Original Article

# Vascular access parameters among prevalent dialysis patients: a single center survey

Latif TB[a], Rahman T[b]

**Abstract**

***Background:*** *Vascular access is one of the most important outcome determinant of patients on hemodialysis. In Bangladesh increasingly more patients are started on hemodialysis as a lifesaving procedure. But we lack organized data on different aspects of dialysis practice. Data related to vascular access is even more scanty.*

***Method:*** *A survey was undertaken in one of the busy dialysis centers in Dhaka with a large number of patients on maintenance hemodialysis .Data were collected by doctors in dialysis units from patients along with records kept in the dialysis unit during November and December 2017.*

***Results:*** *Total 143 patients were included. 53% of these patients belonged to age group 61 to 80 years, 39% to age group 41 to 60 years; 56.6 % female and 43.4% male. 73.4% of the study patients received dialysis via central venous catheter at the initiation. But among the prevalent patients during study period, 84% patient were receiving dialysis via arterio-venous fistula and 5% via arterio-venous graft as permanent vascular access. Among these permanent vascular access left forearm was used in 47% and left upper arm in 33% of cases. Vascular ultrasound mapping before permanent access creation was done in only about 40% of cases. Almost 56 % of the vascular access surgery was done by experienced medical graduates in vascular access creation without any post graduate surgical qualifications.*

***Conclusion:*** *Vascular access data should be collected in a structured manner so that dialysis practice pattern of different centers and regions of the country can be compared. Similar data from several centers around the country will increase scope of improvement .*

***Key words:*** *Vascular access, Hemodialysis, Vascular mapping, Arterio-venous fistula.*

***(BIRDEM Med J 2020; 10(2): 120-124)***

## Introduction

Vascular access is called the life line of a dialysis patient. With increasing number chronic kidney disease patients due to various causes all over the world, access issue is becoming even more important. In many countries, dialysis registries keep track of different parameters of patients who are on dialysis. But many of such registries do not record data related to vascular access in a structured manner. In Bangladesh registry data about dialysis practice parameter is even more lacking. In our country facilities related to dialysis are increasing at least in major cities to meet the needs of increasing number of patients needing this therapy. We decided to collect data about dialysis vascular access from a single center of a tertiary level private hospital in the capital where a significant number of patients come for maintenance hemodialysis.

**Author information**

a. Dr. Tanveer Bin Latif MBBS, MRCP(UK) ,Consultant Nephrologist ,United Hospital Limited,Dhaka, Bangladesh

b. Dr. Tanvir Rahman MBBS MD(Nephrology) Specialist , Nephrology, United Hospital Limited,Dhaka

**Address of correspondence:** Dr Tanveer Bin Latif MBBS MRCP(UK) Consultant Nephrologist, United Hospital Limited, Plot 15, Road 71, Gulshan, Dhaka 1212,Bangladesh.

Email : tanveer.lati f@uhlbd.com

**Received:** January 03, 2020 **Accepted:** February 29, 2020

## Methods

A survey was undertaken to understand a number of issues related to vascular access of prevalent dialysis patients at the United Hospital Dialysis Center. Ethical approval was granted by the hospital ethics committee. A questionnaire form was designed to be filled in by doctors working in the dialysis unit. They collected data from patients while they were on dialysis with assistance from hospital medical record. Data were collected over a period of one month (November-December 2017). A total of 143 patients were included. All patients who

were diagnosed as chronic kidney disease stage 5 and had to be on maintenance hemodialysis were included in the study. Patients who were being dialyzed for acute kidney injury or acute kidney injury on chronic kidney disease were excluded. During filling in the forms, doctors of the dialysis unit collected data based on patients' history and also from patients' hospital medical record preserved in dialysis unit. The surgeons who performed the vascular access procedure were from different hospitals. We defined 'Vascular surgeons' as surgeons who had post graduate qualification in vascular surgery or any other related surgical specialty and 'experienced medical graduates' were doctors who had sound and long experience of vascular access creation for dialysis patients but had no post graduate surgical qualification. Permanent vascular access was defined as either an arterio-venous fistula or a arterio-venous graft.Data were processed with help of statistical packages for social sciences(SPSS) version 20.0.

## Results

Among 143 patients who were included in the study, 53% of the patients belonged to the age group 61 to 80 years and 39% in 41 to 60 years (Figure 1). More female (56.6%) compared to male were taking dialysis in our unit (figure 2). Majority (54%) of prevalent patients on maintenance dialysis at our center were on dialysis for 2 years or less (figure 3). More than 73% of the prevalent patients were initiated on dialysis in an unplanned way using a central venous catheter(CVC) (Figure 4). Only about 27% started first dialysis via a permanent vascular access either arterio-venous fistula (AVF) or arterio-venous graft (AVG). But during maintenance, 84% were having dialysis via AVF, almost 5% AVG and 9% tunneled catheter (Table I). Patients who had permanent vascular access (AVF or AVG) about 47% were created on left forearm and 33% on left upper arm (Table II). Right arm was used for permanent vascular access in about 20% of patients (Table II). Most of the AVF or AVGs (59.9%) were less than 2 years old (Table III). Among the 120 patients who were being dialyzed through AVF only about 15 % of the patients had 2nd AVF created for primary or secondary failure (Figure 5). Majority of permanent vascular access surgery AVF surgery were done by medical graduates experienced in access creation (56.3%) who were not qualified vascular surgeons (Table IV). Most of the patients (59%) did not have their venous mapping done before fistula creation (Table V) Among the prevalent patients 71% were hypertensive and 65% diabetic (Table VI).

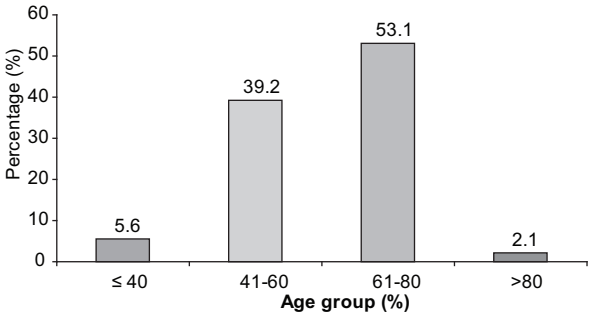


**Figure 1** Distribution of the study patients by age (n=143)

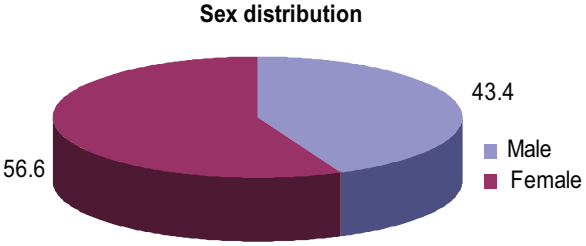


**Figure 2** Distribution of the study patients by sex (n=143)

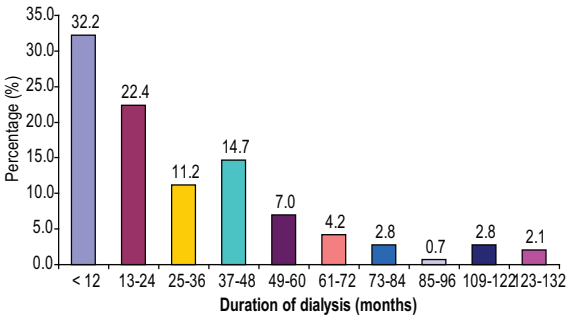


**Figure 3** Bar diagram showing the duration of dialysis of the study patients

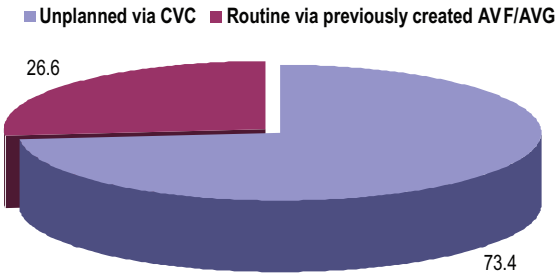


**Figure 4** Distribution of the study patients by dialysis access use at the initiation of dialysis (CVC= Central venous catheter; AVF=Arterio-venous fistula; AVG=Arterio-venous graft) (n=143)

**Table I** Distribution of the study patients by existing vascular access type (n=143)

| Current type of vascular access used | Frequency | Percentage |
|---|---|---|
| Arterio-venous fistula(AVF) | 120 | 83.9 |
| Arterio-venous graft (AVG) | 7 | 4.9 |
| Tunneled catheter | 13 | 9.1 |
| Non-tunneled | 3 | 2.1 |
| Total | 143 | 100.0 |

**Table II** Distribution of the study patients by location of existing AVF& AVG (n=127)

| Location of existing AVF&AVG | Frequency | Percentage |
|---|---|---|
| Upper arm (left) | 42 | 33.1 |
| Upper arm (right) | 15 | 11.8 |
| Forearm (left) | 60 | 47.2 |
| Forearm (right) | 10 | 7.8 |
| Total | 127 | 100.0 |

**Table III** Distribution of the study patients by duration of use of current functional AVF/AVG (in yrs)

| Duration of use of current functional AVF/AVG (in yrs) | Frequency | Percentage |
|---|---|---|
| < 2 yrs | 76 | 59.6 |
| 2-4 yrs | 30 | 23.6 |
| 4-8 yrs | 16 | 12.5 |
| > 8 yrs | 5 | 0.039 |
| Total | 127 | 100.0 |
| Mean±SD | 2.27±2.28 | |
| Range | (1 months to 10.9 yrs) | |

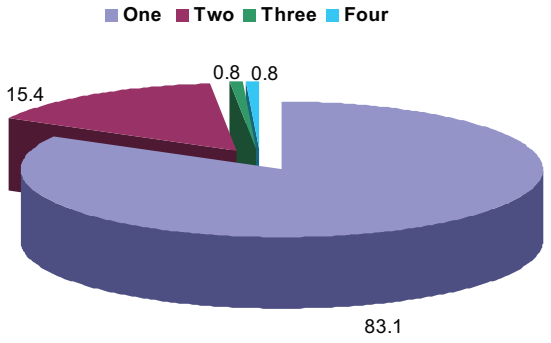


**Figure 5** Distribution of the study patients by number of AVF creation on a single patient (n=120)

**Table IV** Distribution of the study patients with existing AVF or AVG created by experienced medical graduate versus vascular surgeon (n=127)

| | Frequency | Percentage |
|---|---|---|
| Experienced & skilled medical graduate | 71 | 55.9 |
| Vascular surgeon | 56 | 44.1 |
| Total | 127 | 100.0 |

**Table V** Distribution of the study patients on dialysis via AVF/AVG who underwent vascular mapping before access creation versus who did not (n=127)

| | Frequency | Percentage |
|---|---|---|
| Doppler guided vascular mapping done | 52 | 40.7 |
| Not done | 75 | 59.3 |
| Total | 127 | 100.0 |

**Table VI** D.istribution of the study patients by co-morbidities (n=143)

| Cause of CKD | Frequency | Percentage |
|---|---|---|
| DM | 93 | 65.0 |
| Biopsy proven GN | 3 | 2.1 |
| Presumed GN | 6 | 4.2 |
| Hypertension | 102 | 71.3 |
| Obstructive nephropathy | 1 | 0.7 |
| APKD | 2 | 1.4 |
| Other | 7 | 4.9 |

**Discussion**

Importance of data related to vascular access has recently been emphasized as United states Renal Data System (USRDS) has devoted an entire chapter on this topic[1].It shows that in 2016, 80% of patients were using a catheter at hemodialysis initiation . Our study is a single center observational study so there is inherent risk of observation bias; nonetheless it shows that it's a little lower at around 73% in our center (Figure 4) . But it was proposed more that 10 years ago that autogenous arterio-venous fistula (AVF) should be the preferred method for dialysis initiation.[2] Fistula First

Breakthrough Initiative (FFBI) was proposed by the Centers for Medicare & Medicaid in United States[3]. The proportion of AVF at the initiation is often considered as an indicator for quality of HD care. Adequate preparatory counseling and timely referral for AVF/AVG creation within about 12 months of the estimated time to dialysis when eGFR < 15-20 mL/min/1.73 m should be the standard practice[4] and this would translate into more people initiating hemodialysis via AVF

The international Dialysis Outcomes and Practice Patterns Study (DOPPS) generated data by which dialysis practice across the world can be compared. Large international differences exist in AVF location, predictors of AVF location, successful use of AVFs, and time to first AVF/AVG use, challenging what constitutes best practice. The large shift in the united states from lower- to upper-arm AVFs raises serious concerns about long-term health implications for some patients and how policies and practices aimed at increasing AVF use have affected AVF placement location.[5] In our study majority (57%) of AVF/AVG was created on forearm as standard guidelines suggest that these should be created as distally as possible.

All over the world the field of vascular access surgery is dominated by surgeons and interventional radiologist trained in vascular access procedure. Vascular access teams include a medical director, one or more dedicated vascular access coordinators, vascular surgeons, and interventional nephrologists or radiologists. It leads to better outcome.[6] But in our resource constrained country majority of access creation is done by experienced medical graduates (56%) without any organized vascular access team (table 4). In fact vascular surgeon dedicated solely to AVF creation is almost non-existent in our country.

It is suggested in many international guidelines that vascular mapping with ultrasonography increases fistula patency.[7]Arteries and veins of adequate diameter are preselected by ultrasound along with clinical examination and suitable ones are chosen. Routine preoperative vascular ultrasound in addition to clinical assessment improves AVF outcomes in terms of patency and use for dialysis [8]. Although we had the facility for vascular mapping in our center, we could employ it in only 41% of cases (table V).

Although there is no randomized controlled trials comparing different types of vascular access , scientific societies like Kidney Disease Outcomes Quality Initiative(K/DOQI) and European Renal Best Practice Guidelines strongly promote the use of AVF and discourage the use of catheters.[9,10]Large observational studies show that the use of AVFs is associated with the lowest and catheters with highest risk of death from infection and cardiovascular disease.[11,12] In United States in 2018 among prevalent dialysis patients, access was : AVF 64%, AVG 17% and Catheter 19%.The use of dialysis catheter is more prevalent in elderly as nephrologists might be reluctant to prepare these patients for dialysis because many of them die before starting dialysis at all.[13]As diabetic and cardiovascular patients are increasing world-wide, their fistula often do not mature due vasculopathy and so catheter use become inevitable. [14,15]We had a remarkable 84% of prevalent patient receiving dialysis using AVF (Table 1). The reason for very small number of patients on AVG is probably lack of vascular surgeon with appropriate training in graft placement.

***Conclusion***

We believe that vascular access should be studied in more detail in all the dialysis centers in Bangladesh, compared and this way contribute to better outcome in access placement.

**Conflict of interest:** Nothing to declare

**References**


1. National Institutes of Health. National Institute of Diabetes and Digestive and Kidney Diseases. United states renal data system. 2018 USRDS annual data report: Epidemiology of kidney disease in the united states., bethesda, MD. 2018.
2. van Dijk PC, Jager KJ, de Charro F, et al. Renal replacement therapy in Europe: the results of a collaborative effort by the ERA-EDTA registry and six national or regional registries. Nephrol Dial Transplant. 2001;16(6):1120–1129. doi:10.1093/ndt/16.6.1120
3. Vassalotti JA, Jennings WC, Beathard GA, et al. Fistula first breakthrough initiative: targeting catheter last in fistula first. Semin Dial. 2012;25(3):303–310. doi:10.1111/j.1525-139X.2012.01069.x
4. Shechter SM, Skandari MR, Zalunardo N. Timing of arteriovenous fistula creation in patients With CKD: a decision analysis. Am J Kidney Dis. 2014;63(1):95–103. doi:10.1053/j.ajkd.2013.06.021
5. Pisoni RL, Zepel L, Fluck R, et al. International Differences in the Location and Use of Arteriovenous Accesses Created

for Hemodialysis: Results From the Dialysis Outcomes and Practice Patterns Study (DOPPS). Am J Kidney Dis. 2018;71(4):469–478. doi:10.1053/j.ajkd.2017.09.012

6. Kiaii M, MacRae JM. A dedicated vascular access program can improve arteriovenous fistula rates without increasing catheters. J Vasc Access. 2008;9(4):254–259..
7. Maya ID, Allon M. Vascular access: core curriculum 2008. Am J Kidney Dis. 2008;51(4):702–708. doi:10.1053/j.ajkd.2007.10.046
8. Ferring M, Claridge M, Smith SA, Wilmink T. Routine preoperative vascular ultrasound improves patency and use of arteriovenous fistulas for hemodialysis: a randomized trial. Clin J Am Soc Nephrol. 2010;5(12):2236–2244. doi:10.2215/CJN.02820310
9. Vascular Access 2006 Work Group. Clinical practice guidelines for vascular access. Am J Kidney Dis. 2006;48 Suppl 1:S176–S247. doi:10.1053/j.ajkd.2006.04.029
10. Vanholder R, Canaud B, Fluck R, et al. Diagnosis, prevention and treatment of haemodialysis catheter-related bloodstream infections (CRBSI): a position statement of European Renal Best Practice (ERBP). NDT Plus. 2010;3(3):234–246. doi:10.1093/ndtplus/sfq041
11. Ravani P, Palmer SC, Oliver MJ, et al. Associations between hemodialysis access type and clinical outcomes: a systematic review. J Am Soc Nephrol. 2013;24(3):465–473. doi:10.1681/ASN.2012070643
12. Ravani P, Gillespie BW, Quinn RR, et al. Temporal risk profile for infectious and noninfectious complications of hemodialysis access. J Am Soc Nephrol. 2013;24(10):1668–1677. doi:10.1681/ASN.2012121234
13. Demoulin N, Beguin C, Labriola L, Jadoul M. Preparing renal replacement therapy in stage 4 CKD patients referred to nephrologists: a difficult balance between futility and insufficiency. A cohort study of 386 patients followed in Brussels. Nephrol Dial Transplant. 2011;26(1):220–226. doi:10.1093/ndt/gfq372
14. Dember LM, Beck GJ, Allon M, et al. Effect of clopidogrel on early failure of arteriovenous fistulas for hemodialysis: a randomized controlled trial. JAMA. 2008;299(18):2164–2171. doi:10.1001/jama.299.18.2164
15. Vachharajani TJ, Moossavi S, Jordan JR, Vachharajani V, Freedman BI, Burkart JM. Re-evaluating the Fistula First Initiative in Octogenarians on Hemodialysis. Clin J Am Soc Nephrol. 2011;6(7):1663–1667. doi:10.2215/CJN.05830710