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Assessment of Intradialytic Complications and Predisposing Factors in Chronic Kidney Disease Individuals Receiving Hemodialysis

Lokesh Narayanaswamy[1]*, Rakshitha Gonur Prakasha Murthy[1], Nataraj Gowda Rajappa[2], Aravind Patil [3], Aman Suresh Tharayil[4] and Vaishnavi Sairaman[5]

[1]Department of Pharmacy Practice, S.J.M. College of Pharmacy, Chitradurga, Karnataka, India.
[2]Department of Pharmacology, S.J.M. College of Pharmacy, Chitradurga, Karnataka, India.
[3]Department of Nephrology, BMCH & RC Hospital, Chitradurga, Karnataka, India.
[4]Department of Pharmacy Practice Sandip Institute of Pharmaceutical Sciences, Nashik, Maharashtra, India.
[5]Department of Pharmacy Practice, Arulmigu Kalasalingam College of Pharmacy, Krishnan Koil, Tamil Nadu, India.

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The investigation focused on assessing the prevalence of complications and predisposing factors, assessing the co-morbidities, and comparing the risk of age and complications as hypertension in CKD patients undergoing haemodialysis. A prospective observational investigation was undertaken across two separate sites. Basaveshwara Medical College & Hospital and Akshaya Global Hospital, Chitradurga. The data was collected in a pre-designed data collection form after obtaining the patient's consent. After the data collection, the information was entered into an Excel spreadsheet and subjected to analysis. The statistical analysis includes the calculation of percentages, the generation of descriptive statistics, and the computation of Pearson correlations. The study enrolled 70 patients; there were more multiple complications and predisposing factors compared to single complications and predisposing factors. The prevalence of complications such as muscle cramps (75.75%), followed by chills (47.10%), itching (38.50%), and hypotension (34.30%), were higher. While predisposing factors such as elevated blood pressure (88.6%) and diabetes mellitus (65.7%) were more commonly observed. Co-morbid conditions of hypertension and diabetes (47.15%) were found more. Insignificant correlation was found between age as a risk factor and hypertension as a complication. Our study concludes that muscle cramps, chills, itching, and hypotension were common complications, while hypertension and diabetes were frequent predisposing factors. Hypertension with diabetes was the most common comorbidity, and no significant age-related correlation with hypertension as a complication was observed.

Keywords: Chronic Kidney Disease, Co-morbidities, Complications, Hemodialysis, Risk Factors.

Chronic kidney disease is defined as reduced glomerular filtration rate (GFR) of less than 60 mL/min per 1·73 m² or kidney damage indicators, or both, for a minimum of three months, demonstrating renal function, irrespective of the underlying cause. This definition has changed over time, but current international guidelines still apply. [1]

*Corresponding author E-mail: lokisaho789@gmail.com

Chronic kidney disease is a five-staged condition, ranging from very minimal kidney impairment in stage 1 to full kidney failure in stage 5[2]. Treatment for renal replacement is a costly but effective therapy that can save lives for people with advanced renal disease. This can take the kind of kidney transplant or dialysis.[3]

Dialysis is a process that removes excess water and waste from the blood. A machine filter used in haemodialysis is called a dialyser, or artificial kidney, to eliminate extra salt and water, to balance the body's other electrolytes, and to eliminate metabolic waste. In patients with renal failure, it is mostly utilised to give an artificial substitute for lost kidney function. [4]

It is common for haemodialysis to need removal of fluid (by the ultrafiltration process) since the majority of renal impairment patients pass little or no urine. Low blood pressure, exhaustion, headaches, nausea, cramping in the muscles, and chest pains are some of the side effects of excising too much fluid too soon. The term "dialysis washout" or "hangover" is occasionally used to describe these symptoms that can occur both during and after therapy. [5]

Chronic renal disease is thought to be strongly associated with kidney disease. Also, renal disease can also result from diabetes mellitus, obesity, smoking, and hypertension. Uncontrolled hypertension and/or diabetes can easily and quickly lead to end-stage kidney illness in a patient.[6]

By studying these complications and predisposing factors, healthcare providers can implement preventive strategies, closely monitor patients, and personalise their care to minimise the occurrence and impact of adverse events. Additionally, ongoing research and advancements in haemodialysis technology aim to address these challenges and improve patient outcomes.

MATERIALS AND METHODS

Study location and subjects

A prospective observational investigation was undertaken across two separate sites, Basaveshwara Medical College & Hospital and Akshay Global Hospital in Chitradurga. The study enrolled 70 patients throughout the study session of six months (May-October) 2023, among whom those who met inclusion criteria were 25–75 years of patients who were diagnosed with CKD and undergoing haemodialysis regularly, and both male and female were examined in the research; conversely, individuals suffering from sudden kidney failure and patients preparing for kidney transplantation were excluded from the research.

Data collections and method of study

Patients who met the aforementioned research requirements were enrolled in the trial once permission was obtained, and the study was thereafter initiated. Patient demographic information and prior health history were collected from the patients' health records and recorded in a form that was appropriately created for data collection.

statistical analysis

After the data collection, the information was entered into an Excel spreadsheet and then examined with IBM SPSS 29 software. This analysis encompassed the calculation of percentages, the generation of descriptive statistics, and the computation of Pearson correlations.

RESULTS

During the six-month trial period from May to October 2023, a sum of 70 patients were enrolled in order to evaluate the complications and predisposing factors in individuals suffering from persistent renal illness with haemodialysis.

Complication distribution of CKD patients undergoing HD

Complication distribution of 70 patients CKD patients undergoing HD, a greater number of patients had multiple complications, i.e., 59 patients (84%) are more prominent, followed by single complications, i.e., 11 patients (16%). The result has been shown in 5.3.A**.** and graphically represented in Figure No. 5.3.A.

Comprehensive Prevalence of Complications in CKD patients undergoing HD Patients

Comprehensive prevalence of complications in CKD those receiving HD, the Results Showed Among 70 patients, a larger number of people, 53 patients, had muscle cramps (75.5%), followed by 27 had itching (38.5), 12 patients had nausea (17.1), 23 patients had headaches (32.9), 12 patients were having fever (17.1), 33 patients were having chills (47.1), 7 patients were having chest pain (10%), 13 patients

were having hypertension (18.6%), 11 patients had vomiting (15.7%), and 24 patients were having hypotension (34.5%). The result has been shown in Table No. 5.3. B and graphically represented in Fig. No. 5.3. B

Predisposing Factors Distribution in CKD patients undergoing HD

Risk factor distribution in CKD patients undergoing HD Among 70 patients, multiple predisposing factor patients were more, with 51 having (72.9%) followed by single risk factor patients, 19 (27.1%). The result has been shown in Table No. 5.4. A and graphically represented in Figure No. 5.4. A.

Comprehensive Predisposing factor prevalence in CKD patients undergoing HD

Comprehensive risk factor prevalence in CKD patients undergoing HD, the results were reported: a greater number of patients (62) had hypertension (88.6%), followed by 46 patients were having diabetes (65.7%), 13 patients were having smoking (18.6%), 13 patients were associated with obesity (18.6%), 5 patients were associated with cardiac ischaemia (7.1%), and 2 patients were associated with polynephritis (2.9%) among 70 patients. The result has been shown in Table No.

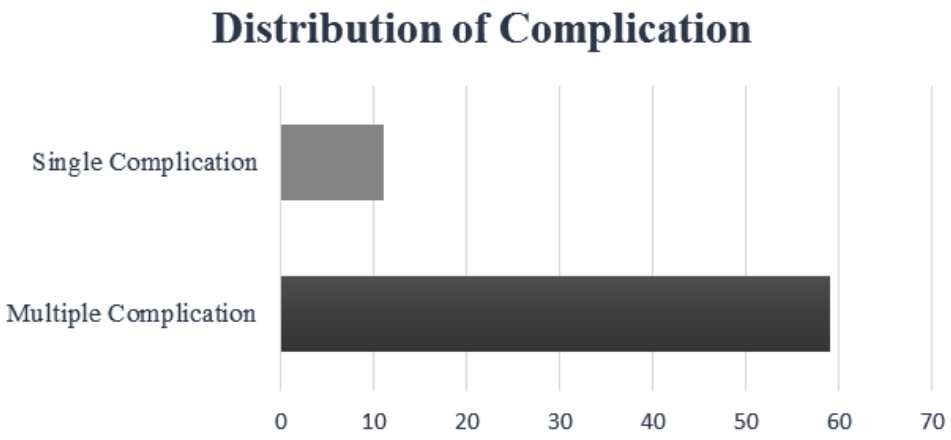

Figure 5.3.A. Complication Distribution of CKD Patients Undergoing HD

Table 5.3.A. Complication distribution of CKD patients undergoing HD

S. No	Distribution	Frequency	Percentage
1	Multiple Complication	59	84.285
2	Single Complication	11	16.714
3	Total	70	100

Table No 5.3.B. Comprehensive Prevalence of Complications of CKD patients undergoing HD

S. No	Complication	Present	Absent	Prevalence Percentage
1	Muscle cramp	53	17	75.7%
2	Itching	27	43	38.5%
3	Nausea	12	58	17.1
4	Headache	23	47	32.9%
5	Fever	12	58	17.1%
6	Chills	33	37	47.1%
7	Chest pain	7	63	10.0%
8	Hypertension	13	57	18.6%
9	Vomiting	11	59	15.7%
10	Hypotension	24	46	34.3%

5.4.B and graphically represented in Figure No. 5.4.B.

Co-Morbidities in CKD patients undergoing HD

Co-morbidities in CKD patients undergoing HD were having a significant portion of patients, constituting 47.15%, presented with co-morbidities associated with both hypertension and diabetes. This was followed by 32.9% of patients having hypertension only, 10% with diabetes only, 5.72% with cardiovascular disease (CVD), and 4.3% with other comorbidities (including thyroid and TB). The result has been shown in Table No. 5.5 and graphically represented in Figure No. 5.5.

Comparing the Risk factor and Complications of Hemodialysis with Age and Hypertension

Comparison of results of predisposing factors and complications of haemodialysis patients reviewed negative correlation by Pearson correlation test. -0.133 is the correlation coefficient indicating a negative association between the two variables, since there is a negative correlation; age and hypertension are not related, and they are travelling in different directions.

Table. 5.4. A Risk Factor Distribution in CKD patients undergoing HD

S. No.	Risk Factors	Frequency	Percentage
1	Single Risk Factor	19	27.1
2	Multiple Risk Factor	51	72.9
3	Total	70	100.0

DISCUSSION

This investigation is prospective observational research. explores the complex challenges faced by individuals with chronic kidney disease (CKD) undergoing haemodialysis, particularly focusing on the complications and predisposing factors during haemodialysis sessions and their resulting consequences.

The participants, predominantly aged between 46 and 55, displayed a noticeable gender bias, with men outnumbering women. Comparable outcomes were conducted by Raja SM, revealed that males were 19 (65.5%) and females were 10 (34.5%). [8]

This observed gender imbalance might be influenced by epidemiological patterns, as studies indicate a general predisposition of men to kidney diseases. This inclination could arise from biological variances, hormonal influences, susceptibilities to specific predisposing factors, and various lifestyle and occupational exposures.

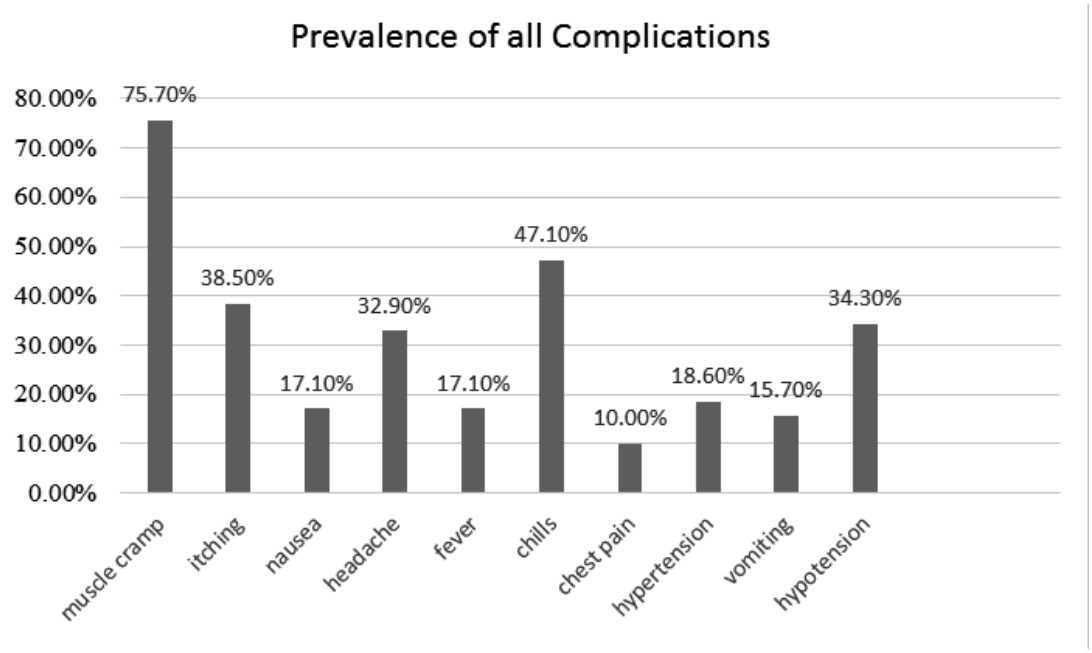

Figure. 5.3.B. Comprehensive Complications of CKD Patients Receiving HD: Prevalence

In our investigation, a significant 16.7% of patients faced single complications, and 84.2% faced multiple complications, highlighting the various challenges in CKD patients undergoing hemodialysis. When individuals reach the latter stages of kidney disease and initiate haemodialysis, they often contend with health challenges, including cardiovascular issues, electrolyte imbalances, rapid fluid and electrolyte shifts, changes in blood pressure, and the removal of waste products and metabolic disturbances. These underlying complexities contribute to the heightened vulnerability of CKD patients to multiple complications during the haemodialysis process.

Table. 5.4.B. Comprehensive Risk Factors in CKD patients undergoing

S. No	Risk factors	Frequency	Prevalence Percentage
1	Hypertension	62	88.6
2	Diabetes	46	65.7
3	Smoking	13	18.6
4	Obesity	13	18.6
5	CVD	5	7.1
6	Polynephritis	2	2.9

Complications such as muscle cramps (75.75%), itching (38.50%), nausea (17.10%), headache (32.90%), fever (17.10%), chills

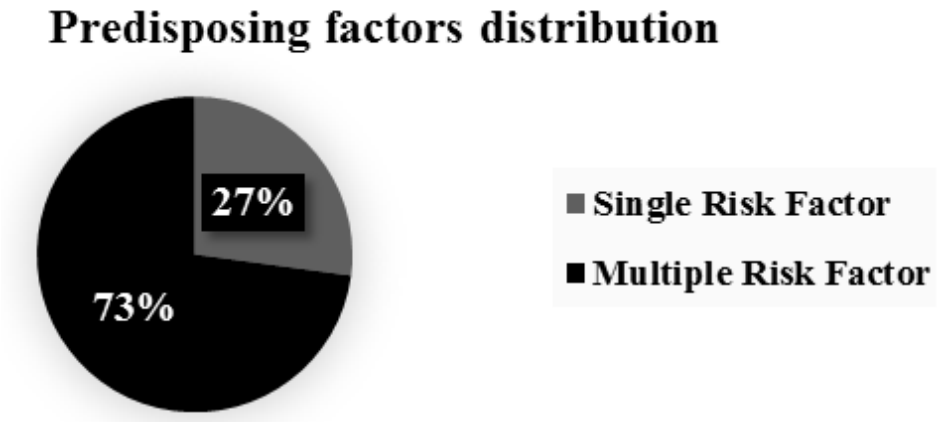

Figure 5.4.A. Predisposing Factor Distribution in CKD Patients Undergoing HD

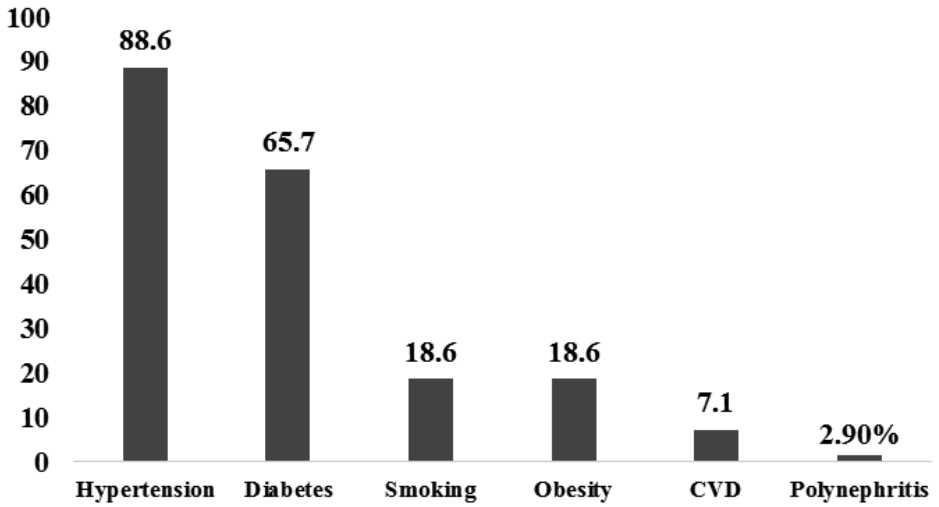

Figure 5.4.B. Comprehensive Prevalence of Predisposing factors in CKD Patients Undergoing HD

Table 5.5. Comprehensive Co-Morbidities of CKD patients undergoing HD

S. No	Risk factors	Frequency	Percentage
1	Hypertension only	23	32.9
2	Diabetes only	7	10.0
3	Hypertension with diabetes	33	47.15
4	CVD	4	5.72
5	Others (thyroid &TB)	3	4.3

(47.10%), chest pain (10.00%), hypertension (18.60%), vomiting (15.70%), and hypotension (34.30%) were observed in our study, which were comparable to the research carried out by Fatima T that showed 70.7 percent of patients have muscle cramps; headache (13.4%), hypertension (8.5%), hypotension (37.8%), and vomiting (13.4%). [9]

The high prevalence of muscle cramps, likely due to the removal of excess fluid during

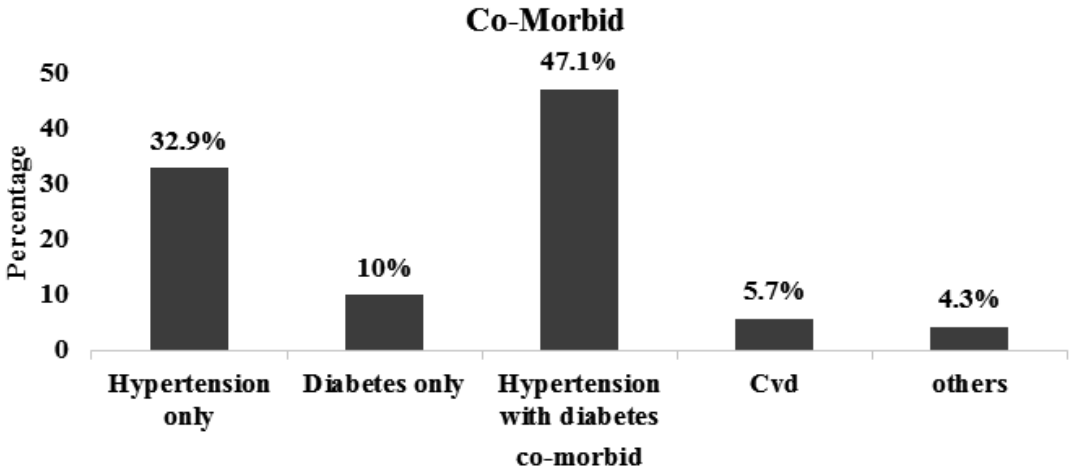

Figure 5.5. Co-morbidities of CKD patients undergoing HD

haemodialysis, calls for tailored strategies to alleviate this common problem.

In the study conducted by Muhammad Ali, hypotension (28.7%) was identified as the most common complication, followed by hypertension (17%) and nausea/vomiting (11.7%). The study analysed a total of 94 patients with a mean age of 45.51 ± 13.29 years, comprising 62 males (66%) and 32 females (34%). In contrast, our findings revealed a different trend in the distribution of complications.[10]

In Habas E's study, 40.9% of patients had vomiting within the first hour of their haemodialysis (HD) session, accounting for 61.8% of all reported cases. Notably, the frequency of vomiting during the second and third hours of the HD session was comparable. The timing and number of vomiting episodes, however, showed the reverse tendency in our research. This discrepancy can result from variations in supportive care strategies, dialysis procedures, or patient demographics. To investigate these conflicting results and pinpoint possible contributing elements, more investigation is required.[11]

In our investigation involving 70 participants, 51 patients (72.9%) presented with multiple predisposing factors, while 19 patients (27.9%) exhibited a singular risk factor. In our specific study, hypertension emerged as the predominant risk factor, with 62 (88.60%) and 46 patients (65.7%) having diabetes mellitus, which was comparable to the research carried out by Burmeister JE, which showed hypertension (87.50%) and diabetes mellitus (35.80%), signifying these two conditions as the major contributors to the risk profile in the study population. [12]

Co-morbidity analysis shows that 32.9% had hypertension alone, 10% had diabetes alone, 47.15% had both hypertension and diabetes, and 4.3% had other comorbidities, providing insights into the complex health landscape of CKD patients.

Table. 5.6. Pearson Correlation

Age group	Pearson correlation	1	-0.133
	Sig (2 tailed)		0.273
	N	70	70
Hypertension	Pearson correlation	-0.133	1
	Sig (2tailed)	0.273	
	N	70	70

Pearson Correlation Coefficient

S. No	Size of Correlation	Interpretation
1	.90 to 1.00 (-90 to 1.00)	Very high positive (Negative) correlation
2	.70 to .90 (-.70 to - .90)	High positive (Negative)correlation
3	.50 to .70 (-.50 to -.70)	Moderate positive (Negative) correlation
4	.30 to .50 (-30 to -.50)	Low positive (Negative) correlation
5	.00 to .30 (.00 to -.30)	Negligible correlation

Employing the Pearson correlation coefficient, we analysed that the correlation among predisposing factors, complications, and age with hypertension is found to be negative (-0.133); similarly, research carried out by Patil VD discovered that there was no obvious relationship between gender and age with intradialytic complications. [13]

A longitudinal study and a larger sample size are required to establish a more comprehensive understanding, particularly for exploring correlations over an extended period. Increasing the observation duration and sample size enhances the study's capacity. to elucidate meaningful relationships between age and hypertension.

CONCLUSION

In conclusion, our study revealed a higher proportion of males in the CKD patient population undergoing haemodialysis, with middle-aged adults being the most prevalent. The identified multiple complications, including muscle cramps, chills, itching, and hypotension, and multiple Predisposing factors include obesity, smoking, diabetes, and hypertension. Hypertension and diabetes often co-occurred as comorbidities.

The correlation between age as a risk factor and hypertension as a complication did not exhibit a significant correlation. The study findings emphasise the critical need for improved care to minimise complications, benefiting both patients and the healthcare system. Managing the complexities of haemodialysis is achievable through proper monitoring and patient care. This study contributes to our understanding of CKD and haemodialysis, laying the foundation for enhanced clinical practices and future research in this field.

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Conflict of interest

The authors do not have any conflict of interest.

Data Availability Statement

This statement does not apply to this article.

Ethics statement

The SJMCP, Chitradurga institutional

ethics committee gave its approval to the study. Subject No.: SJMCP/99/2023-24.

Informed Consent Statement

This study involved human participants, and all procedures were conducted in accordance with the ethical standards of the institutional ethics , its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study prior to their participation. The privacy rights of all participants were strictly observed throughout the research process.

Clinical Trial Registration

This research does not involve any clinical trials**.**

Authors contribution

Lokesh N: Conceptualization, Methodology, Writing – Original Draft.; Rakshitha GP: Data Collection, Analysis, Writing – Review & Editing.; Nataraj GR: Visualization, Supervision and Project Administration; Aravind Patil BS: Visualization, Supervision and Project Administration; Aman Suresh: Supervision, statistical analysis & Editing; Vaishnavi: Analysis, Writing – Review & Editing.

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