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Blood Flow Rate Of Hemodialysis Patients; A Hospital Based Study

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ABSTRACT
Background: In chronic renal disease, impaired kidney function hinders waste elimination. Hemodialysis is fundamental for removing creatinine, urea, and excess water. The study explores blood flow rates in hemodialysis patients with chronic renal disease, shedding light on dialytic dynamics in this context.
Materials and Methods: A total of 100 patients were selected irrespective of age and gender. All hemodialysis patients were recruited in Institute of Kidney Diseases, Hayatabad, Peshawar. Blood flow rate and demographic information were entered into a performa. Microsoft Excel 2007 was used to enter and analyze data.
Results: Out of total, 58.3% and 41.7% were found male and female respectively. Highest number of patients observed in age greater than 55 years. The study revealed varying blood flow rates, with 43.9% at 300 ml/min, highlighting the distribution among hemodialysis patients. Three hours hemodialysis were found frequently among dialysis patients.
Conclusion: Despite improvements in dialysis care, challenges such as recirculation, co-morbidities, and nutritional issues persist, emphasizing the need for innovative therapeutic approaches and ongoing research to enhance patient outcomes. The study's findings provide valuable insights into optimizing hemodialysis effectiveness.
Keywords: Blood Flow, Hemodialysis, Pakistan, Age, Gender

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INTRODUCTION

Individuals suffering from end-stage renal illness require dialysis assistance to maintain their quality of life. Adequate dialysis administration is necessary to extend survival as well as enhance quality of life.[1] Therefore, the goals of dialysis are to lower morbidity, improve quality of life, and extend life.[2] Effective dialysis practice is necessary to meet these goals. Ineffective dialysis is one of the factors contributing to these patients' deaths, and effective hemodialysis (HD) is one of the key elements that helps reduce morbidity and mortality of patients.[3] Numerous surveys show the connection between a patient's death and morbidity and their dialysis dosage. Dialysis doses that are too low lengthen hospital stays and raise total healthcare costs.[4] Consequently, the rate of morbidity and the expense of care can both be reduced with efficient dialysis.[5] Greater dialysis efficiency is associated with lower uremia complications and mortality, according to the National Cooperative Dialysis Study.[6]

Chronic kidney disease (CKD) manifests when the kidneys fail to efficiently eliminate bodily waste, resulting in irreversible impairment lasting from 120 days to 12 months. End-stage renal disease (ESRD) denotes complete renal function loss, necessitating kidney transplant or renal replacement treatment.[7] Dialysis, employing a semi-permeable membrane within the dialyzer commonly referred to as an artificial kidney, facilitates the removal of excess water and waste products like urea and creatinine.[8] For individuals with abnormal renal function suddenly or permanently, whether they are critically sick or chronically unwell, this procedure is essential.[9] The dialysate, a decontaminated mineral ion solution, aids in removing undesirable compounds like phosphate and potassium. Maintaining concentrations similar to regular plasma mitigates shortages.[10] Successful dialysis treatments correlate with improved health, regulated arterial pressure, optimal fluid balance, and the absence of uremic symptoms.[11]

Increasing the length of dialysis is a helpful strategy for raising Kt/V, although patient intolerance and financial constraints sometimes make this impractical.[12] Additionally, urea diffuses more readily from blood into the dialysate when the flow rate of the dialysate is increased, albeit this effect is not prolongable.[13] Furthermore, employing premium filters is not cost-effective. The objective of our study was to determine the blood flow rate in hemodialysis patients.

METHODS AND MATERIALS

This cross-sectional study was conducted in duration of six months from February to May 2020, and performed at Institute of Kidney Disease, Hayatabad, Peshawar, Pakistan. A total of 100 dialysis patients included and recruited through non-probability

convenient sampling method. The demographic data were collected though designed performa, and also studied the duration of dialysis and blood flow rate.
Data collection utilized tools of weight machine, BP set, syringes, gel tubes, and gloves. Pre-dialysis samples were drawn either from an arterial needle, at least 0.01L of blood has been drawn, or from a central venous catheter, prior to the administration of any saline or heparin. Microsoft Excel 2007 was used for data entry and analysis. Percentages along with descriptive analysis were performed.

RESULTS

A total of 100 patients were recruited in this study. Among total, 58.3% were male and 41.7% were female patients. Age-wise patients were also categorized in which highest number of patients observed in age group of >55 years followed by 26-40 years, and 41-55 years (Table 1).

Table 1: Gender-based and age-based distribution of hemodialysis patients

Gender	Patients % (n)
Male	58.3 (77)
Female	41.7 (55)
Total	100 (132)
Age (Years)	
10-25	15.9 (21)
26-40	30.3 (40)
41-55	18.9 (25)
>55	34.8 (46)
Total patients	100 (132)

Among the total, a substantial 43.9% (n=58) exhibited a major blood flow rate of 300ml/min, followed by 26.5% (n=35) at 250ml/min, 17.2% (n=23) at 200ml/min, 7.5% (n=10) at 350ml/min, and 4.5% (n=6) at 400ml/min (Table 2).

Table 2: Hemodialysis patients' blood flow rate

Blood flow rate (ml\min)	Patients % (n)
200	17.2 (23)
250	26.5 (35)
300	43.9 (58)
350	7.5 (10)
400	4.5 (06)

Duration of hemodialysis procedure were also observed in which majority patients (92.4%) were observed in 3 hours duration (Table 3).

Table 3: Hemodialysis process duration

Duration of procedure	Number of patients % (n)
2hrs	7.6 (n=10)
3hrs	92.4 (n=122)

DISCUSSION

Hemodialysis emerges as a vital therapeutic intervention for enhancing the survival of individuals with chronic renal illness. Predictors influencing its success encompass fundamental parameters like gender, duration of dialysis, age, and the presence of co-morbidities.[14] Additionally, factors associated with dialysis, nutritional status, and inflammation play predictive roles.[15]
Hemodialysis effectiveness is dependent on a number of factors, including dialyzer size, age, co-morbid conditions, angioaccess, membrane permeability, and blood flow.[16] Angioaccess-related challenges, encompassing recirculation, inadequate machine assessment, and suboptimal blood flow rates, contribute to the complexity. Hypotension and hypertension further complicate the scenario. Nutritional and socioeconomic status significantly impact dialysis sufficiency.[17] The intricate interplay of factors such as poor membrane biocompatibility, anorexia, uremic toxin accumulation, and nutrient loss during dialysis exacerbates the multifaceted challenge of malnutrition in dialysis patients.[18] Addressing these factors collectively is crucial for optimizing the effectiveness of hemodialysis and improving patient outcomes.[19]
The poor dialysis observed could be attributed to an underlying medical condition or a side effect from dialysis.[20] Some patients experienced interruptions in their dialysis due to acute intradialytic hypotension, while a few patients were terminated earlier than anticipated. The primary issues were machines losing conductivity, notable early circuit breaks in the water supply system, and the development of hypertension in some patients during treatment, the exact cause of which remains unknown. Additionally, insufficient clearance and mechanical shortcomings in the dialyzer membrane led to urea creatinine recirculation into the circulation before completion of the clearance process.[21] Hematological parameters are also affected with hemodialysis.[22]
Even though aging may play a role, some people can continue to flow blood at a rate lower than 250 milliliters per minute.[23] The critical factors, however, are the patient's nutritional status and socioeconomic circumstances. Another concern is that blood pressure is not measured at the midpoint or conclusion of the dialysis session, and weight is inaccurately recorded before and after.[24] Inattention to patients who eat during dialysis treatments can lead to intra-dialytic hypotension. It is essential to utilize highly biocompatible and pure dialysate membranes to reduce inflammatory reactions.[25] Dialysis membranes that stimulate leukocytosis, inflammatory reactions, and fast complement activation are not allowed to be used.[26]
The study's general findings are confined to patients at Institute of Kidney Disease, Hayatabad, Peshawar, Pakistan and may not be extrapolated to the entire city of Peshawar or any specific area. As a prospective study, the results should be interpreted exclusively within the context of the center from which the data was obtained, namely Institute of

Kidney Disease, Hayatabad, Peshawar, Pakistan. The exclusion of certain individuals and the age range for chronic kidney disease (CKD) constituted additional research limitations. The study's male-to-female ratios are another constraint; despite having similar numbers of male and female patients, the link between inadequacy and etiology is expected to hold true for both sexes, along with the risk that study participants will have CKD.

CONCLUSION

The study revealed the demographic data of hemodialysis patients along with duration of process. Recirculation, co-morbid conditions, inadequate nutrition, costs, blood flow, and angioaccess were shown to be the main reasons of insufficiency, which makes them worth studying.. Therefore, employing novel therapeutic approaches and conducting cutting-edge research is imperative.

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