

Prevalence Of Intradialytic Hypertension In Patients Undergoing Hemodialysis And Its Association With 44 Hour Interdialytic Ambulatory Blood Pressure: A Prospective Observational Comparative Study

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Abstract: Back ground of the study: Haemodialysis is a life sustaining procedure for end-stage renal disease patients, but an accepted consequence of haemodialysis is the tendency for blood pressure to fall frequently during haemodialysis treatments. Large fluctuations in BP measurements during haemodialysis are a risk factor for increased mortality in ESRD patients.¹ The adverse outcomes associated with large decreases in BP during HD are well known², but nephrologists should be aware of the clinical significance of increases in BP during HD (known as Intradialytic Hypertension), as well. Cohort data demonstrates that the expected response to a haemodialysis treatment is a reduction in systolic BP of about 10-15 mm Hg with BP decreasing rapidly during the first hour and then decreasing relatively slowly for the remaining duration of the treatment³. However, there is a spectrum of BP responses, with a notable subgroup even demonstrating increases in BP during the treatment. While BP variability occurs frequently both during and between haemodialysis treatments in most haemodialysis patients, observing BP patterns over prolonged periods of time will help identify those patients who experience intradialytic hypertension most frequently. One recent cohort study defined intradialytic hypertension as an increase in systolic BP ≥ 10 mm Hg from pre- to post-dialysis to identify the prevalence of this phenomenon over long-term follow-up. Over the course of 6 months, intradialytic hypertension occurred in over 90% of the patients at least once⁴.

Keywords: Intradialytic Hypertension; Interdialytic hypertension; Ambulatory BP; End Stage Renal Disease

Aim: The present study aimed to assess the prevalence of intradialytic hypertension in patients undergoing hemodialysis and its association with 44 hour interdialytic ambulatory blood pressure. (We hypothesized that patients with intradialytic hypertension have higher interdialytic ambulatory systolic BP than those without intradialytic hypertension).

Material and Methods:

- ✓ A multicentre Prospective Observational study on HD patients.
- ✓ A comparative study

Result: The study has been carried out on 50 subjects; (equally allocated in two groups i.e. one with intradialytic hypertension & the other without intradialytic hypertension), with mean age of 58.4 years. Amongst them, 78% were males & 83% were diabetic. The mean pre hemodialysis systolic BP for the intradialytic hypertension and non-intradialytic hypertension groups was 148.0 and 155.2 mmHg, respectively. Mean post hemodialysis systolic BP was 157.4 and 129.0 mmHg, for the intradialytic-hypertension and non-intradialytic hypertension groups, respectively. The mean systolic ambulatory BP was 156.8 and 144.6 mmHg for the intradialytic hypertension and non-intradialytic hypertension groups, respectively (P = 0.005).

Conclusion: The study concluded that the patients with intradialytic hypertension have higher interdialytic ambulatory systolic BP than those without intradialytic hypertension).

I. INTRODUCTION & BACKGROUND OF THE STUDY

In general, IDH is an increase in BP from pre to post hemodialysis that has been shown to be associated with poor

outcomes. As pointed out by Chou et al⁵ there is no uniform definition of IDH.

Various definitions of IDH by many authors have been given. E.g. Amerling et al⁶ did a study in 1995 in which he

studied the complications of HD where he took 15 mm hg increase in MAP as a criteria for uIDH. Cirit et al⁷ in same year studied paradoxical rise in BP during ultrafiltration in dialysis patient where BP higher at the end of a dialysis session compared to that of at dialysis onset in more than 50% of dialysis session was taken as criteria of IDH. Gunal et al while studying paradoxical rise in blood pressure during ultrafiltration is caused by increased cardiac output in 2002 took exceeding initial values during four dialysis sessions in row as criteria. Chou et al⁵ in 2006 while studying physiological changes in dialysis took normal or high BP at initiation of dialysis followed by MAP increase 15 mm hg during or more than 2/3rd of most recent 12 dialysis session. Chen et al⁸ in same year while studying management of IDH took hypertension that appears resistant to UF and which occurs during or immediately after dialysis procedure as a criteria. Inrig et al in 2009 while assessing BP increase during dialysis took 10 mm Hg rise as a criteria for IDH. Most of the above authors working in same timeline from 2002-2010 have had different definitions of IDH but nobody worked on the consensus of common working definition of IDH.

According to Joline Chen et al, to date, no studies have evaluated the prevalence and prognostic importance of intradialytic hypertension. It may be because the definition of IDH was so varied, a very few studies have been able to demonstrate that IDH is an important complication of HD. As a result, the prevalence ranges from 5 to 15%, depending on the definition used. The pathogenesis of intradialytic hypertension is complex and is considered to be due to extracellular fluid volume expansion, increased cardiac output, activation of the renin-angiotensin system and the sympathetic nervous system, increased circulating vasoactive substances resulting in peripheral vasoconstriction, erythropoietin use, and fluctuations in electrolytes and removal of antihypertensive medications during the dialysis procedure⁸. It occurs in around 10% of haemodialysis (HD) patients. It is associated with HD patients' hospitalization and increased risk of death. According to them fluid removal remains the key point for treating IDH. Several important unanswered questions remain and the need for further research is highlighted.

AIMS OF THE STUDY

- ✓ To assess the prevalence of Intradialytic Hypertension in patients undergoing hemodialysis.
- ✓ To determine association between Intradialytic Hypertension and interdialytic ambulatory blood pressure in patients receiving hemodialysis.

OBJECTIVES

- ✓ To assess the prevalence of Intradialytic Hypertension.
- ✓ To assess the pre and post HD BP
- ✓ To assess the pre and post HD weight.
- ✓ To assess 44 hour interdialytic ambulatory BP.
- ✓ To identify the association between intradialytic hypertension with 44 hour interdialytic ambulatory blood pressure.

II. MATERIAL AND METHODS

STUDY DESIGN: Mixed.

- ✓ A multicentre Prospective Observational study on HD patients.
 - ✓ A comparative study
- The study has been conducted in two phases:

PHASE I

STUDY DESIGN: Prospective Observational

TIME FRAME: Longitudinal

STUDY SETTINGS: The study will be conducted in haemodialysis units of selected hospitals of Delhi- NCR.

STUDY POPULATION: Chronic HD patients.

SAMPLING PROCEDURE: Total enumeration technique will be used to select the sample population. All the patients with ESRD/CKD undergoing haemodialysis in selected centres, meeting the inclusion and exclusion criteria will be enrolled for the study.

STUDY TOOL

- ✓ BP was monitored at onset, after 1 hour and after completion of HD using sphygmomanometer as a routine clinical regimen without any manipulation.

OUTCOME MEASURES: Intradialytic Hypertension (rise of ≥ 10 mmHg in systolic blood pressure between pre- and post-dialysis in at least 4 out of six dialysis sessions.)

PHASE II

STUDY DESIGN: Comparative

STUDY POPULATION: Chronic HD patients.

SAMPLING TECHNIQUE: Consecutive sampling

SAMPLE SIZE: 25 each

Group I consisted of subjects with Intradialytic Hypertension (systolic BP increase ≥ 10 mmHg from pre- to post haemodialysis or no change in BP even after an hour of ultrafiltration in at least four of six treatments.)

Group II consisted of subjects with ≥ 10 mmHg decrease in BP from pre- to post hemodialysis in at least four of six treatments.

SETTING: Haemodialysis Centers

HAEMODIALYSIS BLOOD PRESSURE MEASUREMENTS

BP will be measured and recorded by a sphygmomanometer. Pre-HD BP will be measured in the nonaccess arm after a 5-minute rest while the patient is in supine/semi fowler's position before placement of a dialysis needle. Five minutes after HD, BP will be measured again in a similar fashion. Data for the six treatments (2 weeks) before the ABP measurement will be averaged for the pre- and post-HD systolic and diastolic BP. Similarly, the "mean HD-unit" systolic BP will be calculated by averaging all pre- and post systolic BP measurements during those 2 weeks.

INTERDIALYTIC BLOOD PRESSURE MEASUREMENTS

44 hour Ambulatory BP monitoring: After a mid-week HD treatment, subjects will be made to wear an ABP monitor on the nonaccess arm placed by the principal investigator or nurses trained by the study principal investigator. The ABP monitor will be turned on, and the subjects will leave the HD unit after the first cuff inflation. Subjects will be instructed to wear the cuff and monitor for the entire 44-hour interdialytic period except for bathing (subjects will remove the cuff immediately after a measurement and replace it within the measurement interval). BP will be measured every 30 minutes from 6:00 a.m. until 10:00 p.m. and hourly from 10:00 p.m. to 6:00 a.m. Subjects will be instructed to continue their typical diets and antihypertensive regimens. Subjects will return to the dialysis unit for the following treatment still wearing the monitor. The monitor will be turned off before starting HD and picked up by study personnel. In cases where the cuff will be found turned off or had taken insufficient recordings, the procedure will be repeated after the next mid-week treatment.

III. CONTENT VALIDITY

The content validity of tool was determined by a team of 5 experts. The experts included one Ph.D. in Medical Surgical Nursing and four nursing experts specialized in Medical Surgical Nursing. Based on the experts' suggestions, the tool got its final form.

IV. RESULTS

The data collected was edited, tabulated, analyzed, interpreted and findings obtained were presented in the form of tables and diagrams represented under following sections:

SAMPLE CHARACTERISTICS

Attribute	Intradialytic Hypertension (n=25)	Non-Intradialytic Hypertension (n=25)
Age (years)	60.6	56.2
Male (%)	78	78
Diabetic (%)	80	86
Hypertensive (%)	100	100
Smoker (%)	74	68
Alcoholic (%)	62	54

Table 1: Distribution of subjects as per their socio-demographic profile

	Intradialytic Hypertension (n=25)	Non-Intradialytic Hypertension (n=25)	P
44-hour ambulatory SBP	155.4 (14.2)	142.4 (16.5)	0.005
44-hour ambulatory DBP	82.4 (10.8)	76.9 (8.6)	0.05

Two-week averaged predialysis SBP	144.0 (9.7)	155.5 (15.5)	0.003
Two-week averaged predialysis DBP	77.5 (9.2)	82.5 (9.2)	0.06
Two-week averaged postdialysis SBP	159.0 (9.3)	128.1 (10.9)	0.0001
Two-week averaged postdialysis DBP	80.9 (7.6)	71.9 (6.6)	0.0001

Table 2: Ambulatory & HD Center BP measurements

V. DISCUSSION

PHASE I: BP was monitored at onset, after 1 hour and after completion of HD using sphygmoma-nometer as a routine clinical regimen without any manipulation.

Based on the adopted definition the subjects were assigned to two groups; one with IDH and the other without IDH.

PHASE II: The study undertook 44 hour ABP of the subjects in both groups and the collected information was further analysed under 44-hour ambulatory SBP, 44-hour ambulatory DBP, Two-week averaged predialysis SBP, Two-week averaged predialysis DBP, Two-week averaged postdialysis SBP, and Two-week averaged postdialysis DBP. Then the results were compared and the findings revealed that the subjects with IDH have higher 44-hour ambulatory SBP, 44-hour ambulatory DBP, Two-week averaged postdialysis SBP, and Two-week averaged postdialysis DBP. Two week averaged predialysis SBP & DBP was found to be higher in other group with no IDH.

CONCLUSION

The study concludes that the patients with IDH have higher 44 hour interdialytic ambulatory systolic blood pressure as compared to their counterparts, which necessitates the more aggressive lowering of BP in such patients to reduce associated morbidity and mortality.

RECOMMENDATIONS

- ✓ Similar study can be undertaken with a larger number of samples to generalize the findings.
- ✓ A study can be undertaken to find out the causes and/or interventions to control IDH.

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