache was found in 23 (23%) of our patients as compared to 6.6%[3] in international statistics. Factors triggering headache[4,18] include hypertension, hypotension, hyponatremia, decreased serum osmolarity, low plasma rennin, changes in blood urea nitrogen levels and low levels of magnesium. Psychological factors, depression, financial burdens are common contributors to headaches in our population. Providing maximum comfort and adding anti-depressants may be helpful in reducing the frequency of headaches. Shivering was observed in 22 (22%) of patients as compared to 1-4 % in international statistics[3]. It is associated with fever and preventable with infection

Table-II: Effect of baseline characteristics on acute complications during Hemodialysis.

Complications	Hypotension		Muscle cramps		Itching		Hemorrhage	
	Odds Ratio	*p*-value	Odds Ratio	*p*-value	Odds Ratio	*p*-value	Odds Ratio	*p*-value
Gender (F)	1.077	0.902	0.618	0.352	17.289*	0.018	0.048*	0.023
Age	0.984	0.422	0.999	0.929	0.910*	0.014	1.059	0.168
Dialysis (Emergency)	5.938*	0.022	3.437*	0.047	2.65E10	0.996	3.807E8	0.997
Duration	4.606*	0.016	0.684	0.421	1.536	0.692	0.729	0.761
Ultrafilterate	0.846	0.728	1.015	0.968	1.498	0.635	0.410	0.299
Flowrate	1.004	0.650	1.010	0.136	1.004	0.763	1.036	0.124
Hepatitis C (Positive)	1.296	0.691	0.711	0.546	0.372	0.306	1.862	0.632
Hepatitis B (Negative)	0.026	0.134	0.584	0.613	24.260	0.068	0.012	0.319
Ischemic Heart Disease (Positive)	0.648	0.536	1.263	0.741	0.099*	0.033	0.164	0.183
Diabetes Mellitus (Positive)	0.394	0.123	2.153	0.182	0.886	0.890	0.722	0.780
Hypertension (Positive)	1.842	0.317	0.934	0.897	5.773*	0.049	1.105	0.926

prevention. Cardiac arrhythmias were seen in 8% match able to 5-75%[3,19] worldwide. Chest pain was observed in 15% of patients comparing 5-75% internationally[3], and none of them had myocardial infarction as evaluated with ECG and cardiac enzymes. Chest pain in all patients settled spontaneously within few minutes of observation. No event of cardiac arrest was observed, though myocardial infarction and sudden cardiac deaths are reported 10 to 20 times more common during dialysis as compared to normal population[20]. Itching was found in 14% patients as compared to 50% worldwide[3]. Factors responsible include xerosis[21], peripheral neuropathy, increases in divalent ions[22], high level of parathyroid hormones[23] increases in the level of sensitivity to histamine[24] and dialysis-related factors[25]. The therapy involves moisturizing creams and capsaicin[4], low protein diet, cholestyramine, efficient dialysis, heparin, opioid antagonists, erythropoietin, parathyroidectomy, Serotonin antagonists, antihistamines and nicergoline. Hypertension was found in 10 (10%) of our patients match able to 12-13% worldwide[3]. An intradialytic increase of >10 mmHg BP was considered as hypertension in our patients. In the treatment of hypertension in haemodialysis patients attainment of dry weight is important[26] for which sodium chloride should be restricted to 5 gram per day, weight gain between two sessions kept up to 1kg during the week and to 1.5-2 kg at weekends. Sodium profiling, avoidance of fluids with high sodium, gradual change in weight of the patients to their dry weight, additional dialysis sessions and prolongation of duration of session are recommended[4,26] persistent hypertension after attainment of dry weight requires antihypertensive therapies. Hemorrhage was observed in 7 (7%) of our patients as compared to 10%-15% as per international statistics[3]. It was found as gum bleed, upper gastrointestinal tract bleed, bleeding from arteriovenous fistula. None of the patients was found to have hemorrhagic stroke, probably prevented successfully by use of preventable measures[27] i.e. low heparin use in high risk patients. Seizures were found in 7 (7%) of patients as compared to less than 1% worldwide. Seizures are associated with electrolyte disturbance and dialysis disequilibrium syndrome[4]. They are preventable[4] with slow rate of dialysis and short duration frequent sessions in the beginning, gradual normalization of electrolytes, fluid and BUN. Effect of confounders i.e. gender, age, indication of dialysis, duration of dialysis, ultrafilterate removed, flow rate, viral hepatitis C and B, ischemic heart disease, diabetes mellitus and hypertension on complications had been studied. Results of regression analysis revealed that these factors simultaneously affect only hypotension, muscle cramps, itching and hemorrhage (table-II). Hypotension was significantly higher in patients came for emergency dialysis and also those with longer duration of dialysis. Muscle cramps are significantly higher in patients with emergency dialysis. Itching was significantly higher in females, young patients, in patients with hypertension and ischemic heart disease. While hemorrhage was significantly higher in females. Limitation of study was availability of limited number of new patients. New patients arriving for dialysis at Combined Military Hospital Lahore were 4-5 patients per week. Otherwise study could have been extended to many more patients. Study of 100 patients is insufficient to cover rare complications like dialysis disequilibrium syndrome, cardiac arrest, myocardial infarction, stroke etc. Another study is recommended with large number patients over a longer duration for more information regarding rare complications.

CONCLUSIONS

Infection related complications were more common in our set up as compared to international statistics which depicts that we should improve our antiseptic techniques.

CONFLICT OF INTEREST

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

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