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Intradialysis Blood Pressure Changes In Chronic Kidney Disease Patients On Maintenance Hemodialysis

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Abstract

Background: Hemodialysis is the main way to replace a kidney for those with end-stage renal disease (ESRD). Although it is successful, problems that happen during and after dialysis happen often, putting the safety of patients and the success of their treatment at risk. Recognizing these problems early on is important for better clinical treatment and better overall care.

Objective: To evaluate the incidence and pattern of intradialytic complications in patients receiving continuous hemodialysis.

Material and Methods: A cross-sectional research including 203 CKD patients receiving haemodialysis at HMC/IKD Peshawar (June–November 2024) was performed. The records were checked for age, gender, and serum creatinine. We looked at changes in blood pressure during dialysis by measuring systolic blood pressure before and after the procedure.

Results: out of the 203 haemodialysis patients, 55.2% were men, with an average age of 44.5 years. Intradialytic hypotension was observed in 64% of cases, whilst

hypertension was noted in 36%. Older men with a greater BMI were more likely to have low blood pressure, while younger women with a normal BMI were more likely to have high blood pressure ($P < 0.05$).
C**onclusion:** Intradialytic hypotension was the most prevalent condition, and changes in blood pressure were connected to age, gender, BMI, and baseline blood pressure. Personalised treatment is necessary to mitigate hazards in Pakistani haemodialysis patients.

Introduction

Chronic kidney disease (CKD) is characterized by enduring renal impairment or a glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m^2 for a minimum duration of three months. Chronic kidney disease (CKD) is a major worldwide health issue, leading to morbidity and death, mostly caused by hypertension and diabetes (1). The most common kind of renal replacement treatment for those with stage 5 CKD is hemodialysis. Hemodialysis is linked to a number of problems, the most serious of which is changes in blood pressure during dialysis (2).

Intradialytic hypotension (IDH) occurs when the systolic blood pressure (SBP) drops by at least 20 mmHg or the mean arterial pressure (MAP) drops by 10 mmHg during dialysis and is accompanied by symptoms. It may cause ischemic cardiovascular events, vascular access thrombosis, dysrhythmias, and poor dialysis delivery (3-6). Its prevalence ranges from 10% to 70%, depending upon definitions and patient demographics (5, 7, 8).

Intradialytic hypertension (IDHT), while less prevalent (5–10%), is linked to negative outcomes, including heightened 2-year mortality for each 10 mmHg increase in SBP during dialysis. Subclinical volume overload, sympathetic overactivity, stimulation of the renin-angiotensin system, and endothelial dysfunction are all part of its pathogenesis (3, 9-11).

In spite of improvements in dialysis equipment, changes in blood pressure during dialysis are still a big worry. It is important to be able to predict these changes in order to sort patients by risk and improve their care. This research sought to evaluate the incidence and correlating variables of intradialytic blood pressure fluctuations in chronic kidney disease patients receiving maintenance hemodialysis in Pakistan.

Methods and Materials:

A descriptive cross-sectional study was executed at the Department of Nephrology, HMC/Institute of Kidney Diseases, Peshawar, throughout the designated study period. The research comprised individuals aged 18 years and older with stage 5 chronic kidney disease (CKD) who had received maintenance haemodialysis for a minimum duration of three months. A convenience sampling approach that does not employ probability was used. Patients with acute renal damage, recent hospitalisation, or unstable cardiovascular problems were not included in the research.

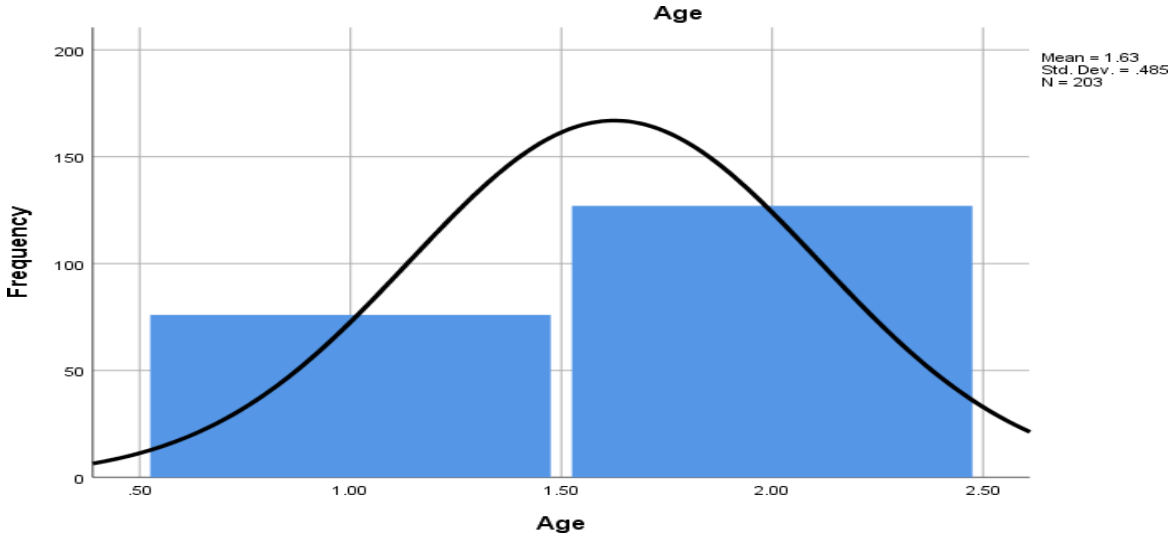
Data Collection Procedure: Records were used to gather patient information, such as comorbidities, test findings, and dialysis specifics. We checked the blood pressure before, during, and after dialysis. IDH was characterised as a considerable reduction in BP with symptoms, and IDHT as an increase in BP. Every incident was recorded.

Data and Statistical Analysis: We used SPSS v25 to look at the data. We showed continuous variables as mean ± SD and categorical variables as frequencies and percentages. We used Chi-square tests to look at associations, and $P < 0.05$ was seen as significant.

Results

The average age of the 203 CKD patients was 35 years. CKD lasted anywhere from one to six months. The average BMI, serum creatinine, pre-dialysis SBP, and post-dialysis SBP were 0.75 kg/m², 0.43 mg/dL, 0.46 mmHg, and 0.48 mmHg, respectively. Patients aged 18 to 35 years constituted 37.4% (n=76), while those aged 36 to 50 years represented 62.6% (n=127). There were more men than females (55.2% vs. 44.8%; p=0.0002). Before dialysis, 70.4% of people had normal SBP and 29.6% had high SBP. After dialysis, 36.5% had normal SBP and 63.5% had high SBP.

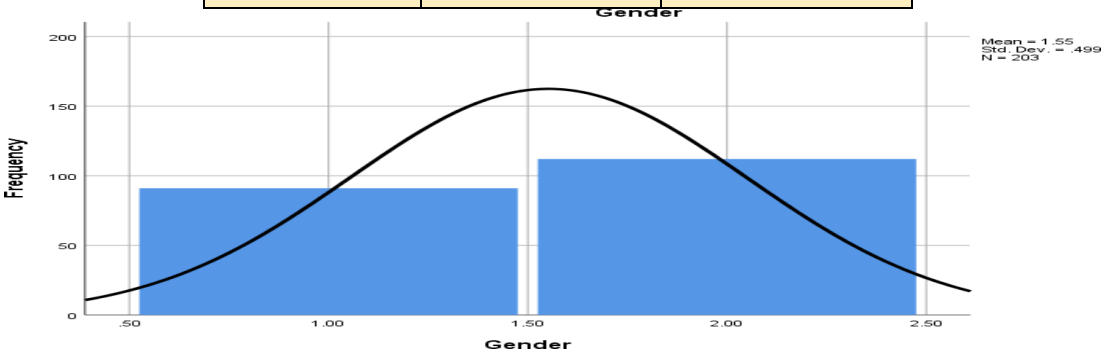
Intradialytic BP variations were examined based on age, gender, BMI, and pre- and post-dialysis SBP.



Gender	Frequency	Percentage (%)
Male	112	55.2
Female	91	44.8
Total	203	100

Most of the people in this study were elderly (36–50 years), making up over two-thirds of the participants. About one-third was younger (18–35 years). This offers you an indication of the age range of the people in the research.

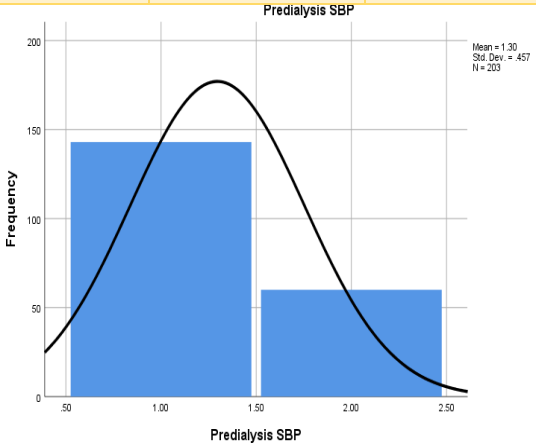
Age (years)		Percentage (%)
18 to 35	76	37.4
36 to 50	127	62.6
Total	203	100



This study had a few more male patients than female patients, which shows that the study population was mostly male.

Pre dialysis SBP	Frequency	Percentage (%)
Normal	143	70.4
High	60	29.6
Total	203	100

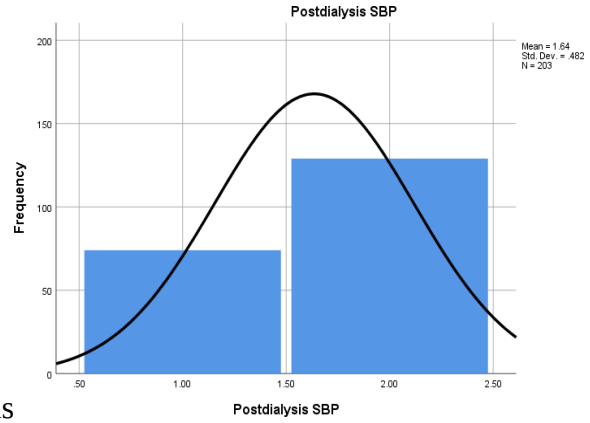
Intradialytic BP changes	Frequency	Percentage (%)
Hypotension	130	64.0
Hypertension	73	36.0
Total	203	100



Most patients had normal SBP before dialysis, but over a third had high SBP, which means that a lot of patients already had high blood pressure before dialysis.

Post dialysis SBP	Frequency	Percentage (%)
Normal	74	36.5
High	129	63.5
Total	203	100

Most of the patients had elevated SBP after dialysis, while only around one-third had



normal SBP. This means that after dialysis, many patients' systolic blood pressure tended to go up or stay high.

Intradialytic hypotension was the predominant haemodynamic alteration observed during dialysis, impacting almost two-thirds of patients, whereas intradialytic hypertension was noted in about one-third. This shows that this group of people often has problems with their blood pressure dropping during dialysis.

Discussion:

In 64% of individuals, there was intradialytic hypotension, and in 36%, there was hypertension. This shows that the haemodynamic stability was quite low. Hypotension was correlated with advanced age, male sex, and elevated BMI, whereas hypertension was connected with younger age, female sex, and reduced BMI. Pre- and post-dialysis blood pressure affected these incidents, showing that personalised monitoring and treatments, such customised ultrafiltration or cooled dialysate, are necessary to make patients safer.

Diabetic kidney disease (DKD) impacts 20–40% of individuals with diabetes and is a significant worldwide health concern. It is more frequent in African-Americans, Asian-Americans, and Native Americans, and type 2 diabetes is the main cause of its total burden. Risk factors encompass hyperglycemia, male gender, obesity, hypertension, insulin resistance, dyslipidaemia, and genetic susceptibility. It is important to find and deal with modifiable variables early on in order to lower the number of cases of DKD and stop its development (6).

Intradialytic BP abnormalities—hypotension, hypertension, and variability—are linked to higher mortality in hemodialysis patients. Mechanisms include ischemia and endothelial dysfunction. Current guidelines exist but are based on limited evidence, and management strategies remain unclear. Further research is needed to define diagnostic criteria, understand mechanisms, and guide prevention and treatment(12).

Pre- and post-dialysis blood pressure levels are independently associated with mortality, with elevated pulse pressures signifying increased risk. After controlling for other health problems, low pre- and post-dialysis diastolic blood pressure, high post-dialysis systolic blood pressure, and considerable weight increases between dialysis sessions were all linked to worse survival rates. Beta-blockers were consistently linked to better survival rates across antihypertensives, which suggests that they may have a protective impact. These results underscore the prognostic significance of meticulous blood pressure regulation and interdialytic weight management in haemodialysis patients(13).

Limitations: The single-center design, observational nature, and failure to account for drugs and comorbidities may restrict generalizability.

Conclusions:

Intradialytic hypotension is the most common problem that happens during hemodialysis, and it happens to over two-thirds of patients. Age, gender, BMI, and baseline pre- and post-dialysis blood pressure are important factors. To lower the risk

of heart disease and enhance treatment results in Pakistani CKD patients, it is important to keep a close eye on them and tailor their dialysis plans to their needs.

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