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ORIGINAL ARTICLE

Delays in establishing permanent vascular access and referring new hemodialysis patients to a nephrologist: A single center study.

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ABSTRACT… Objective: To determine the frequency and causes of delayed nephrology referral and late vascular access creation in newly initiated hemodialysis (HD) patients at a tertiary care center in Peshawar, Pakistan. **Study Design:** Descriptive Cross-sectional study. **Setting:** Department of Nephrology, Lady Reading Hospital, Peshawar. **Period:** January 2025 to June 2025. **Methods:** A total of 248 adult patients with end-stage renal disease (ESRD) initiating maintenance HD were enrolled. Data regarding demographics, comorbidities, timing of nephrology referral, counseling for vascular access, type of vascular access at initiation, duration of delay, and patient-reported reasons for delay were collected. Delay in permanent vascular access creation was categorized as no delay, 1–3 months, 4–6 months, or more than 6 months. Data were analyzed using SPSS version 25, with Chi-square tests applied for categorical variables. **Results:** The mean age of patients was 52.6 ± 13.4 years, with 57.3% males. Hypertension (75.8%) and diabetes mellitus (53.2%) were the most common comorbidities. Diabetic nephropathy (35.5%) and hypertension (25.0%) were the leading causes of ESRD. At HD initiation, non-tunneled central venous catheters (ntCVC) were used in 49.2% of patients, arteriovenous fistulas (AVF) in 33.9%, tunneled CVCs (tCVC) in 16.5%, and arteriovenous grafts (AVG) in 0.4%. Only 21.0% of patients had no delay in permanent vascular access creation, whereas 31.5%, 25.0%, and 22.5% experienced delays of 1–3 months, 4–6 months, and more than 6 months, respectively. The most frequently reported patient-related reasons for delay were financial burden (26.6%), lack of awareness (23.4%), fear of pain (19.4%), denial of disease (16.1%), and family refusal (14.5%). **Conclusion:** A catheter-first approach predominates among incident HD patients, with substantial delays in establishing permanent vascular access. Both patient- and system-level factors contribute to these delays, emphasizing the need for early CKD detection, timely nephrology referral, structured pre-dialysis counseling, and streamlined vascular access pathways to improve outcomes.

Key words: Arteriovenous Fistula, Chronic Kidney Disease, Catheter-first, Hemodialysis, Nephrology Referral, Vascular Access.

INTRODUCTION

Chronic kidney disease (CKD) is a global public health problem with an increasing prevalence, especially in developing countries where healthcare resources are limited.[1] It is associated with significant morbidity, mortality, and socioeconomic burden, with diabetes mellitus and hypertension being the leading causes worldwide.[2] Early referral to a nephrologist plays a crucial role in delaying disease progression, optimizing medical therapy, and planning renal replacement therapy (RRT).[3] International guidelines such as the Kidney Disease: Improving Global Outcomes (KDIGO) recommend that patients with advanced CKD be referred to a nephrologist at least six months prior to the anticipated initiation of dialysis.[4]

Vascular access is essential for transport out hemodialysis (HD). There are three main categories of vascular access: native arteriovenous fistula (AVF), arteriovenous graft (AVG), and central venous catheter (CVC),which includes tunneled CVC (tCVC) and non-tunneled CVC (ntCVC).[5] According to the National Kidney Foundation–Kidney Disease Outcomes Quality Initiative (KDOQI) clinical practice guidelines for vascular access, an arteriovenous fistula (AVF) or arteriovenous graft (AVG) is generally favored over a central venous catheter (CVC) in both

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newly initiated and ongoing hemodialysis (HD) patients, owing to their reduced susceptibility to infections.[6] An arteriovenous fistula (AVF) is linked to reduced morbidity and mortality among hemodialysis patients.[7,8] Similarly, system-related issues such as delayed diagnosis by primary care physicians (PCPs), lack of structured CKD education, and inadequate coordination between healthcare providers also play a significant role.[9]

Chronic kidney disease (CKD) patients reported greater satisfaction with arteriovenous fistulas (AVFs) compared to other types of vascular access.[10] However, there is limited literature from Khyber Pakhtunkhwa (KPK), particularly Peshawar, regarding the prevalence and causes of delayed nephrology referral and vascular access placement.

This study was therefore conducted at Lady Reading Hospital, Peshawar, with the aim of determining the frequency and causes of delayed nephrology referral and late establishment of permanent vascular access in newly initiated hemodialysis patients.

METHODS

This descriptive cross-sectional study was conducted in the Department of Nephrology, Lady Reading Hospital, Peshawar, from January to June 2025. The sample size was calculated using Cochran's formula for categorical data (Cochran, 1977)[11], expressed as:

$n = (Z^2 \times p \times (1 - p)) / d^2$

Where Z = 1.96 (95% confidence level), p = 79.9% (prevalence of delayed permanent vascular access at initiation of hemodialysis, reported in a large-scale cohort study)[12], and d = 5% margin of error. The calculated minimum sample size was 248 patients, which was achieved using a non-probability consecutive sampling technique.

All adult patients aged 18 years and above with end-stage renal disease (ESRD) who were initiated on maintenance hemodialysis (MHD) during the study period and who provided informed written consent were included. Patients undergoing peritoneal dialysis, those dialyzed for acute kidney injury (AKI), and patients with functioning renal transplants were excluded.

Data were collected at the bedside during hemodialysis sessions using a structured proforma. Demographic information (age, sex, marital status, education, occupation, and socioeconomic status) and comorbid conditions (hypertension, diabetes mellitus, ischemic heart disease, and hepatitis) were recorded. Clinical information included the time of CKD diagnosis, timing of referral to a nephrologist, and counseling for permanent vascular access creation, and vascular access type at initiation of dialysis (arteriovenous fistula [AVF], arteriovenous graft [AVG], tunneled central venous catheter [tCVC], or non-tunneled CVC [ntCVC]).

Delay in vascular access creation was categorized as no delay, 1–3 months, 4–6 months, or more than 6 months. Patient-reported reasons for delay, including fear of pain, denial of disease, financial burden, family pressure, lack of awareness, or lifestyle disruption, were systematically documented.

Data were entered and analyzed using SPSS version 25. Continuous variables such as age were presented as mean ± standard deviation (SD), while categorical variables were summarized as frequencies and percentages. The normality of continuous data was assessed using the Shapiro–Wilk test. Associations between baseline characteristics and delay in vascular access creation were analyzed using the Chi-square test. A p-value ≤0.05 was considered statistically significant.

Ethical approval was obtained from the Institutional Ethical Review Committee of Lady Reading Hospital, Peshawar (Reference No: 453/LRH/MTI Date: 22/08/2025).

RESULTS

This table shows the baseline demographic and clinical characteristics of the study population, including age distribution, gender, comorbid conditions, and causes of ESKD/CKD.

Variable	Value
Age (years, mean ± SD)	52.6 ± 13.4
Gender	
Male	142 (57.3%)
Female	106 (42.7%)
Comorbidities	
Hypertension	188 (75.8%)
Diabetes Mellitus	132 (53.2%)
Ischemic Heart Disease	68 (27.4%)
Hepatitis	46 (18.5%)
Causes of ESKD/CKD	
Diabetic Nephropathy	88 (35.5%)
Hypertension	62 (25.0%)
Glomerulonephritis	28 (11.3%)
Adult Polycystic Kidney Disease	18 (7.3%)
Renal Stone Disease	14 (5.6%)
Reflux Nephropathy	12 (4.8%)
Benign Prostate Hypertrophy	10 (4.0%)
Unknown / CKDu	16 (6.5%)

Table-I. Demographic and clinical characteristics of patients (n=248)

This table demonstrates the distribution of vascular access types at initiation of hemodialysis, the duration of delays in permanent vascular access creation, and patient-reported reasons for delay.

Variable	Value
ntCVC at initiation	122 (49.2%)
AVF at initiation	84 (33.9%)
tCVC at initiation	41 (16.5%)
AVG at initiation	1 (0.4%)
No delay	52 (21.0%)
Delay 1–3 months	78 (31.5%)
Delay 4–6 months	62 (25.0%)
Delay >6 months	56 (22.5%)
Fear of pain	48 (19.4%)
Denial of disease	40 (16.1%)
Financial burden	66 (26.6%)
Family refusal	36 (14.5%)
Lack of awareness	58 (23.4%)

Table-II. Vascular access types, delay duration, and reported reasons (n=248)

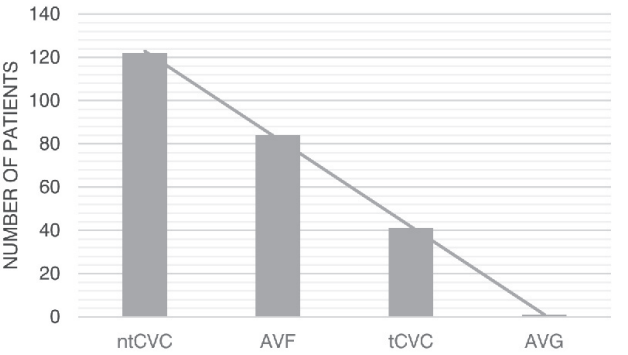

Figure-1. Distribution of vascular access types at initiation of hemodialysis (n=248).

This bar chart illustrates the frequency of vascular access types used at the initiation of hemodialysis in the study population. Non-tunneled central venous catheters (ntCVC) were the most frequently used, followed by arteriovenous fistulas (AVF), tunneled central venous catheters (tCVC), while arteriovenous grafts (AVG) were rarely employed.

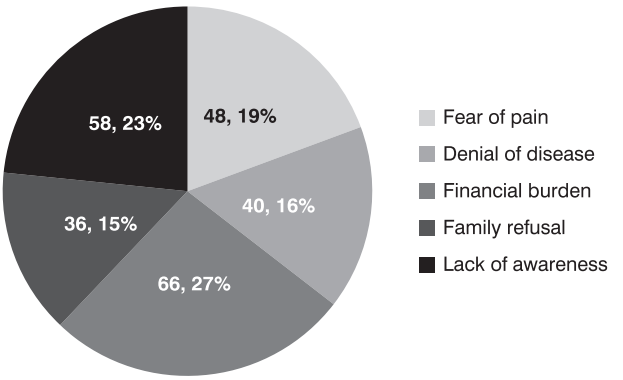

Figure-2. Reported reasons for delay in permanent vascular access creation (n=248).

This pie chart demonstrates the distribution of patient-reported reasons for delayed creation of permanent vascular access. Factors recorded included fear of pain, denial of disease, financial burden, family refusal, and lack of awareness.

DISCUSSION

In this single-center cross-sectional study from Peshawar, a catheter-first pattern at hemodialysis (HD) initiation predominated, with non-tunneled CVCs used in 58.5%, AVFs in 22.2%, tunneled CVCs in 18.5%, and AVGs in 0.8% of incident patients. This distribution aligns with prior Pakistani reports showing heavy reliance on CVCs at the start of HD, though the exact mix

varies by center and time. For example, in Karachi, 61.1% initiated HD via CVC and 38.4% by AVF, with patient-level barriers such as fear of pain (43.3%) and denial of disease (21.3%) most frequently reported—salient themes our cohort also echoed.[13] Earlier Pakistani data from an incident cohort found 80% required a CVC as first access, of which 74.2% were non-tunneled and 5.8% tunneled, underscoring the persistence of catheter-first starts across settings.[14]

Internationally, high catheter use at initiation remains common. In incident patients from Korea, 73.3% began with CVCs versus 21.5% AVF and 5.2% AVG, and access type at start was closely linked to patient-centered outcomes (survival, quality of life, depression).[15] In the United States, national analyses have documented a sustained "catheter-first" reality despite quality initiatives, with adverse sequelae well characterized.[16] Moreover, secular data show evolving access patterns over the first year of dialysis at the population level, but catheters remain prominent early on.[17] Collectively, these observations suggest that even where guidelines strongly favor AVF/AVG, real-world initiation frequently defaults to catheters.

The clinical consequences of catheter-first starts are non-trivial. Compared with AVFs, both AVGs and especially catheters confer increased infectious risk; one large analysis reported an ~80% higher 3-year sepsis risk for catheter users relative to AVF (hazard ratio ~1.80), with AVGs also elevated (HR ~1.35).[18] Patient-reported outcomes and satisfaction are likewise better with AVF than with catheters or AVGs[19], while qualitative work documents how catheter starts adversely affect daily routines, sleep, and perceived well-being.[20] Our center's high initial CVC use therefore likely carries tangible implications for morbidity, admissions, and patient experience—reinforcing the need for earlier referral and access planning.

Explaining the delays is multifactorial. Consistent with our findings, regional work from Saudi Arabia identified insufficient pre-dialysis education (63.7%) and late nephrology referral (56.6%) as major system-level contributors to delayed permanent access.[21] Patient-level barriers—fear, denial, and competing priorities—mirror those observed in Karachi[13] and elsewhere.[20] From the health-system perspective, late referral narrows the window for AVF creation and maturation, often forcing emergency starts via non-tunneled catheters. Classic observational data link late referral to worse access trajectories and even reduced likelihood of transplantation.[22] Transitions from catheter to permanent access are also delayed by comorbidity, vascular anatomy, and organizational factors.[23]

Global initiatives (e.g., KDOQI, "Fistula First/ Balanced") have emphasized planned AVF/ AVG prior to anticipated start, with strong epidemiologic support: AVF use correlates with better survival and fewer infections at the population level.[24,25] However, translating guidance into practice requires earlier CKD detection, timely nephrology referral, structured pre-dialysis education, and surgical pathway capacity. In resource-constrained environments like ours, pragmatic strategies—embedding access coordinators, fast-track AVF clinics, and standardized counseling scripts addressing fear and misconceptions—may be particularly impactful.

Our study has limitations typical of single-center cross-sectional designs (e.g., potential referral bias, reliance on patient report for reasons of delay), but it adds contemporary evidence from a high-burden public hospital in northern Pakistan. The very low AVG use (0.8%) we observed also highlights local practice patterns and device availability that differ from some international settings. Future work should test targeted interventions (education bundles, early-referral triggers in primary care, and streamlined surgical lists) and track whether these reduce catheter-first starts and improve patient-centered outcomes.

CONCLUSION

This single-center study highlights a persistent "catheter-first" pattern among incident hemodialysis patients in Peshawar, with nearly half initiating dialysis via non-tunneled central venous catheters and only one-third using arteriovenous

fistulas. Delays in permanent vascular access creation were common, driven by both patient-related factors—fear of pain, denial of disease, financial constraints, and lack of awareness—and system-level issues, including late nephrology referral and insufficient pre-dialysis education. These findings underscore the urgent need for early CKD detection, timely nephrology referral, structured patient education, and streamlined access creation pathways to improve clinical outcomes and patient quality of life.

STRENGTHS

This study provides valuable, contemporary evidence from a high-burden tertiary care center in northern Pakistan, addressing a gap in the local literature. The relatively large sample size of 248 patients enhances the robustness of the findings. The study's detailed assessment of both patient- and system-related barriers offers actionable insights that can inform targeted interventions. Additionally, the inclusion of precise data on vascular access types, delay durations, and patient-reported reasons allows for meaningful comparisons with regional and international studies, reinforcing the external relevance of the observations.

LIMITATIONS

The single-center cross-sectional design limits the generalizability of the results to other healthcare settings. Reliance on patient-reported reasons for delay introduces the possibility of recall or reporting bias. The very low use of arteriovenous grafts in the study population restricts the evaluation of this access type. Furthermore, the study did not assess long-term outcomes, such as morbidity, mortality, or transition from catheter to permanent access, which are important to fully understand the clinical impact of delayed vascular access creation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Humera Bukhari:** Conception, design, final approval.
2	**Mehak Zaidi:** Data collection, drafting manuscript.
3	**Fayaz Khan:** Data collection.
4	**Musab Umair Akhunzada:** Data analysis.
5	**Faizan Banaras:** Critical revision, interpretation.
6	**Amjad Shahzad:** Drafting manuscript.