

## To study pattern and prevalence of cardiovascular Morbidity intradialytic hypotension patients

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### Abstract

**Background & Method:** This Study was conducted at Department of General Medicine, NSCB Medical College and Hospital, Jabalpur (MP) on patients coming for dialysis with chronic renal failure from all over mahakaushal area of central India with an aim to study pattern and prevalence of cardiovascular Morbidity intradialytic hypertensive patients. **Result:** Mean Post-dialytic systolic Blood Pressure for hypertensive group was  $145.88 \pm 22.06$  mmHg which was significantly ( $p < 0.001$ ) higher than mean Post-dialytic systolic Blood Pressure  $139.41 \pm 20.74$  mmHg of Hypotensive group. Mean Post-dialytic systolic Blood Pressure for Normotensive group was  $139.41 \pm 21.38$  mmHg which was comparable ( $p > 0.05$ ) to mean Post-dialytic systolic Blood Pressure  $139.41 \pm 20.74$  mmHg of Hypotensive group. Mean Post-dialytic systolic blood pressure for Hypotensive group was  $145.88 \pm 22.06$  mmHg which was Significantly ( $p < 0.05$ ) higher than mean Post-dialytic systolic Blood Pressure  $139.41 \pm 20.74$  mmHg of Normotensive group. Mean Post-dialytic diastolic Blood Pressure of Hypertensive group, Normotensive group and Hypotensive group was comparable ( $p > 0.05$ ). Mean of average intradialytic variability for systolic blood pressure at each point of measurement was higher for Normotensive group and lower for Hypotensive group but comparable in all three study groups ( $p > 0.05$ ). Mean of average intradialytic variability for diastolic at each point of measurement was higher for Hypotensive group and lower for Normotensive group but comparable in all three study groups ( $p > 0.05$ ). **Conclusion:** As far as morbidity in terms of abnormal 2D ECHO findings is concerned Hypotensive group of patients showed the significantly greater number of abnormalities among three groups. Although both Hypertensive and Hypotensive group had more abnormalities in 2D ECHO compared to the Normotensive group. The left ventricular hypertrophy, Pericardial effusion and signs of Pulmonary hypertension were in significantly higher in Hypertensive group. While Aortic regurgitation, Diastolic dysfunction and Tricuspid valve regurgitations were observed in significantly higher proportion in both Hypertensive and Hypotensive groups compared to the Normotensive. Overall death rate was 12.07% in our study which was significantly higher in Hypotensive group of patients. Although the most common cause of death was infection and cardiac causes accounted for second most common cause, vascular deaths were in significantly higher proportion among Hypotensive group of patients where causes for cardiopulmonary arrest were High ventricular rate, Myocardia ischemia, sudden cardiac arrest, Ventricular fibrillation, and ischemic cerebrovascular accident following Atrial fibrillation respectively.

**Keywords:** Morbidity, Prevalence, Intradialytic, hypotension & dialysis.

**Study Designed:** Cross Sectional Observational Study.

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### Introduction

Cardiovascular complications top among the list of complications with the current practices in hemodialysis. Among the cardiovascular complications, the rate of symptomatic intradialytic hypotension range between 20% and 50%, and it remains an important problem. Another concern is the arrhythmias associated with hemodialysis, the rate of which is reported to be between 5% to 75%. The common and severe type of arrhythmias include ventricular arrhythmias and ectopics. The rate of hemodialysis-associated complex ventricular arrhythmia is around 35% [1].

The second most common type of arrhythmia is atrial fibrillation, the rate of which is 27%. Sudden cardiac death accounts for 62% of cardiac-related deaths and it is usually attributed to arrhythmias [2].

The first year of hemodialysis is of vital importance with respect to sudden cardiac deaths, which was evaluated in 93 of 1000 patients in the first year of hemodialysis [3]. During the early period of introduction of dialysis therapy cramps were observed in 24% to 86% and in contrast with current advances in dialysis the data shows about 2% of the patients having  $\geq 2$  hemodialysis sessions in a week suff from cramps [4]. Other common complications include nausea, vomiting with a rate of 5% to 15%, headache with a rate of 5% to 10% and itching with a rate of 5% to 10% [16,17]. Although cramps, nausea, vomiting, headache and itching do not result in mortality, they substantially deteriorate the quality of life in these patients. Although more common during the first years following the introduction of dialysis, disequilibrium syndrome and complications associated with dialyser, water systems and dialysis machines are currently uncommon but may have fatal consequences.

### Material & Method

Study was conducted at Department of General Medicine, NSCB Medical College and Hospital, Jabalpur (MP) on patients coming for dialysis with chronic renal failure from all over mahakaushal area of central India from March 2019 to August 2020.

### Inclusion criterion

- Patients who are 18 years or older in age.
- Patients who has renal cause for dialysis (i.e. CRF, ESRD)
- Patient who consented to be a part of study

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**Exclusion criterion**

- Patients with other indications for dialysis than CRF/ESRD.
- Patients with vascular access in both upper limbs.
- Patients who have Blood pressure variability due to other causes than CRF/ESRD and Essential HTN-
- Pregnant women
- Patients with liver disease
- Patients who could not undergo direct height and weight measurements
- Patient will not consent to be a part of study

**Data scrutiny****Results**

- Data for the patients will be summarized and expressed in the form of Mean blood pressure and standard deviation (Mean  $\pm$ SD).
- Comparison of three groups (i.e. Hypertensives, hypotensives and normotensives.) will be conducted used students t test/ Chi-square analysis/ANOVA.
- Correlational analysis will be done for clinical (e.g. age, sex, weight and height etc) and morbidities with BP variability.

**Expected outcome**

After planned study we expect to find Prevalence of hypertensive and hypotensive episodes during hemodialysis. We will be able to correlate blood pressure fluctuations to different patient parameters and incidences of cardiovascular morbidities if any.

**Table 1: Sex**

SEX	Hypertensive Group	Normotensive Group	Hypotensive Group	TOTAL
Male	37 (69.81%)	28 (63.64%)	16 (84.21%)	81 (69.83%)
Female	16 (30.19%)	16 (36.36%)	3 (15.79%)	35 (30.17%)
<b>TOTAL (N=116)</b>	<b>53 (45.69%)</b>	<b>44 (37.93%)</b>	<b>19 (16.38%)</b>	<b>116 (100%)</b>

Chi-square, df 2.666, 2; P value = 0.2637

Proportion of Males were highest in the Hypotensive group with 84.21%, followed by 69.81% males in Hypertensive group however it was similar to all patient sex ratio, while lowest males proportion was in normotensive group with 63.64% males. However, the proportional distribution for two sexes was comparable among three study groups ( $p > 0.05$ ).

**Table 2: Treatment during dialysis**

Treatment	Number of Patients n (%)
Furosemide	34 (29.31%)
Nifedipine	16 (13.79%)
Amlodipine	38 (32.76%)
Saline	5 (4.31%)
Noradrenaline	2 (1.72%)
Dopamine	3 (2.59%)
Multiple Drugs	4 (3.45%)
None	14 (12.07%)
<b>TOTAL</b>	<b>116 (100%)</b>

Most frequent treatment needed during intradialytic period was for Hypertension as most of the patients (90.24%) were hypertensive. Amlodipine was the most common with 38 (32.76%) followed by Furosemide in 34 (29.31%), Nifedipine in 16 (13.79%) patients. For management of hypotension, Saline 5(4.31%), Dopamine in 3 (2.59%) and Noradrenaline in 2 (1.72%) patients. Use of multiple antihypertensive drugs was observed in 4 (3.45%) patients while 14 (12.07%) did not need any drug treatment other than usual intradialytic treatment.

**Table 3: Mean pre dialytic blood pressure**

Pre-Dialytic Variability	Hypertensive Group	Normotensive Group	Hypotensive Group	TOTAL
Systolic	152.34 $\pm$ 24.55	145.79 $\pm$ 19.8	155.15 $\pm$ 21.3	150.29 $\pm$ 22.46
Diastolic	88.78 $\pm$ 16.98	87.12 $\pm$ 10.36	91.81 $\pm$ 11.75	88.7 $\pm$ 13.82

Hypertensive vs. Normotensive  $< 0.0001$  Significant. Hypertensive vs. Hypotensive 0.2916 NS, Normotensive vs. Hypotensive  $< 0.0001$  Significant. Mean Predialytic systolic Blood Pressure for hypertensive group was 152.34  $\pm$  24.55 mmHg which was significantly ( $p < 0.0001$ ) higher than mean Predialytic systolic Blood Pressure 145.79  $\pm$  19.8 mmHg of Normotensive group. Mean Predialytic systolic blood pressure for Hypotensive group was 155.1  $\pm$  21.3 mmHg which was significantly ( $p < 0.0001$ ) higher than mean Predialytic systolic Blood Pressure 145.79  $\pm$  19.8 mmHg of Normotensive group. Mean Predialytic systolic blood pressure of Hypertensive group and Hypotensive group was comparable ( $p > 0.05$ ).

Mean Predialytic diastolic Blood Pressure for hypertensive group was 88.78  $\pm$  16.98 mmHg which was significantly ( $p < 0.0001$ ) lower than mean Predialytic diastolic BP 91.81  $\pm$  11.75 mmHg of Normotensive group.

Mean Predialytic diastolic Blood Pressure for Hypotensive group was 87.12  $\pm$  10.36 mmHg which was significantly ( $p < 0.0001$ ) lower than mean Predialytic diastolic BP 91.81  $\pm$  11.75 mmHg of Normotensive group. Mean Predialytic diastolic Blood Pressure of Hypertensive group and Hypotensive group was comparable ( $p > 0.05$ ).

**Table 4: Mean post Dialytic Blood Pressure**

Post-Dialytic BP (Mean $\pm$ SD)	Hypertensive Group	Normotensive Group	Hypotensive Group	TOTAL
Systolic	145.88 $\pm$ 22.06	139.41 $\pm$ 21.38	139.41 $\pm$ 20.74	142.1 $\pm$ 21.76
Diastolic	88.59 $\pm$ 13.3	86.93 $\pm$ 11.35	85.52 $\pm$ 13.4	87.35 $\pm$ 12.63

Hypertensive vs. Normotensive 0.1268 NS Hypertensive vs. Hypotensive 0.0098 Significant Normotensive vs. Hypotensive 0.3642 NS

Mean Post-dialytic systolic Blood Pressure for hypertensive group was 145.88  $\pm$  22.06 mmHg which was significantly ( $p < 0.001$ ) higher than mean Post-dialytic systolic Blood Pressure 139.41  $\pm$  20.74 mmHg of Hypotensive group.

Mean Post-dialytic systolic Blood Pressure for Normotensive group was 139.41  $\pm$  21.38 mmHg which was comparable ( $p > 0.05$ ) to mean

Post-dialytic systolic Blood Pressure 139.41  $\pm$  20.74 mmHg of Hypotensive group.

Mean Post-dialytic systolic blood pressure for Hypotensive group was 145.88  $\pm$  22.06 mmHg which was Significantly ( $p < 0.05$ ) higher than mean Post-dialytic systolic Blood Pressure 139.41  $\pm$  20.74 mmHg of Normotensive group.

Mean Post-dialytic diastolic Blood Pressure of Hypertensive group, Normotensive group and Hypotensive group was comparable ( $p > 0.05$ ).

**Table 5: Average Intradialytic Blood Pressure Variability**

Average Intradialytic BP Variability (Mean±SD)	Hypertensive Group	Normotensive Group	Hypotensive Group	TOTAL
<b>Systolic</b>	8.83 ± 3.09	8.94 ± 2.83	8.39 ± 3.23	8.8 ± 3
<b>Diastolic</b>	8.26 ± 2.8	7.93 ± 2.07	9.02 ± 2.29	8.26 ± 2.47

ANOVA:  $p > 0.05$  not significant

Mean of average intradialytic variability for systolic blood pressure at each point of measurement was higher for Normotensive group and lower for Hypotensive group but comparable in all three study groups ( $p > 0.05$ ). Mean of average intradialytic variability for diastolic at each point of measurement was higher for Hypotensive group and lower for Normotensive group but comparable in all three study groups ( $p > 0.05$ ).

#### Discussion

In this study "Analysis of intradialytic blood pressure variability and its impact on cardiovascular morbidity", 116 patients were recruited for demographic, clinical and laboratory evaluation alongside thorough Blood Pressure monitoring. Blood pressure (BP) measurement is a fundamental part of hemodialysis (HD) but pre- to post-hemodialytic Blood Pressure change has a limitation as a prognostic metric, because it does not reflect individual intradialytic BP measurements such as nadir systolic BP and fail to record intradialytic fluctuations in BP which may have effect on cardiovascular health[5]. Deviation from this expected BP course include precipitous BP drops (intradialytic hypotension), pre- to post-dialysis BP elevation (intradialytic hypertension) and more subtle BP fluctuations (intradialytic BP variability) all these phenomena are associated with adverse clinical outcomes[6].

Hemachandar (2017) also reported Diabetic nephropathy being most common cause of chronic kidney disease (CKD) in 37% ( $n = 47$ ) of patients, hypertensive nephropathy in 8.66% ( $n = 11$ ). The cause of ESRD could not be identified in 45.67% ( $n = 58$ ) of patients. The other 8.67% included chronic glomerulonephritis, Alport syndrome, autosomal dominant polycystic kidney disease, multiple myeloma, and lupus nephritis[7&8]. Those results were similar to ours but on lower side due large number of unidentified causes. Another similar pattern of etiology was observed by Nirav et al. (2018) where diabetic nephropathy in 26%, hypertensive nephropathy in 23%, chronic glomerulonephritis in 26%, obstructive uropathy in 14%, polycystic kidney disease in 2% and chronic pyelonephritis in 8% patients[8&9]. Most frequent treatment needed during intradialytic period was for Hypertension as most of the patients (90.24%) were hypertensive. Amlodipine was the most common with 41 (35.34%) followed by Furosemide in 37 (31.9%), Nifedipine in 18 (15.52%) patients. Pothan et al. (2019) also found similar pattern of drug use in both interdialytic and intradialytic periods where antihypertensive agents were prescribed most frequently (30.1%) which included 13% of calcium channel blockers like amlodipine (5.3), nifedipine (4.5), cilnidipine (3%) were given. While Furosemide and Torsemide was used in 7% patients[52]. Use of diuretics was less than our study[10&11]. The most common variability observed was hypertensive in 53 (45.69%) patients followed by Normotensive in 44 (37.93%) and Hypotensive in only 19 (16.38%) patients. The mean systolic blood pressure during intradialytic period was in hypertensive range for all three groups with highest in hypotensive group with  $155.15 \pm 21.3$  mmHg which was significantly ( $p < 0.05$ ) higher than normotensive first reading and comparable to first reading of Normotensive group[12].

A gradual fall in mean Blood Pressure was observed over intradialytic period up to last Post hemodialytic reading. This gradual fall became significantly lower than first mean systolic blood pressure in 90 minute reading and readings after it for Hypertensive group[13&14].

#### Conclusion

As far as morbidity in terms of abnormal 2D ECHO findings is concerned Hypotensive group of patients showed the significantly greater number of abnormalities among three groups. Although both Hypertensive and Hypotensive group had more abnormalities in 2D ECHO compared to the Normotensive group. The left ventricular hypertrophy, Pericardial effusion and signs of Pulmonary hypertension were in significantly higher in Hypertensive group.

While Aortic regurgitation, Diastolic dysfunction and Tricuspid valve regurgitations were observed in significantly higher proportion in both Hypertensive and Hypotensive groups compared to the Normotensive. Overall death rate was 12.07% in our study which was significantly higher in Hypotensive group of patients. Although the most common cause of death was infection and cardiac causes accounted for second most common cause, vascular deaths were in significantly higher proportion among Hypotensive group of patients where causes for cardiopulmonary arrest were High ventricular rate, Myocardia ischemia, sudden cardiac arrest, Ventricular fibrillation, and ischemic cerebrovascular accident following Atrial fibrillation respectively.

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