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INTRADIALYTIC COMPLICATIONS DURING HEMODIALYSIS: A SINGLE CENTRE, PROSPECTIVE, OBSERVATIONAL STUDY

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ABSTRACT **Introduction:** Hemodialysis is type of renal replacement therapy used for patients with acute kidney injury, end-stage renal disease and patients with fluid and electrolyte imbalances. Though hemodialysis is a life-saving treatment for such patients, it is associated with various intradialytic complications. The prevalence of intradialytic complications among patients undergoing hemodailysis ranges from 20 to 63%. However, such studies from north-east part of India are missing. Hence, this study was undertaken to evaluate various intradialytic complications, and their incidence in this tertiary care centre from north-east India. **Materials and Methods:** A total of 2867 patients on hemodialysis were studied for complications during hemodialysis. A detailed history and appropriate clinical examination was done in each patient. Complications encountered were divided into three groups: patient- related complication, technical complications, and vascular access- related complications. Data was compiled and appropriate statistical analysis was done. **Results:** The incidence of intradialytic complications was 36.87% of patients in the present study. Most patients with intradialytic complications had diabetic kidney disease (51.2%), followed by chronic glomerulonephritis (16.6%). 80% of complications were patient related, followed by vascular access related complications in 22.32%, and technical complications in 3.41% of the patients. Intradialytic hypotension (29.39%) was the most common patient related complication in this study, followed by nausea and vomiting (20.07%). **Conclusion:** Hemodialysis is a life-saving treatment for patients with severe degree of renal impairment, however it is associated with various intradialytic complications. Patient-related complications, such as hypotension, nausea, and vomiting, were the most common, highlighting the importance of vigilant monitoring and proactive management during hemodialysis sessions. Vascular access-related complications, particularly catheter-related issues, were also observed, emphasizing the need for regular assessment and appropriate maintenance of vascular access.

KEYWORDS :

INTRODUCTION

Haemodialysis (HD) is a form of renal replacement therapy (RRT), where the kidney's role of filtration of the blood is supplemented by artificial equipment, which removes excess water, solutes, and toxins when the kidneys are unable to do so.(1) The incidence of renal replacement therapy (RRT) depends on the incidence and prevalence of conditions causing acute kidney injury (AKI), end-stage renal disease (ESRD), early diagnosis of chronic kidney disease (CKD), and measures to slow the progression to ESRD.(2) Globally, the prevalence of kidney diseases has increased in the last two decades, currently standing at 11- 13%.(3) This might be due to the increasing burden of diabetes mellitus, hypertension, glomerular diseases, renal stone diseases, and the use of over-the-counter medications. The Global Burden of Disease, Injuries and Risk Factors study estimates the worldwide number of men with impaired kidney function at 336 million and the number of women at 417 million, a ratio of 0.81; the number of men treated with dialysis at 1.7 million, and women at 1.3 million, a ratio of 1.3.(4) CKD affects 10 to 15% of adults in the US, Europe and Asia, and the prevalence increases dramatically with age (from 4% at age 20–39 to 47% at age 70+ years in the US).(5)

MATERIALS AND METHODS

The present study was conducted in the Department of Nephrology, Gauhati Medical College, Guwahati, Assam. A total of 2867 patients requiring dialysis who were willing to participate, and signed the informed consent document were enrolled in the study. Pregnant and lactating women, and patients aged less than 18 years were excluded from the study. All patients were subjected to detailed history, clinical examination and appropriate biochemical evaluation. Complications encountered were divided into three groups: patient-related complication, technical complications, and vascular access-related complications.The approval of study was obtained from the Institutional Ethical Committee. Data was compiled and appropriate statistical analysis was done.

RESULTS

Mean age in our study was 47.82 ± 11.66 years with predominantly males (64.95%). Majority of the patients required hemodialysis for diabetic nephropathy (38.75%), followed by chronic glomerulonephritis (21.28%), acute kidney injury (15.21%), rapidly progressive glomerulonephritis (8.79%), hypertensive nephropathy (7.95%), cystic kidney disease (4.92%) and unexplained renal failure (3.10%). (Table 1) The majority of the patients had vascular access via a temporary central catheter (47.51%) and an AVF (30.97%) in the present study.

The incidence of intradialytic complications was 36.87% of patients in the present study. Most patients in this study who suffered from complications had diabetic nephropathy (51.2%) followed by chronic glomerulonephritis (16.6%). (Table 2) There was significant association between the intradialytic complications with age group of 41-60 years. In the present study, male gender was found to be significantly associated with intradialytic complications.

In the present study, 80% of the complications were patient related among which the most common complication was hypotension (29.39%) followed by nausea and vomiting (20.07%).(Fig1) The vascular access related complications were 22.32% in which catheter infection and femoral hematoma were the most common complications in this study.(Fig2) Only 3.41% of the patients had technical complications. Among those technical complications, dialyzer reactions were the most frequent (55.56%) followed by blood clots in the dialyzer.

DISCUSSION

The majority of patients who required hemodialysis had diabetic nephropathy (38.75%) in the present study. Ali M et al also observed that 47.9% patients requiring hemodialysis had diabetic nephropathy.(3) 47.51% patients had vascular access via a temporary central catheter and 30.97% had AVF in the present study. Similarly 50% of the patients had AVF as their vascular access, while the remaining 50% had tunneled or temporary central lines in their study by Raja SM and Seyoum Y.(6)

36.87% of patients had intradialytic complications in the present study. Similar incidence occurred in 36.2% of total HD sessions in study by Amira CO.(7) A total 50 patients suffered from more than one type of complication. Among these patients, 24 had patient related and vascular access complications and only 2 patients had complications of all types i.e., patient related complications, vascular access, and technical complications.

In present study, 80% of the complications were patient related among which the most common complication was hypotension (29.39%) followed by nausea and vomiting (20.07%). Ali et al found hypotension to be the most common complication (28.7%), followed by hypertension (17.0%), nausea/vomiting (11.75%).(3) The most frequent intradialytic complications was hypotension, which occurred in 10% of the sessions, followed by nausea and vomiting (5.24%) in the study by Raja SM and Seyoum Y.(6) According to the literature, the most prevalent acute consequence of HD is hypotension (20-50%), followed by muscle cramps (20%), nausea and vomiting (5-15%). Hypotension may be caused by a high ultrafiltration rate, a high dialysate temperature, a low sodium level in the dialysate, antihypertensive medication, autonomic dysfunction, and a poor cardiac reserve due to underlying coronary artery disease. The main cause of nausea and vomiting is intradialytic hypotension. Other factors may be gastroparesis, particularly in diabetic individuals, high salt and calcium concentrations in the dialysate, and dialysis disequilibrium syndrome.(8)

The vascular access related complications were 22.32% in which catheter infection. According to Lok CE et al, infection and sepsis are the most prevalent major vascular access consequences. Sepsis and infections associated to vascular access continue to be a major cause of morbidity and mortality in dialysis users.(9) Ravani et al concluded that patients utilising catheters for HD appear to have the highest risk of death, infections, and cardiovascular events when compared to other vascular access options, whereas individuals with useable fistulas had the lowest risk.(10)

In the present study, only 3.41% of the patients had technical complications. Among those technical complications, dialyzer reactions were the most frequent (55.56%), followed by blood clots in the dialyzer. In a study by Ali et al, only two cases of type B dialyzer reaction and one case of dialysis equilibrium syndrome were reported.(3) Mehmood et al, on the other hand, observed a 5% incidence of dialyzer reactions.(1) A study that examined the frequency of responses found that reactions occurred 0.17 times out of every 1000 sessions with cellulose membranes and 4.2 times out of every 1000 sessions with synthetic membranes annually. These responses are therefore not very prevalent, although they do happen occasionally in all dialysis units, and they are more usually linked to the use of synthetic membranes.(11)

There was a significant association between the intradialytic complications and age group of 41-60 years in the present study (p-value < 0.0001).(Fig3) Very few studies analysed the association of age with intradialytic complications. For instance, Sands et al. conducted a study involving patients with an age range of 55.4-68.4 years and found a significant association with intradialytic hypotension (p-value < 0.0001).(12) In the present study, male gender was found to be significantly associated with intradialytic complications (p-value < 0.0001). Similarly, Ali et al. and Sands et al. also found the association between male gender and intradialytic complications to be significant (p-value = 0.04 and p-value < 0.001 respectively).(3,12)

CONCLUSION

Patient-related complications, such as hypotension, nausea, and vomiting, were the most common intradialytic complications, highlighting the importance of vigilant monitoring and proactive management during hemodialysis sessions. Vascular access-related complications, particularly catheter-related issues, were also observed, emphasizing the need for regular assessment and appropriate maintenance of vascular access.

Table 1. Distribution of patients according to reasons for hemodialysis

Etiology	N (=2867)	%
Diabetic nephropathy	1111	38.75
Chronic glomerulonephritis	610	21.28
Acute kidney injury	436	15.21
RPGN	252	8.79
Hypertensive nephropathy	228	7.95
Cystic kidney disease	141	4.92
Unexplained	89	3.10

Table 2. Distribution of patients with complications according to etiology

Etiology for HD	N (=1057)	%
Diabetic nephropathy	541	51.2
Chronic glomerulonephritis	176	16.6
RPGN	118	11.2
Acute kidney injury	114	10.8
Hypertensive nephropathy	48	4.5
Cystic kidney disease	38	3.6
Unexplained	22	2.1

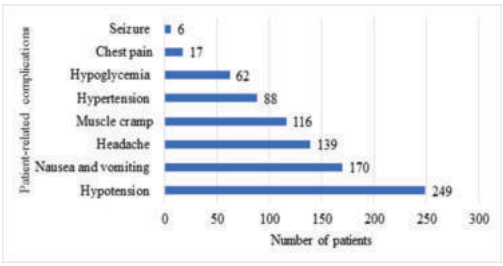

Figure 1. Distribution of patients according to patient-related complications

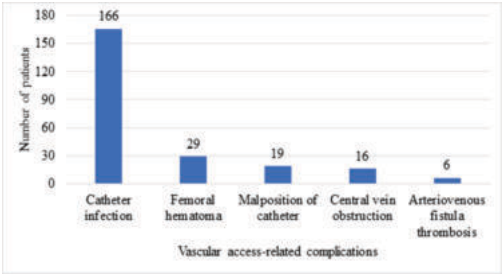

Figure 2. Distribution of patients according to vascular access-related complications

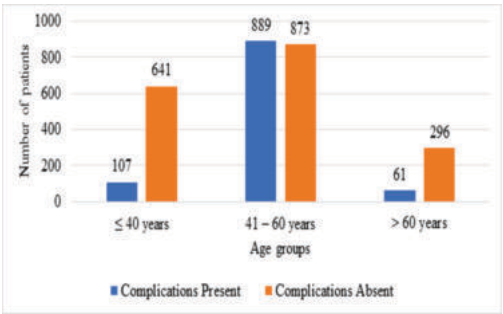

Figure 3. Association of complications with age

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