ORIGINAL ARTICLE

THE FREQUENCY OF INFECTIONS OF ARTERIOVENOUS FISTULA IN PATIENTS ON DIALYSIS WITH CHRONIC KIDNEY DISEASE

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ABSTRACT

Objective: To determine the frequency of infective complication associated with Arteriovenous fistula in patients with chronic kidney disease.

Material and Methods: This study was conducted at department of Nephrology, Khyber Teaching Hospital, Peshawar. Study design was cross-sectional study (Descriptive) which was conducted for the period of 6 months (January 2014 till June 2014).One hundred and fifty six (156) patients were studied, using 9% proportion of infection with 95% confidence interval and 4.5% margin of error under WHO software for sample size determination. Moreover consecutive (non-probability sampling technique) was used for sample collection.

Results: Maximum number of patients (84%) were in age range of 31-60 years. Mean age was 38 years with standard deviation ± 2.16. Sixty five percent patients were male and 35% patients were female. Of various complications related to AVFs the incidence of infection related to arteriovenous fistula (AVF) was found in 13% of these patients.

Conclusion: A functional AVF is a major determinant of successful hemodialysis (HD), however AVF is one of the risk factor for hospitalization in dialysis patients. Knowledge about the potential complications of AVFs should contribute to their timely detection and allow measures to be taken that might prevent deleterious consequences that range from loss of vascular access to serious morbidity, and may ultimately be fatal. Therefore, AVF care should be a priority not only for patients but also for the entire professional team involved in the management of dialysis patients.

Key Words: Arteriovenous fistula (AVF), Chronic kidney disease (CKD) Hemodialysis (HD), Glomerular Filtration rate (GFR).

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INTRODUCTION

Chronic kidney disease is defined as a slow and progressive kidney damage leading to Glomerular filtration rate below 60 mL per minute per 1.73 m^2 for three months or more[1]. It is a major public health problem worldwide. In the United States, kidney failure is becoming increasingly common and is associated with poor health outcomes and high medical expenditures[2]. The number of patients suffering from chronic kidney disease in United States is growing rapidly and is expected to reach 71 million by 2030[3]. A study conducted in Karachi Pakistan showed a prevalence of moderate CKD (GFR <60) to be 5% among people aged 30 years or above[4]. Arteriovenous fistula (AVF) is the life line of all ESRD patients on Dialysis. This Access is essential for quality hemodialysis (HD). But due to repeated needling of these veins, it can lead to various complications.

Complications of arteriovenous fistula (AVF) create significant problems for renal practitioners, the healthcare providers and especially for the patient themself[5,6]. A study by Madsen KM et al reported overall frequency of complications at 16%[7], while another study conducted by Jaffer HT showed overall complication rate of 29%[8].

Present study will determine the frequency of infective complications of arteriovenous fistula in chronic kidney disease patients. This is a potentially treatable and preventable complication. The results of this study will help us highlight the magnitude of this common

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complication in our center. The study results will be compared with available international data and on the basis of this we can draw conclusion and recommendations for future research work.

The most common complications of AVF can be summarized as under;

1. Infections
2. Surgical complications
3. Aneurysmal Enlargement of Blood Vessel Wall
4. Stenosis and thrombosis of vessel
5. Vascular Access-Induced Ischemia of limb
6. Ischemic Polyneuropathy of distal digits

Infections accounts for up to 20% of all AVF complications worldwide, which is still ten times lower than the rate of infection of arteriovenous graft (AVG.) Most AVF infections leads to perivascular cellulitis, which manifests as localized erythema and edema and is usually easily treated[9]. Much more serious is infection, when associated with anatomical abnormalities such as aneurysms, hematomas or abscesses. Clinical suspicion arises after visible signs of inflammation at the vascular access puncture site (calor, dolor and rubor) with or without systemic manifestations.

Localized infections occurring after AVF puncture are treated with appropriate antibiotics based on the results of swab and blood cultures. In extreme cases ligature of the AVF is required, when it becomes a source of recurrent septic pulmonary embolism[10]. The Aim of this study was to determine the frequency of infective complications of AVF in our set up which is a potentially treatable and preventable complication.

MATERIAL AND METHODS

This study was coducted in the Department of Nephrology, Khyber Teaching Hospital Peshawar, Pakistan from January 2014 to June 2014. A total of 156 patients using 9% proportion of infection, 95% confidence interval and 4.5% margin of error under WHO software for sample size determination was used. It was a cross-sectional study (descriptive) All patients, age 18 years or above who were diagnosed CKD, on regular maintenance dialysis and had AV fistula with various complications were included in this study.

Chronic kidney disease patients with bleeding diatheses (i.e. bleeding from other sites on the basis of history or clinical examination), chronic kidney disease with liver and cardiac failure (history, physical examination and investigations i.e. ultrasound and echo based), previously repaired arteriovenous fistula confirmed by history and past record were excluded from the study. Permission was obtained from "Hospital Ethical Committee". The study was carried out at Nephrology unit, Khyber Teaching Hospital, Peshawar and all patients fulfilling the diagnostic criteria (i.e. complications related to arteriovenous fistula) for inclusion were selected through consecutive sampling from OPD. Written informed consent was obtained from the patients. History of hemodialysis was obtained and basic investigation like renal function tests, full blood counts, CRP levels, wound swab culture and ultrasound abdomen were done. All the above mentioned information including name, age, gender and address was recorded in a pre-designed proforma.

All data collected was entered and analyzed using SPSS version 17. Frequencies were calculated for the qualitative variables like gender and infection of arteriovenous fistula. Mean and standard deviation was calculated for quantitative variables like age of the patient. Infection of arteriovenous fistula was stratified among age and gender to see effect modifiers. The results were presented as tables and charts.

RESULTS

One hundred & fifty-six patients having different complications of AVF were observed. We assessed the frequency of infective complications, associated with Arteriovenous fistula in patients with chronic kidney disease and the results were as below: Age distribution among 156 patients was analyzed and it was found that 17(11%) patients were in age range 20-30 years, 39(25%) patients in age range 31-40 years, 44(28%) patients in age range 41-50 years, 48(31%) patients in age range 51-60 years, and 8(5%) patients were in age range >60 years. Mean age was 38 years with standard deviation ± 2.16. (Figure 1)

Gender distribution among 156 patients was analyzed and it was seen that 101(65%) patients were male and 55(35%) patients were female. (Figure 2) The incidence of infection among 156 patients with various complications of AVF was found in 20(13%) patients only while non- infective causes were present in the remaining 136(87%) patients. (Figure 3)

Stratification of infective process of arteriovenous fistula with age distribution was analyzed. In 20 cases of infective arteriovenous fistula, 2 patients were in age

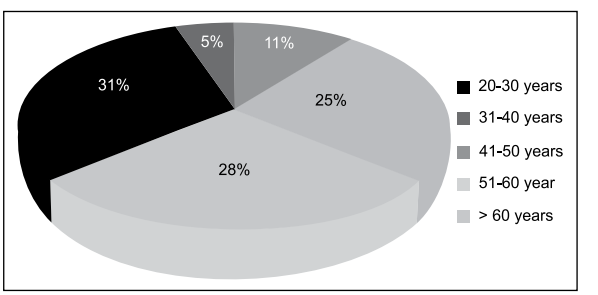

Figure 1: Age Distribution (N=156)

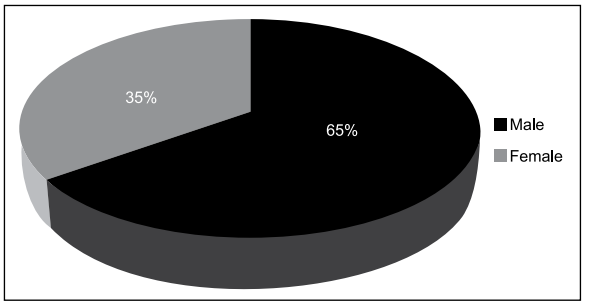

Figure 2: Gender Distribution (N=156)

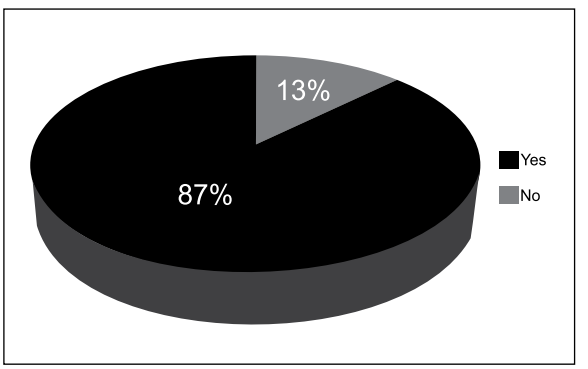

Figure 3: Status of Infection of Arteriovenous Fistula (N=156)

range 20-30 years, 4 patients in age range 31-40 years, 5 patients in age range 41-50 years, 8 patients in age range 51-60 years and only one patients was in age range >60 years. Stratification of infection of arteriovenous fistula with gender distribution was analyzed in these 20 cases of infective arteriovenous fistula, 16 patients were male and 4 patients were female.

DISCUSSION

Chronic kidney disease is a silent global epidemic. Although formal data in our population is lacking, the prevalence of chronic kidney disease in Pakistan is expected to be high, commensurate with the high prevalence of its major risk factors namely diabetes and hypertension. Majority of patients with chronic kidney disease cannot get optimal management of their condition due to multiple reasons such as high cost of management, lack of financial support by the government, absence of health insurance, lack of health care facilities, complex management issues, failure of health professionals to recognize the magnitude of this problem and the complications of chronic kidney disease. These factors make it unlikely that chronic kidney disease patients in Pakistan will receive adequate management, and therefore the magnitude of complications is expected to be higher.[11]

This study shows that majority of our patients 25%, 28% and 31% were in age range 31-40 years, 41-50 years and 51-60 years. Mean age was 38 years with standard deviation ± 2.16. Sixty five percent patients were male and 35% patients were female. Infection as cause of complication of arteriovenous fistula was found in 13% patients while non-infective causes were found in 87% patients. Similar results were found in other studies as the common complication rate of AVF Chronic HD access complications include thrombosis (40%), infection (9.5-36%), rupture (19%), ischemic steal syndrome (5-10%), aneurysms (3%), venous hypertension (3%), hematomas, heart failure (1%), and prolonged bleeding[12]. Another study also showed the rate of infection (11-20%), thrombosis (14-33%), rupture (11%), hematomas (2-3%), and ischemic steal (13%) syndrome respectively[13,14].

In one of the local study, 47% cases had early nephrologists care which in comparison to other countries is very low, i.e., 60-79% patients seeing a nephrologists >4 months before hemodialysis and 69–88% seeing nephrologists >1 month before starting dialysis[15,16,17]. Time of nephrology consultation is an important factor and has significant impact on timing of vascular access creation and failure. But even in late access creation group 36% of patients had an early nephrology consultation but in them fistula was formed late. The reasons in these patients are different and include poor education status, low income to support dialysis, Hemodialysisphobia and wrong claims of quacks and non-conventional practicing physicians to keep them of off dialysis. So despite thorough counselling these patients are unwilling to get vascular access created at early stages. As a result of this, most of the vascular access are created just before or after starting hemodialysis and majority of patients (81.3%) have first hemodialysis through double lumen. In comparison to patients having seen a nephrologist >4 months prior to ESRD onset, catheter use varied from 10% in Japan to around 50% in Canada, USA and UK[16].

Time of referral to surgeon and time taken by surgeon for access creation also has impact on likelihood of starting hemodialysis through catheter and thus fistula failure. With lesser time there is more possibility of starting hemodialysis through AV fistula. The mean time from referral to vascular access creation varies from 5 to 6 days in Italy, Japan and Germany, and from 40 to 43 days in Canada and UK[12]. Time between AVF creation and cannulation in our setup is more than 4 weeks as in most countries. In a few countries, a high proportion of patients (>60%) have their AVF first cannulated within 4 weeks after AVF creation[17,18].

A systematic review found increased arteriovenous fistula-related infections with buttonhole compared with rope ladder in randomized trials.[19] Only the application of mupirocin cream was noted to be associated with reduced risk of infection.[20]

CONCLUSION

A functional AVF is a major determinant of successful HD; however, AVFs may be a risk factor for hospitalization in dialysis patients.

RECOMMENDATIONS

Knowledge about the potential complications of AVFs should contribute to their timely detection and allow measures to be taken that might prevent deleterious consequences that range from loss of vascular access to serious morbidity, and may ultimately be fatal. Therefore, AVF care should be a priority not only for patients but also for the entire professional team involved in the treatment of dialysis patients.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Khan AZ: Concept, Design and overall Supervision.
Alam SA: Data Collection
Ikram T: Tabulation and Designing
Mehmood MA: Bibliography
Khan RA: Follow up

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.