INTRADIALYTIC COMPLICATIONS AND THEIR IMPACT ON DIALYSIS RECOVERY TIME IN HEMODIALYSIS PATIENTS: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Introduction:

The prevalence of Chronic kidney disease (CKD) is rising globally, making renal failure a widespread issue. Renal replacement therapy is an essential lifesaving treatment for end-stage renal disease, with hemodialysis being the primary method to eliminate waste and toxins from the body. Hemodialysis (HD) therapy necessitates seamless coordination among the healthcare team. However, despite the use of modern and efficient dialysis machines, patients may still experience various complications. Post-dialysis fatigue is a frequent and distressing issue for patients. Dialysis recovery time (DRT) has recently emerged as a reliable method for post-dialysis fatigue assessment. Understanding how intradialytic symptoms affect dialysis recovery time can help identify targets for improvement and reduce skipped sessions, hospitalization, and death risks.

Aim:

The aim of the study is to examine the impact of Intradialytic complications on patient Dialysis recovery time (DRT).

Methodology:

A prospective observational study was conducted over a period of eight months from November 2023 to June 2024 in the hemodialysis unit of two multi-speciality hospitals under Krishna institute of medical sciences (KIMS) in Telangana, India. The necessary data was collected by using paper based data collection forms from patient hemodialysis records and self-designed questionnaire forms. 260 patients from hemodialysis unit were participated in the study. The data was collected and analysed using SPSS 29.0.1.0 version software.

Results:

The study enrolled a total of 260 subjects, most were male 170 (65.4%) with the predominant age group being 60-70 years (29.2%). Majority of them 253(97.3%) had one or more comorbidities with Hypertension (94.2%) being the most common conditions leading to the development of CKD. Most of the patients were scheduled for dialysis thrice a week (71.5%) and had been on dialysis for 1-3years (31.3%). Very few (2.7%) patients experienced no Intradialytic complications. The most common intradialytic complications observed was Cramps (52%), followed by Post HD asthenia (38%), Hypotension (15.3%), Vomiting (11.5%), Headache (8.8%). Regarding Dialysis recovery time (DRT), majority of patients recovered within less than 2 hours (37.3%), followed with more than 24 hours (27.7%), 2-6 hours (22.3%), and 7-12 hours (12.7%). Intradialytic complications (P <0.01) and Period of dialysis (P <0.034) were significantly associated with prolonged Dialysis recovery time (DRT).

Conclusion:

The conducted research shows that there is an association within the Intradialytic complications experienced during or after Hemodialysis and Dialysis recovery time (DRT) as well as within Period of dialysis and Dialysis recovery time (DRT).

Keywords:

Hemodialysis, Comorbidities, Intradialytic complications, Dialysis recovery time, Renal failure, Aneurysm.

INTRODUCTION:

Kidneys play an important role in homeostasis as they maintain the normal environment of the

body. The waste products produced in various metabolic activities are excreted through kidneys. Water and electrolyte balance in the body is also maintained by the healthy kidneys. In case of any renal diseases, kidneys are unable to perform these normal functions which would result in water and sodium retention in the body[1].

Chronic kidney disease is a heterogeneous disorder affecting kidney structure and function. It is based on the presence of kidney damage or decreased kidney function (i.e., glomerular filtration rate [GFR] <60 mL/min per) for 3 months or more, irrespective of clinical diagnosis. CKD can be detected with routine laboratory tests, and treatments can prevent development and slow disease progression, reduce complications and improve survival and quality of life. Early stages of disease are often asymptomatic, are detected during the assessment of comorbid disorders, and can be reversible. The disease is classified into five stages on the basis of GFR: more than 90 mL/min (stage 1),60–89 mL/min (stage 2), 30–59 mL/min (stage 3),15–29 mL/min (stage 4), and less than 15 mL/min (stage 5) and it is generally associated with old age, diabetes, hypertension, obesity, and cardiovascular disease[2].

Hemodialysis is the most common method - used to remove waste and toxic substances from the body, hence it is used to treat patients of different types of renal failure. Dialysis term is derived from Greek word Dia means through and lysis meaning Splitting or loosening3,wherein it uses a special filter or semi-permeable membrane that allows the blood to pass through it which then removes the extra water, body waste and toxic products from the blood. This procedure thus cleans the blood, maintains the homeostatic environment of the body and regulates the normal BP through maintaining the proper fluid and electrolyte balance. Hemodialysis therapy requires complete coordination between the health care team which includes nephrologists, dietitian, nurse, technician and social worker. But even with the use of modern and effective dialysis machines for therapy patients may still encounter with different types of complications[1&2].

These complications can occur during dialysis or in between dialysis[3]. However, frequency with which they occur is low and majority are not life threatening. 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 due to technical advancements and include dialyzer reactions, blood clotting or leaks, hemolysis, air embolism and contaminated dialysates[4].The most commonly associated complications include hypotension, muscle cramps, nausea and vomiting, headache, pruritus, fever and chills. Rarely, life threatening complications such as arrhythmias and other cardiovascular complications occur[5].

The dialysis recovery time (DRT) is a recent and reliable method of post-dialysis assessment. It entails asking patients “How long does it take you to recover from a dialysis session?”[6].Individuals on conventional HD typically report a median post-dialysis recovery time (DRT) in the range of 2–4 hours[7].The degree to which intradialytic symptoms result in lengthened time to recovery after dialysis or shortening or even skipping dialysis, which can increase the risk for hospitalization and deaths, can clarify the extent of the problem and allow targets for improvement to be set[8].

AIM AND OBJECTIVES

Aim:

The aim of the study is to examine the impact of Intradialytic complications on patient Dialysis recovery time.

Objectives:

1. To investigate the complications of Hemodialysis.
2. To determine the frequency of Intradialytic complications.
3. To evaluate the Dialysis recovery time (DRT).
4. To assess the impact of various Comorbidities on DRT.
5. To evaluate the influence of Frequency of dialysis on DRT.
6. Investigating the incidence of Intradialytic complications, considering the duration since the initiation of hemodialysis i.e. Period of dialysis and its implications on DRT.
7. To examine the impact of Intradialytic complications on patient's Dialysis recovery time (DRT).

METHODOLGY:

Study site and period:

The study was conducted in KIMS multispeciality hospital, Secunderabad and Kondapur for a period of 8 months i.e., from November 2023- June 2024. Study design- It is a prospective observational study.

Study instrument:

The data is collected by using paper-based data collection forms from patient hemodialysis records and self-designed questionnaire forms. The data collection form includes patient demographic details, comorbidities, frequency of dialysis, period of dialysis, access sites, intradialytic complications, dialysis recovery time and medications. The collected data were categorised and compared, and the results were analysed using the CHI-SQUARE test.

The study was approved by institutional ethics committee of St. Pauls college of Pharmacy, Osmania university, Hyderabad.

Study criteria-

a. Inclusion criteria-

1. Gender: Both male and female are included.
2. Age: Adults over 18 years.
3. Patients on maintenance Hemodialysis (HD).
4. Patients willing to answer the self-designed questionnaire forms.

b. Exclusion criteria-

1. Pregnant and Lactating women.
2. Patients below 18 years of age.
3. Patients with psychiatric conditions.

4. Patients who is not willing to answer the self-designed questionnaire forms.
5. Dead patients.
6. Road traffic accidents and drug abuse patients.

Statistics:

Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) software for windows (version 29.0.1.0). The CHI-SQUARE test was used for the analysis. A P-value less than 0.05 was considered to be statistically significant.

RESULTS

The study enrolled a total of 260 subjects. In this study the patients were routinely monitored with respect to Age, Gender, Economic category, Comorbidities, Frequency of dialysis, Period Of dialysis, Access sites, Prescription patterns, Intradialytic complications And Dialysis recovery time. Considering the age (from 18years and above), the predominant age group is 60-70 years (29.2%) with predominant age group being 60-70 years (29.2%). Among 260 patients 170 (65.4%) were male patients and 90 (34.6%) were female patients. Of them, 253 (97.3%) had Comorbidities and 7 (2.7%) had no Comorbidities. Most of the patients were scheduled for dialysis thrice a week (71.5%) and had been on dialysis for 1-3years (31.3%). In a total of 260 patients,30 patients had no Intradialytic complications and 230 patients had Intradialytic complications. The most common Intradialytic complications observed was Cramps (52%), followed with Post HD asthenia (38%), Hypotension (15.3%), Vomiting (11.5%), Headache (8.8%).Considering the Dialysis recovery time (DRT), majority of patients recovered within less than 2 hrs (37.3%), followed with more than 24 hrs (27.7%), 2-6 hrs (22.3%) and 7-12 hrs (12.7%).Intradialytic complications ($p < 0.01$) and Period of dialysis ($p < 0.03$) were significantly associated with prolonged Dialysis recovery time (DRT).

Table 1: Applying Chi-square test within Period of dialysis and Dialysis recovery time (DRT)

A Statistical Analysis was performed using Chi-Square test to analyse the Dialysis recovery time with respect to Period of dialysis. The P value is <0.005 which is considered to be in significance.

Period of dialysis * Dialysis recovery time (DRT) Crosstabulation

Count

		Dialysis Recovery Time				
		Less than 2hrs	2-6 hrs	7-12 hrs	More than 12hrs	Total
Period of dialysis	Less than 1 year	33	14	2	14	63
	1-3years	29	18	9	25	81
	3-5 years	14	14	9	10	47
	More than 5 years	21	12	13	23	69
Total		97	58	33	72	260

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	18.120[a]	9	.034
Likelihood Ratio	19.281	9	.023
N of Valid Cases	260		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 5.97.

Table 2: Applying Chi-square test within Intradialytic complications and Dialysis recovery time (DRT)

A Statistical Analysis was performed using Chi-Square test to analyse the Dialysis recovery time with respect to Intradialytic complications. The P value is <0.001 which is considered to be in significance.

Intradialytic complications * Dialysis recovery time (DRT) Crosstabulation
Count

		Dialysis Recovery Time				
		Less than 2hrs	2-6 hrs	7-12 hrs	More than 12hrs	Total
Intradialytic complications	YES	72	54	33	71	230
	NO	25	4	0	1	30
Total		97	58	33	72	260

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	32.051[a]	3	<.001
Likelihood Ratio	35.606	3	<.001
N of Valid Cases	260		

a.1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.81.

DISCUSSION

This prospective observational study was conducted over a period of 8 months in Hemodialysis patients at Krishna Institute of Medical Sciences (KIMS) in Secunderabad and Kondapur using paper-based data collection from patient Hemodialysis records and self-designed questionnaires. The objective is to enhance understanding of factors influencing Dialysis Recovery Time (DRT).

In this study the patients were routinely monitored with respect to Age, Gender, Economic category, Comorbidities, Frequency of Dialysis, Period of Dialysis, Access sites, Prescription

patterns, Intradialytic complications And Dialysis Recovery Time (DRT).

Comorbidities:

Most of the patients undergoing Hemodialysis had Comorbidities (97.3%), with Hypertension (94.2%) and Diabetes mellitus (50%) being the most common conditions leading to the development of CKD, which subsequently required Hemodialysis treatment. This is different from various other studies where diabetic nephropathy was the most common cause of ESRD by *Ali M et al*[9] (47.9%, n=45) *Raja and seyoum*[5] (48.3%, n=14) *Bartaula B et al*[11] (38.2%), *Fatima T et al*[10](52.4%). Results of the present study have indicated no statistical significance within Comorbidities and Dialysis Recovery Time (DRT).

Frequency of Dialysis:

Our study also strives to find the influence of Frequency of Dialysis sessions performed in patients and its effect on Dialysis Recovery Time (DRT). Based on the Frequency of Dialysis, most patients were scheduled for Hemodialysis thrice a week (71.5%), followed by twice a week (26.5%), with only a few attending four times a week and once a week. These results differ from other studies, such as *Ali M et al*[9], where 54.3% of patients attended dialysis twice weekly and 45.7% attended three times weekly. Similarly, *Yasir Mehmood et al*[1] reported that 95% of patients attended dialysis twice weekly, while only 5% attended three times weekly. The p-value for this association was not less than 0.05, indicating a statistically insignificant association within the Frequency of Dialysis and Dialysis Recovery Time (DRT).

Period of Dialysis:

Based on the duration since the start of dialysis i.e. Period of Dialysis, most patients had been on dialysis for 1-3 years (31.3%), followed by 5 years or more (26.4%), less than a year (24.2%), and 3-5 years (18.1%). We also correlated the Period of Dialysis and its impact on DRT where our study showed statistically significant association with a p-value of less than 0.05 (p-0.034)

Intradialytic complications:

Most patients (22.3%) in the study experienced at least one Intradialytic complication, while (2.0%) have more than 5 Intradialytic complications and (11.5%) did not have any Intradialytic complications during or after the Hemodialysis procedure. The most common Intradialytic complication observed was Cramps (52%) followed by Post HD asthenia (38%), Hypotension (15.3%), Vomiting (11.5%), Headache (8.8%), Body pains (5.3%), Giddiness (5%), Rigor/chills (4.2%), Fever (3.8%), Hiccups (2.3%), Nausea (2.3%), Hypoglycemia (2.3%) and Insomnia (1.5%). Aneurysm at Access Sites was also observed in some patients (3.8%) which is the major cause of access failure resulting in closure of access site and shifting to another access site. These observations are similar to many other studies[5,9,11]. The p-value for this association was found to be (p- <0.01), thereby suggesting a significant association within Intradialytic complications and Dialysis Recovery Time (DRT).

Dialysis Recovery Time:

Majority of the patients (37.3%) had a Dialysis Recovery Time of less than 2hours, followed by more than 24 hours (27.7%), 2-6 hours (22.3%) and 7-12 hours (12.7%) to recover after

their dialysis session. In *Elsayed et al*[6] Patients had a median DRT of 300 minutes (range: 0.0–2880.0), with 55% of patients reporting a DRT of > 240 minutes and 22.5% of them reporting a DRT of < 30 minutes. In *Luis Alvarez et al*[8] the Median time to recovery was 3 (range, 0-24) hours.

For this analysis, a p-value less than 0.05 is considered significant. The study revealed that the associations within Comorbidities and Dialysis Recovery Time, Frequency of Dialysis and Dialysis Recovery Time were not statistically significant, as indicated by p-values greater than 0.05. In contrast, the associations within the Period of Dialysis and Dialysis Recovery Time, and Intradialytic complications and Dialysis Recovery Time were statistically significant, as indicated by p-values less than 0.05 (p-0.034 and p-<0.01 respectively).

CONCLUSION

The conducted research demonstrates a clear correlation between Intradialytic complications experienced during Hemodialysis and Dialysis Recovery Time post-session.

To summarize, while Hemodialysis is lifesaving, effectively managing its complications is essential for enhancing patient well-being and treatment efficacy. During the study, hemodialysis session of each patient was observed, and common complications such as Cramps, Hypotension, Vomiting, and Post-HD asthenia were recorded. Most patients undergoing in-center hemodialysis report symptoms like feeling washed out, fatigue, and cramps.

Previous studies have consistently focused on either the Intradialytic complications or the Dialysis Recovery Time (DRT) and its impact on the lifestyle of patients and only a handful of research studies have been conducted on the impact of Intradialytic complications on Dialysis Recovery Time (DRT). This study highlights various factors influencing Dialysis Recovery Time emphasizing the need for methods to mitigate these complications and shorten recovery periods.

Our study showed that the recovery time post dialysis was prolonged and was directly proportional to the incidence and severity of Intradialytic symptoms. Regular assessment of patient reported symptoms is feasible in routine dialysis practice and can aid in evaluating the impact of clinical interventions.

The findings from our study have significant implications for healthcare practices. By highlighting the importance of monitoring and managing Intradialytic complications, healthcare providers can enhance patient care and improve recovery times, leading to better health outcomes and an improved quality of life for patients and we recommend incorporating Dialysis Recovery Time (DRT) into routine clinical evaluation of HD patients, potentially using it as a measure of dialysis treatment quality, thereby optimizing the overall dialysis treatment process. This approach by addressing factors influencing recovery time underscores the need for implementing targeted strategies to mitigate Intradialytic complications and to improve patient outcomes, ultimately refining Hemodialysis practices and contributing to superior patient care.

Further research and more prospective studies are necessary to confirm these conclusions and develop effective procedures to reduce the severity of Intradialytic complications and improve recovery times.

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