

# Arteriovenous fistula complications in dialysis patients: Incidence and risk factors

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## Abstract:

The purpose of this study was to determine the prevalence of arteriovenous fistulas (AVFs) and its consequences in patients receiving haemodialysis (HD) in Vadodara, Gujarat. Methods: This was a prospective hospital-based study involving 196 individuals over the age of 18 who were on dialysis in two Vadodara hospitals. A pretested questionnaire was used to gather and document data, which included sociodemographic information as well as information about fistula-related problems. The hospital records were also checked to see if the complication and risk factors were the same. SPSS software version 23 was used to run appropriate statistical tests and analyse the data. The majority of the research patients were between the ages of 41 and 60, with male and female prevalence rates of 49.5 percent and 50.5 percent, respectively. Hypertension was the most common chronic ailment among the patients (41.7%), and more than 30.6 percent had several chronic illnesses. Radio cephalic fistula was the most prevalent kind of AVF (RCF). Ischemic neuropathy was the most common consequence linked with AVF patients (29.6 percent). Non-smokers had a lower risk of myocardial infarction than smokers. Conclusion: For successful care of AVF problems, early and prompt discovery is critical. The difficulties associated with AVF should be well-understood by health professionals. To improve the quality of life of patients with HD, early diagnosis and adequate treatment are critical.

## Introduction

Chronic kidney disease (CKD) and end-stage renal disease (ESRD) are two major health issues that affect people all over the world. The prevalence of CKD varies by area, ranging from 7% to 24% on a global scale. The prevalence of CKD ranges from 16.6% to 25%. Patients with CKD are frequently diagnosed late due to a lack of health education, a lack of health care facilities, and late detection of predisposing factors such as hypertension and diabetes mellitus. (1) Patients with severe stages of CKD or ESRD cannot be treated to stop or delay the progression of their disease. These people are candidates for dialysis or renal transplantation as a kind of renal replacement therapy. Haemodialysis is a type of renal replacement therapy that involves two to three times weekly vascular access through an AVF (AVF) established on one of the upper limbs. (2) In the management of ESRD, it has

become a necessary evil. If haemodialysis is not used in ESRD, patient survival can be up to 6 months. (3)

However, it has drawbacks that limit its effectiveness. The dread of needles is common among patients. The patient's social and economic position is impacted by frequent hospital visits. These patients acquire both systemic and local problems, such as cardiovascular disease, infections, and malignant neoplasms, and have a very bad prognosis, with mortality exceeding 30% three years after starting dialysis 1,6. Similarly, local problems associated with AVF treatment are time-consuming. <sup>(4)</sup>

Infection of the AVF requires intravenous (IV) antibiotics, abscess drainage, and fistula closure. AVF thrombosis results in the loss of IV access for good. In the same way, haemorrhage, ischemia steal syndrome, and AVF pseudoaneurysm may necessitate secondary intervention and fistula revision. As a result, fistula dysfunction is the most common cause of recurrent hospitalisation and increased morbidity. These problems are more pronounced in resource poor countries due to their poor socioeconomic status. (5) This study focuses on the knowledge of complications of AVF in our set up. lack of a central registry makes epidemiological assessment extremely difficult and inadequate. Most of the data regarding disease burden estimates are mostly canter-based. (6)

#### **Methods:**

This was a hospital-based prospective study involving 196 patients in two hospitals who were undergoing HD with AVF. The research was carried out between December 2021 and March 2022. A pretested questionnaire was used to obtain the data. The questionnaire's validity and internal consistency reliability were assessed. The Cronbach's alpha value was found to be  $r = 0.854$ .

All patients had a thorough medical history taken, and data on their age, gender, and cardiovascular risk factors like diabetes and hypertension were obtained (HTN). Clinical evaluations and hospital records were used to further evaluate the patients.

#### **Inclusion criteria**

Patients who are having HD with AVF and have given their agreement to take part in the trial. The anonymity and confidentiality of the data/information reported in the questionnaire were explained to the participants. Only people over the age of 18 were considered.

#### **Exclusion criteria**

Patients who refused to give their consent were not included in the study. Patients treated or consulted in other departments, as well as those under the age of 18, were excluded from our study.

## Ethical confederations

The study ethical committee of the Directorate of Health Affairs, Ministry of Health, Vadodara was accepted by the Research Ethics Parul University in 2021. Patient consent was gained in both written and verbal form.

## Data analysis

MS Excel was used to tabulate all of the data collected, and SPSS version 23 was used for statistical analysis. Continuous variables were expressed as mean SD, and categorical data were expressed as percentages, hence descriptive statistics were utilised. The statistical connection of one variable with another was determined using the Pearson Chi square test. A statistically significant P value of less than 0.05 was used.

## Results

Ours was a one-year prospective cross-sectional study involving 196 patients who were undergoing HD with AVF. The age breakdown of the participants. We covered both genders in our survey, with 49.5 percent males and 50.5 percent females. When asked why they were on dialysis, 49 (25%) said it was because of renal failure, 47 (24%) said it was because of "hypertension," and 6.6 percent said it was because of diabetes. The causes of dialysis are depicted in depth.

According to the history of chronic illness prevalence among the participants, HTN was present in 79 (40.3%) and asthma was seen in 3 (3.6%). 7 (1.5%) participants reported having diabetes, 1 (0.5%) had hyperthyroidism, 1 (0.5%) had SLE, 60 (30.6%) participants reported having multiple illnesses, and 45 (23%) participants reported having no chronic illness.

In terms of the types of AVFs, RCF was found in 64 percent of the patients, with 45 having left RCF and 6 having right RCF. BCFs were found in 73 (37.2%) of the patients, with 51 having left BCFs and 22 having right BCFs. The presence of a brachioradialis fistula (BBF) was found in 42 (21.4%) of the patients, with 35 having left BBFs and 7 having right BBFs. Brachio median antecubital fistulas (BAFs) were found in 5.6 percent of patients (n = 11), with 4 being left and 7 being right. The femoral and saphenous vein fistula (FSF) type was found in 6 (3.0%) of the patients, with 1 FSF on the left and 9 on the right.

In our survey, we discovered that 96.9% of people had dialysis three times per week, 2.0 percent had it twice, and only 1.0 percent had it once per week. According to the study's findings, 19 (9.7%) individuals suffered bleeding from AVF, whereas 27 (13.8%) had venous HTN as a result of AVF. Aneurysms at the AVF location were found in 49 (25%) of the patients.

Ischemic neuropathy was found in 58 (29.6%) of the patients, and 6 (3.1%) of the patients had a history of heart failure.

Three (1.5 percent) of the patients had lymphedema at the AVF site [Table 3]. When the relationship between patients' history of problems and their smoking status was examined, it was discovered that there was no correlation,  $P > 0.05$ , except that smoker had a higher risk of myocardial infarction than non-smokers,  $P 0.05$ .

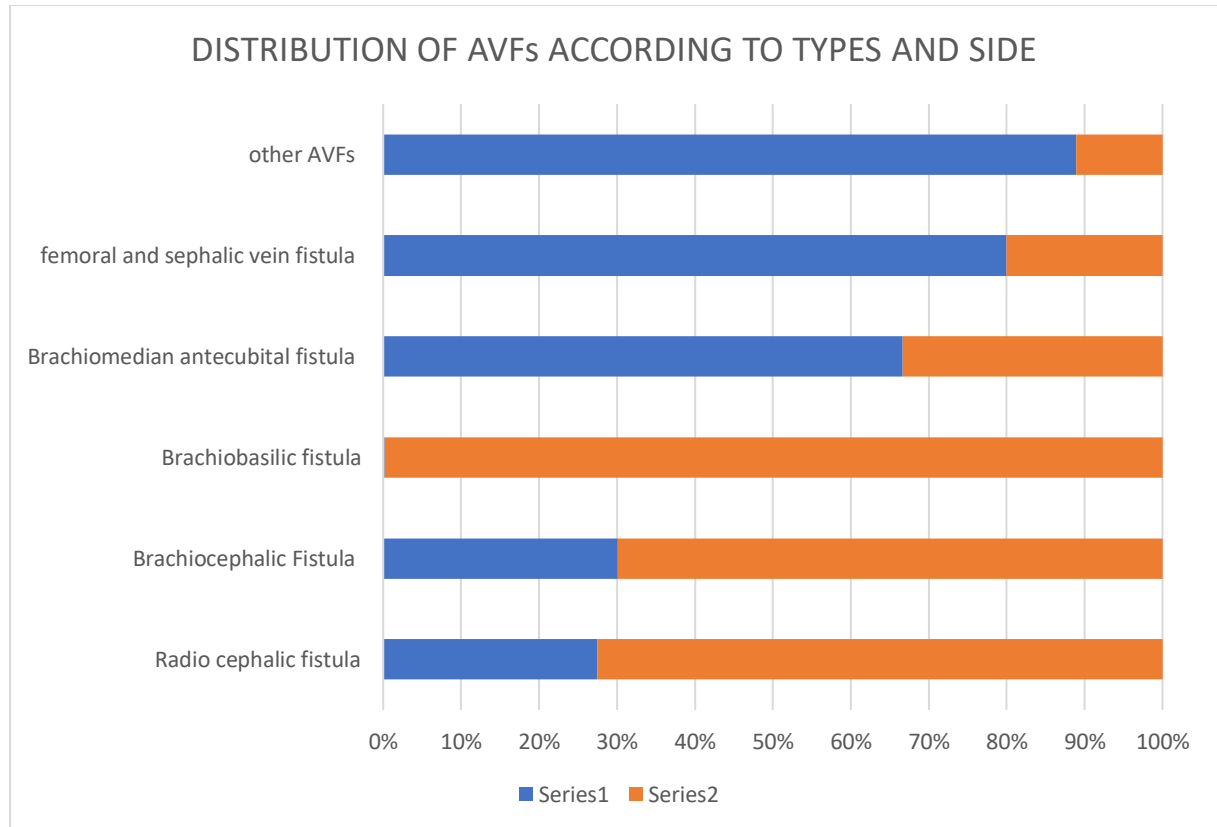
When the kind of AVFs was compared to the age of the patients, no correlation was found, except for femoral and saphenous vein fistulas (FSF).  $P 0.001$  showed that patients with FSFs had more "right type" than "left type."

**Table 1: Distribution of participants according to age categories**

Age	Frequency	Percentage
18-20	6	3.1
21-25	9	4.6
26-30	5	2.6
31-35	10	5.1
36-40	15	7.7
41-45	15	7.7
46-50	20	10.2
Above 50	116	59.2
Total		

**Table 2: Distribution of the participants according to the causes of dialysis**

Cause	Frequency	Percentage
After ophthalmic Surgery	1	0.5
After Pregnancy	2	1.0
Analgesics	5	2.6
CKD	7	3.6
Congenital	6	3.1
Diabetes Mellitus	13	6.6
Fever	1	0.5
Gout	1	0.5
Hypertension	47	24.0
Hypertension and DM	6	3.1
Hypertension and kidney Failure	1	0.5
Kidney Hypertrophy	12	6.1
Kidney Failure	49	25.0
Medications	3	1.5
Recurrent Infection	1	0.5
SLE	3	1.5
Unknown	34	17.5
UTI	4	2.0
Total	196	100.0



**Table 3: Distribution of the participants according to the history of complications (No.: 196)**

Complications	No No. (%)	Yes No. (%)	Relationship with Smoking (P)	Relationship with Smoking (P)
Bleeding from AVF	177(90.3%)	19(9.7%)	0.311	0.876
Venous HTN	169(86.2%)	27(13.8%)	0.657	0.092
Aneurysm at the site of AVF	147 (75%)	49(25%)	0.747	0.921
Ischemic Neuropathy	138 (70.4%)	58(29.6%)	0.541	0.645
History of Heart Failure	190(96.9%)	6(3.1%)	0.315	0.447
History of Lymphedema at the site of AVF	193 (98.5%)	3(1.5%)	0.416	<0.001*
History of stenosis at the site of AVF	157 (80.1%)	39(19.9%)	0.359	0.536
History of Myocardial Infraction	190 (96.7%)	6(3.1%)	0.037*	0.928

**Table 4: Relationship between age of the studied patients and the type of AVF**

Variable	Variable	Type of AVF									
		RCF		BCF		BBF		BAF		FSF	
Age		L	R	L	R	L	R	L	R	L	R
	18-20	2	0	1	0	0	0	0	0	0	0
	21-25	3	0	1	1	1	0	0	0	0	2
	26-30	1	1	0	0	1	0	1	1	1	0
	31-35	4	2	1	0	2	0	1	0	0	0
	36-40	6	1	1	0	4	2	0	0	0	0
	41-45	1	2	4	2	4	1	0	0	0	0
	46-50	4	2	7	3	5	1	0	0	0	2
	Above 50	24	8	36	16	18	3	2	6	0	2
Person Chi square value		12.189		19.047		11.232		20.563		54.496	
P		0.591		0.163		0.668		0.113		<0.001*	

N.B R=Right, L=Left

## Discussion

The haemodialysis (HD) machine pumps the dialysate as well as the patient's blood through a dialyzer. It's a temporary treatment for the patients who are candidates for kidney transplantation and it is also permanent method for the patients who is having ESRD with no chances of Kidney transplantation. In this study most of the patient who had AVF (Atrioventricular fistula) were age was above 40 years and the prevalence increased as age increased and complication of AVF also increased as age increased and management is also Difficult.

The most prevalent cause of dialysis in our study was found to be renal failure followed by hypertension. Researchers claim that occurrence of AVF insufficiency is mostly a result of pre-existing morphologic abnormalities due to the underlying disease such as renal failure or other causes. The findings showed that the prevalence of HTN alone was more (40.3%), followed by asthma alone (3.6%). About 30.6% of patients had multiple chronic illness.

The most common complication seen in these patients was "ischemic neuropathy" (29.6%) followed by "aneurysm at the site of AVF" (25%).

Ischemic neuropathy was detected in 16.1% of the patients in our study, and it was common in diabetic patients.

According to certain research, access-related deaths in patients on HD are extremely rare, and mediation analyses demonstrated that vascular access issues were unable to properly explain the link between access type and death.

Without vascular mapping and evaluation by a competent HD access vascular surgeon, no patient with ESRD should be ruled out for an AVF.

## Conclusion

Knowledge of the potential complications of AVFs could aid in their early discovery and enable measures to be taken to minimise negative outcomes ranging from loss of vascular access to major morbidity and, in the worst-case scenario, death. To avoid problems, both the patient and the expert should treat the AVF with the utmost care. To avoid the loss of vascular access, it is also necessary to diagnose and treat issues connected to AVF as soon as possible.

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