

# Complications during hemodialysis in arterio-venous fistula versus temporary vascular access

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## Abstract

**Background:** Dialysis is procedure that removes excess fluid and the toxic end products of metabolism. The major forms of dialysis are hemodialysis, and peritoneal dialysis. Access to the blood circulation is achieved by the use of central venous catheter or artificial arteriovenous fistula.

**Objective:** To detect and compare prevalence of complications occurs in uremic patients using central venous catheter or arteriovenous fistula in dialysis unit in Al-Kadhimiya Teaching Hospital.

**Patients and methods:** One hundred patients with renal failure (chronic or acute) undergoing hemodialysis were questioned and examined for the Complications occurred during or after the hemodialysis process using arteriovenous fistula or temporary vascular access.

**Results:** The results showed significant of fever and blood flow obstruction in temporary

vascular access (<0.05) as a complications in hemodialysis. Other complications such as hepatitis (B&C), hypotension, exit site infection, nausea, itching, muscle cramp, vomiting, backache, fainting and disequilibrium syndrome are similar in arteriovenous fistula and temporary vascular access.

**Conclusion:** The main complications during hemodialysis in this study were fever, malfunction of the catheter, and exit site infection in catheter more common in temporary Catheter than arteriovenous fistula so advice to do arteriovenous fistula before end stage renal disease

**Keywords:** Hemodialysis, arteriovenous fistula and temporary catheter.

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## Introduction

Dialytic therapy should be started when conservative management fails to maintain the patient in reasonable comfort. Usually, dialysis is required when the glomerular filtration rate drops to 5—10 ml/min. it is both unnecessary and risky to adhere to strict biochemical indications. Broadly speaking, the development of uremic Encephalopathy, neuropathy, pericarditis, and bleeding diathesis are indications to start dialysis immediately. Fluid overload, congestive heart failure, hyperkalemia, metabolic acidosis, and hypertension uncontrolled by conservative measure are also indications for starting patients

patients on dialysis therapy<sup>(1)</sup>.

Dialysis is procedure that removes excess fluid and the toxic end products of metabolism. Dialysis is usually prescribed to patients with significant impairment of renal function resulting from acute or chronic renal failure. It is also used occasionally to remove ingested drugs and other toxin in patients who may have normal renal function<sup>(2)</sup>.

About 62.9% of patients with end stage renal disease were undergoing hemodialysis, 8.7% were being treated with peritoneal dialysis, and the rest were being sustained by functioning kidney transplant<sup>(3)</sup>.

Although the basic principles of hemodialysis have not changed a great deal in the last 20 years, the technology has dramatically improved. Most patients dialyze three times per week<sup>(4)</sup>.

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The use of temporary or semi-permanent hemodialysis catheters remains an essential component of dialysis practice, both for the management of acute renal failure and as temporary bridging access for patients whose other dialysis access is unavailable for use. Unfortunately the use of these catheters is often complicated by mechanical or infectious complications which may result in patient's morbidity or premature catheter removal. Catheter related bacteraemia is the most significant infectious complication of hemodialysis catheter<sup>(5)</sup>.

One of the most frequent complications during hemodialysis is dialysis hypotension. It occurs in an estimated 20 % of all hemodialysis sessions. The symptoms vary from fatigue, yawning, cramps, nausea and vomiting to angina pectoris or loss of consciousness. The symptoms are generally transitory. However, dialysis hypotension can also cause permanent damage, such as a myocardial infarction, a cerebrovascular accident, intestinal infarction or an occlusion of the arterio-venous fistula<sup>(6)</sup>.

With the advent of developments and advances in hemodialysis machine technology, dialysate water purification, and dialyzers, the clinical spectrum of intradialytic complications has changed over the decades. In the pioneering days of hemodialysis, patients were liable to develop allergic reactions to dialyzer membranes, sterilizing and reprocessing agents, coupled with machines that could not accurately control ultrafiltration rates, and chemically and bacterially contaminated dialysate<sup>(7)</sup>.

#### **Patients and method**

A study was conducted of dialysis unit in AL-Kadhmiya Teaching Hospital from the period of February 2007 to October 2008. Complications

during hemodialysis were studied in 700 hemodialysis sessions. The number of patients involved in this study 100 patients (56 male and 44 female) of different age groups ranging from (5 to 70) years mean of age 37.3 year.

52 patients have permanent arteriovenous fistula and 48 patients have temporary catheter. Location of the catheter was subclavian vein in 28, internal jugular vein 12 and femoral vein 8. Patients were followed up for three months. Each patient subjected to hemodialysis for a period of 3–4 hours in two or three sessions per week.

Using GAMBRO AK95S hemodialysis apparatus with polyflux<sup>TM</sup>L dialyzer membrane with effective surface area ranging from 1.4 to 2.1m<sup>2</sup> and flow rate ranging from 200 to 300 ml/min

The composition of dialysate was as follows:

sodium	133 mmol/L
chloride	97 mmol/L
calcium	1.5 mmol/L
potassium	1.5 mmol/L
magnesium	0.8 mmol/L
acetate	40 mmol/L
glucose	2.1g/L

Special formula was prepared for each patient including: name, age, sex, and cause of renal failure, onset of renal failure, and signs and symptoms of complications during the hemodialysis process.

The following complications were given careful consideration in this study: catheter complication, hypotension, infection such as hepatitis, muscle cramps, nausea, vomiting, fainting, headache, chest pain, backache, itching, fever, chills, seizures, and disequilibrium syndrome.

Diagnosis of these patients acute or chronic renal failure depends on history taking from the patients and relative, clinical examination also on

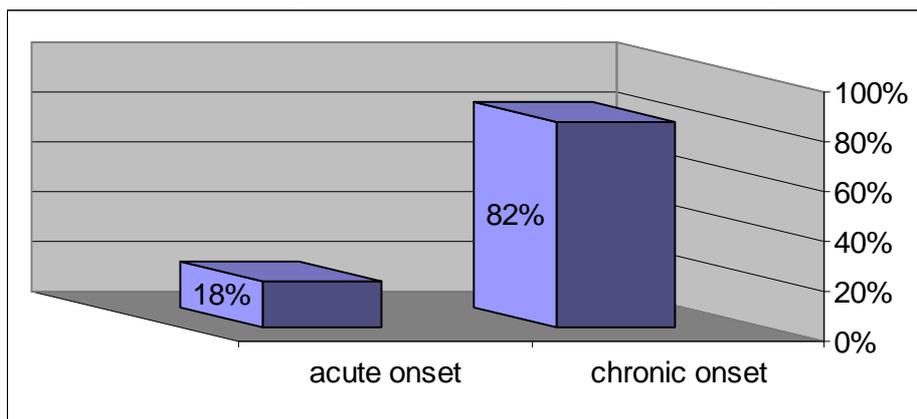
previous investigation and recent investigation which is done in the hospital include general urine examination, blood urea, serum creatinine, ultrasound, serum electrolyte, blood sugar, complete blood film, hepatitis screen,

immunological screening (antinuclear antibody and double strand DNA), chest X ray and blood culture.

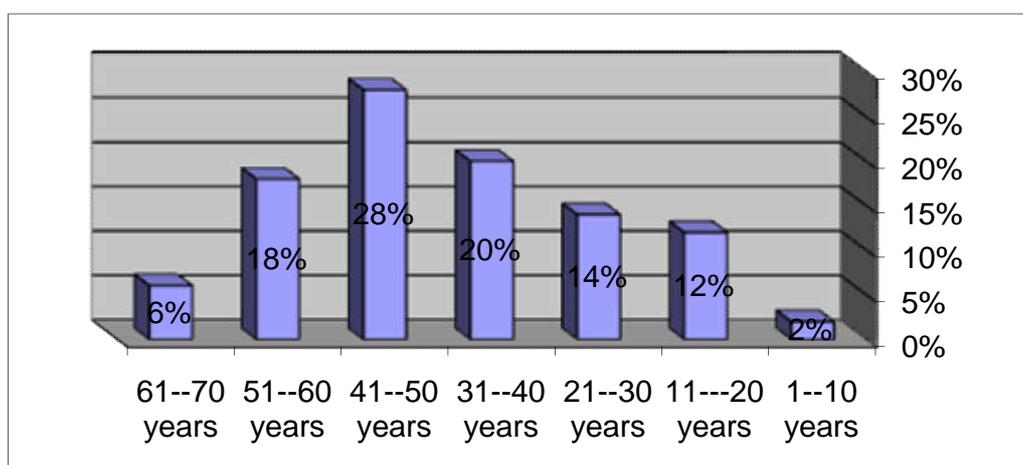
Statically analysis was performed using chi-square test. At level of significance  $p \leq 0.05$  regarded as statistically significant.

### **Result**

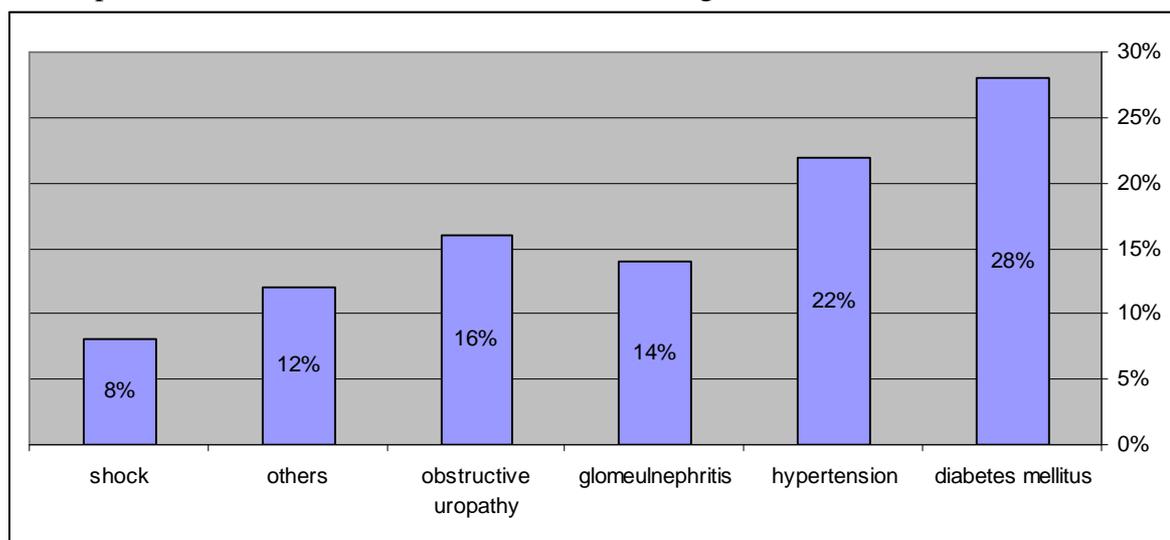
The onset of renal failure for patients on hemodialysis shows in Figure 1:



The distribution of patient's age in hemodialysis unit shows in Figure 2:



The possible causes of renal failure are shown in Figure 3:



**Table 1: Complications during hemodialysis 1**

complication	Temporary vascular access	Atriovenous fistula	P. value
fever	30 (60%)	6 (12%)	0.0009
Blood flow obstruction	20 (40%)	3 (6%)	0.017
hypotension	12 (24%)	16 (32%)	0.80
Hepatitis B&C	15 (30%)	12 (24%)	0.08
Exit site infection	8 (16%)	3 (6%)	0.29
Nausea	15 (30%)	14 (28%)	0.29
itching	13 (26%)	11 (22%)	0.28
Muscle cramp	12 (24%)	10 (20%)	0.63
vomiting	10 (20%)	8 (16%)	0.43
Chills, rigor	27 (54%)	5 (10%)	0.0004
Chest pain	10 (20%)	7 (14%)	0.31
backache	8 (16%)	7 (14%)	0.30
fainting	6 (12%)	4 (8%)	0.54
Disequilibrium syndrome	3 (6%)	2 (4%)	0.92
Seizure	2 (4%)	1 (2%)	0.83

**Discussion**

The major renal replacement therapy is hemodialysis worldwide used in the management of end stage renal disease. both long-term hemodialysis and long- term peritoneal dialysis usually provide no more than about 10% of normal kidney function<sup>(8)</sup>.

In this study, the incidence of chronic renal failure was high in male which is similar to other study but the age onset between 40—50 years which different from other study (usually above 60 years). This indicates the cause of chronic renal failure such as diabetes mellitus, hypertension and obstructive uropathy develop complications are

early due to uncontrolled and late diagnosis<sup>(9)</sup>.

Most of the patients in hemodialysis are diabetic (28%), hypertensive (22%) and obstructive uropathy(16%) due to high incidence of infection, stone, , tumor and prostate hypertrophy.

Other causes (12%) patients on hemodialysis include lupus nephritis, hemolytic uremic syndrome, allport syndrome, pyelonephritis and unknown cause.

The complications during hemodialysis in temporary vascular access are mainly fever 60% (p.value less than 0.05) may be due to catheter related bacteraemia after excluding other possibility of fever such as chest infection or urinary tract infection while in patient with arteriovenous fistula the incidence of fever is less common about 12%. the high rate of fever and rigor in our study is higher than in other study by Lukas K. occurring in 18%(outcome and complications of temporary hemodialysis catheters)<sup>(5)</sup> may be due to high risk of infection.

Other common complications was blood flow problem 40% in temporary catheter mainly due to obstruction in the catheter in the form of thrombosis of the catheter or stenosis or spasm in the vascular. In comparison with arteriovenous fistula there is less blood flow problem unless there are failures or aneurysm of the fistula.

Hypotension is common complications in hemodialysis in temporary catheter and arteriovenous fistula, but in temporary catheter less than in arteriovenous fistula due to low blood flow rate in the catheter. In our study hypotensions occur in 32% which is in the same range of other study done by Andrew Davenport<sup>(10)</sup>.

The incidence of hepatitis (B&C) infection is high (24%) in

arteriovenous fistula but in temporary catheter 30% especially hepatitis C infection because the patient exposed to blood transfusion, defect in sterilization of machine of hemodialysis and defect in facility for diagnosis of hepatitis C virus.

The incidence of hepatitis (B &C) in temporary catheter more than in arteriovenous fistula may be due to poor sterilization, frequent replacement of the catheter or may be the patient in acute renal failure and the patient exposed to multiple injury and blood transfusion.

The prevalence of hepatitis C infection in this study similar to other studies of hemodialysis patients in the United States have reported anti-HCV prevalence of 10%--36% among adults<sup>(11)</sup>.

Exit site infection was common in temporary catheter 16% which is high in comparison to arteriovenous fistula (6%) because poor sterilization of the catheter and long duration of using the catheter.

Regarding other complications vomiting, nausea, headache, itching, muscle cramp, fits, seizure and disequilibrium syndrome are similar in both type and agreement with other study<sup>(12)</sup>.

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