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# Vascular Access status at Initiation of Hemodialysis in a Tertiary Care Hospital.

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## Abstract:

Patients with chronic kidney disease (CKD) 5 are on a slippery slope towards dialysis, however, as is the usual observation, most of the patients' requiring dialysis do so in an urgent or emergent way using temporary non-tunneled hemodialysis catheter. While temporary vascular access provides a ready access in emergency, nevertheless may be associated with serious complications. In this study we determined the frequency of vascular access at initiation of hemodialysis.

Methodology:

This was a retrospective analysis of our hemodialysis registry maintained at our dialysis center for the past three years. Total of 124 patients' complete records were available for analysis.

Results:

The use of non-tunneled hemodialysis catheter was most common n=101 (81.5%), arteriovenous fistula n=22 (17.7%).

Conclusion:

Non-tunneled hemodialysis catheter use is highly prevalent in our population initiating hemodialysis.

**Key Words:** Hemodialysis, temporary hemodialysis catheter, arteriovenous fistula, arteriovenous graft, permanent catheter, urgent dialysis.

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## Introduction:

Chronic Kidney Disease (CKD) is widely prevalent all over the world.[1] Vascular access is the lifeline of patients requiring hemodialysis. Starting from CKD late stage 4 into early CKD stage 5, most nephrologists would advise patients to get permanent vascular access prepared for hemodialysis.[2] However, since most patients are on a follow-up with general physicians or are not on any follow-up and are emergently present with uremic signs and symptoms in the emergency rooms, dialysis is initiated through a non-tunneled hemodialysis catheter. The non-tunneled hemodialysis catheter is, so to say, a necessary evil in such situations.[3] We understand the inherent ease, a relative lack of immediate complications in skilled hands, and relatively low costs (compared to a tunneled catheter) to provide a life-sustaining treatment. On the flip side, we also must accept the risk of late complications, especially catheter-related bloodstream infections that become more likely as the retention period of these catheters is prolonged.[4]

In Pakistan, the prevalence figures remain murky since most of the studies done on this subject are either regional or suffer from methodological issues. There is a wide variation in the reported incidence of renal replacement therapy as well.[5] It is not surprising since the creation of a dialysis registry under

the banner of Pakistan Renal Data System (PKRDS) is a relatively recent endeavor, nevertheless in the right direction.[6] PKRDS

Although tunneled catheters behave better in terms of mechanical complications, catheter-related bloodstream infections, and functional capabilities (e.g. blood flow rates), the need for a dedicated setup with fluoroscopy makes it unrealistic in the present situation in Pakistan where such expertise and resources are lacking.

## Patients and Methods:

This was a retrospective review and analysis of the hemodialysis database (IRB Number: 16/04/24, IRB#1386) created two years ago at our tertiary care center hemodialysis room by our team. The database contains data of all our patients dialyzed over the past three years. The maintenance of this database provides us ample opportunities for analysing and gaining insights into our maintenance hemodialysis patients. For this study we utilized data from Jan 2021 to March 2024.

### *Database Querying and Analysis:*

For this analysis, we used the statistical programming software R. The packages employed were Stats (R Core Team, 2023) and Tidyverse.[7] The demographics were analyzed for quantitative variables such as age and duration of non-tunneled catheters as well as qualitative variables such as gender, type of vascular access employed for initiation of dialysis and whether it was an emergency initiation. Student's T Test and Chi Square test were employed to check for significance among numerical and categorical variables respectively.

## Results:

A total of 125 patients' data was available for analysis. The demographics are presented in Table 1. The most common cause of chronic kidney disease (CKD) among our participants was Diabetic Kidney Disease (52%), followed by Hypertension (20.8%). A majority of patients (81.5%) initiated hemodialysis using Temporary Double Lumen Hemodialysis Catheters. Most of the hemodialysis were initiated as emergency. The most common site for temporary catheter placement was the right internal jugular vein (90.3%).

A chi-square test was conducted to analyze the association between gender and initiation vascular access. The test revealed a non-significant association between gender and the choice of temporary double lumen hemodialysis catheters ( $\chi^2 = 2.1033$, df = 1, p = 0.147) and arteriovenous fistulas ( $\chi^2 = 1.6772$, df = 1, p = 0.1953). Intuitively, a significant association was found between emergency initiation of hemodialysis and the choice of temporary double lumen hemodialysis catheters ( $\chi^2 = 6.4233$, df = 1, p = 0.01126), suggesting that emergency initiation patients were significantly more likely to use temporary catheters. There was no significant difference in ages (t = 1.3774, df = 121, p-value = 0.1709) and BMI (t = 1.3556, df = 121, p-value = 0.1777) between patients initiating dialysis through non-tunneled hemodialysis catheters and arteriovenous fistulas.

## Discussion:

Our findings perpetuate our foreboding of the events surrounding the initiation of hemodialysis in our population. In one of the studies, the authors worked on this same question 6 years ago as well. Granted that our previous endeavor was a multicenter effort with more participants, however, the frequency of utilization of NTHDCs was close to our present insight (88.8% Vs 81.5% presently).[6] The reasons for this stale situation seem to be multiple. Non-tunneled catheters are usually employed when patients present with overt symptoms and signs of uremia and require dialysis to be initiated immediately. These patients are usually either on no follow-up after kidney disease is diagnosed or they are on follow-up

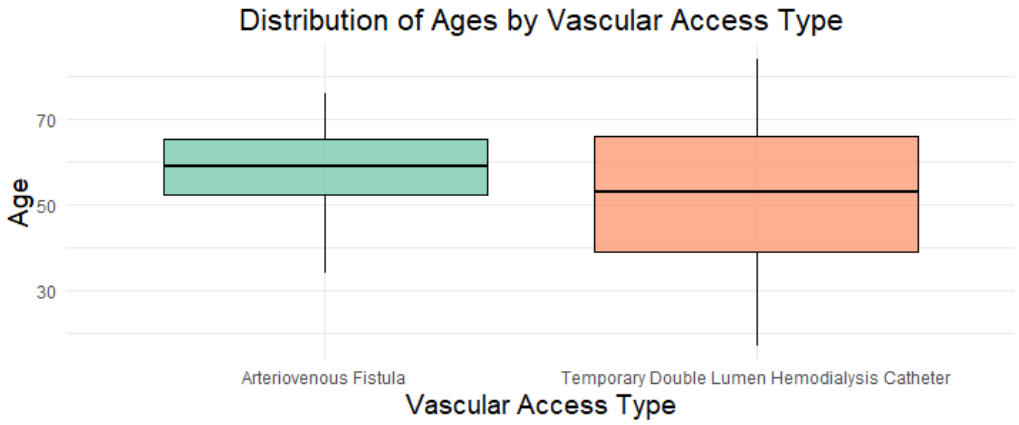
with non-specialists who fail to refer these patients to nephrologists at the right time. Whichever the reason, NTHDCs become a very attractive choice for these patients who often are afford tunneled catheters and usually present out of hours when appropriate expertise for passing tunneled catheters may not be immediately available. There was a marginal betterment in the rates of pre-made arteriovenous fistula for hemodialysis initiation (17.7% Vs 10.9%) which may be considered the proverbial silver lining.

**Table 1:** Demographics of our cohort

| | |
|---|---|
| **N** | 124 |
| **Gender** | Male (%): 79 (63.7) |
| **Emergency Initiation (%)** | 93 (75) |
| **Indications for Initiation of Hemodialysis**<br>**Encephalopathy**<br>**Fluid Overload**<br>**Uremic Symptoms** | <br>9 (7.3)<br>76 (61.3)<br>39 (31.5) |
| **Initiation Vascular Access (%)**<br>**Temporary Double Lumen Hemodialysis Catheter**<br>**Arteriovenous Fistula**<br>**Permanent Catheter** | <br>101 (81.5)<br>22 (17.7)<br>1 (0.8) |
| **Temporary Catheter Duration (Months, Mean±Sd)** | 2.17 (1.37) |
| **Duration On Hemodialysis (Months, Mean±Sd)** | 36.79 (48.71) |

Our querying also revealed that most of the patients were emergently initiated on hemodialysis (n = 94, 74.4%). This is a sad situation since emergency initiation of hemodialysis may be fraught with complications. It has been associated with higher mortality in the short and long term as compared to scheduled start dialysis.[78] The findings from these studies may be amplified in our community because of the lack of appropriate ongoing post-initiation care. The bulk of patients only maintain patchy follow-up visits and many patients hardly ever get routine labs done.

**Figure 1:** Distribution of Age according to Vascular Access type.




Another insight from our analysis reveals that the duration of retention of NTHDCs was around 8 – 9 weeks (2.17 ± 1.37 months). This may have been less than reported by other authors.[89] It does reflect on our practice though. After initiation, arteriovenous fistula formation is usually advised and carried out as soon as possible. The fistulas usually take 6 to 8 weeks for maturation if primary failure is not

seen (4 of our patients had primary AVF failure). In such cases, the retention of temporary hemodialysis catheters must be prolonged, with a consequent rise in the number of catheter-related bloodstream infections. Fifteen (14.8%) of our patients had CRBSI thus leading to the removal of catheters. This again is fuel for thought, since the complications of CRBSI are varied and may include such life-threatening conditions as infective endocarditis and deep-seated organ abscesses.

In our well-seasoned cohort (mean duration on hemodialysis around 3 years) the initiation events may not have been well remembered by the patients. However, we made all possible efforts to obtain as accurate accounts as possible by conducting repeated interviews with the patients as well as the primary caregiver. As an added layer to avoid recall bias, wherever possible, we checked our clinical records to substantiate the history given by the patients. We feel that an effort of this magnitude should be required to bring out the true nature of events surrounding the initiation of dialysis.

## Conclusions:

The prevalence of emergent start hemodialysis and use of non-tunneled hemodialysis catheters is too high in our chronic kidney disease population.

**Conflict of interest:** None declared

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