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# Chronic Haemodialysis in Befelatanana, Madagascar and its Bacterial Complication

**Eliane Mikkelsen Ranivoharisoa[1*], Benja Ramilitiana[1], Olivah Henintsoa Rakotonirainy[2], Harinjara Razanakoto[2], Fahafahantsoa Rapelanoro Rabenja[2] and Willy Franck Harilalaina Randriamarotia[1]**

[1]*Department of Nephrology and Hemodialysis, Befelatanana University School of Medicine, Antananarivo, Madagascar*

[2]*Department of Infectious Disease, Befelatanana University School of Medicine, Antananarivo, Madagascar*

[*]**Corresponding author:** Ranivoharisoa EM, Department of Nephrology and Hemodialysis, Befelatanana University School of Medecine, Antananarivo, Madagascar, Tel: 261341420161; E-mail: remikmed@hotmail.fr

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## Abstract

Patients with Chronic kidney Disease (CKD) are fragile. Hemodialysis, the most useful Renal Replacement Therapy in the world is the only treatment available in Madagascar. It is an invasive act exposing several complications. This study aims to assess the prevalence of the bacterial complication in hemodialysis. We conducted a retrospective, exhaustive, descriptive single centre study. Record based study was carried in Befelatanana Hemodialysis Centre, in Antananarivo, the Capital. All chronic hemodialyzed patients who presented an infection were included. Over 136 infections have been suspected but only 33.8% benefited a bacterial identification. In 42.65% of cases, infection begun in 20 days following the first hemodialysis session. Access vascular using catheter is the principal source of infection in 49.06%, followed by pulmonary infection. *Staphylococcus aureus* (34.3%) was the bacteria frequently en-countered. Sepsis appeared in 98.52% of cases and any patients presented a septic choc. All patients received an adjusted antibiotherapy according to susceptibility testing. The survival rate was in 100%.

Treatment of chronic kidney disease is very expensive in Madagascar and 3% of patients have the opportunity to do hemodialysis. That explains our few studied population. In our cohort, access vascular related to femoral catheter represents the common source of infection (49.06%). This prevalence is higher than another American studies. Patients arrived lately at hospital with End-stage of chronic kidney Disease imposing starting hemodialysis in emergency with catheter. Another source of infection has been seen in another site. Patients can also contract infection independently of hemodialysis. Antibiotherapy allowed favorable evolution. To conclude, using access vascular with catheter is inescapable in our center. To fix that, promoting native fistula with early nephrology medical follows-up could be a good solution. Renal transplantation with living donor, the best and less expensive treatment than chronic hemodialysis is now in progress, in collaboration with the Malagasy Government.

**Keywords:** Arteriovenous fistula; Chronic kidney disease; Emergency; Femoral catheter; Haemodialysis; Infections; Madagascar

## Introduction

Hemodialysis is the most useful Renal Replacement Therapy (RRT) in the world. It is an invasive act and may expose several complications. Chronic hemodialyzed patients are fragile. Their prevalence increases around 4% per year [1,2]. According to the literature, complication related to infection is the second cause of morbidity and mortality in hemodialysis after cardiovascular complications [3,4]. In Madagascar, hemodialysis is only the treatment available for CKD [5] and few studies on infection in chronic hemodialysis have been performed [6]. Controlling infection is a big step to improve the quality of care for chronic hemodialyzed patient [7,8]. This prompted us to do this study on chronic hemodialysis patients in the Hemodialysis Center of Befelatanana, Antananarivo.

This present study aims to assess the prevalence of the bacterial complication in patients who underwent to a chronic hemodialysis in order to improve management.

## Materials and Methods

We carried out a retrospective, descriptive, exhaustive, monocentric study from hemodialyzed patients from 10th May 2006 to 31st July 2010 in Befelatanana Hemodialysis Center, University School of Medicine, in Antananarivo, the Capital of Madagascar.

We included in this study all records of CKD - patients who underwent periodically for a chronic dialysis and who presented a documented bacterial infection with an anti-biogram. We excluded from this study all cases without bacteriological evidence. As parameters, we studied and analyzed the site of infectious, the time of occurrence, the identified germs, the results of the anti-biograms, and the evolution of each patients. The data was processed using the Microsoft operating system and we used Epi-info for statistical test.

## Results

Our study population is composed by 12 women (26.7%) and 33 men (73.4%). The average age was 50 years (23 to 74 years). During the period study, the Centre received 84 patients with End stage of CKD who started chronic hemodialysis. Over 136 infections have been suspected but only 33.8% of the samples (n=45) were tested and

« positive to be infected » and has benefited also a bacterial identification (Figure 1).

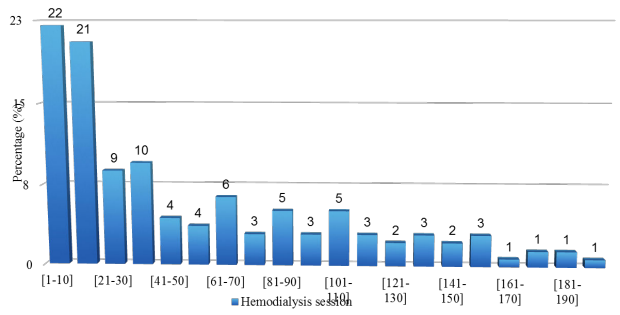


**Figure 1:** Repartition of the infection according to hemodialysis session (n=45). The infection appeared mainly during the 40 sessions after starting hemodialysis. And its rate was very high in the first 20 sessions. After this period, this infection appeared mainly during the 40 sessions arate stays stable until the 110th sessions and decreased slowly among the time.

Vascular access using femoral catheter was the main and principal identified infection (49.06%), followed by the pulmonary infection (21.3%) and the urinary tract infection (12.5%). The others infections were digestive (7.4%), cutaneous (5.1%), genital (1.6%) and meningeal (0.8%). Concerning the delay of onset of the infection, infection occurred mainly during the 40 sessions after starting hemodialysis and its rate was very high and was 42.65 % during the first 20 sessions of hemodialysis. After this period, this rate decreased slowly (Figure 2).

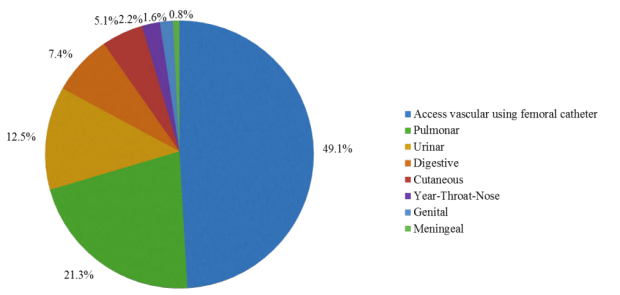


**Figure 2:** Repartition according to the sites of the infection (n=45). The infections were identified in access vascular using femoral catheter in the majority of the cases (49.1%), followed by pulmonary and urinary sites.

*Staphylococcus aureus* was the common germ identified in 34.36%, followed by *Escherichia coli* in 9.38%. *Staphylococcus aureus* resisted some groups of antibiotics such as Amoxicillin and clavu-lanic acid, Ceftriaxone but it was sensitive to Methicillin and Vancomycin. *Escherichia coli* retained sensitivity to Macrolides and Cycline but it was resistant germ to Ciprofloxacin.

In our study, 98.52% of infections were sepsis and there was neither septic shock nor endocarditis complication. All patients received probabilistic antibiotherapy of their infections, after treatment was adjusted secondly according to the antibiograms. The survival rate was in 100%.

## Discussion

Access to RRT remains difficult in Madagascar and few patients have an opportunity to do chronic dialysis. That's explains these few studied population. Bacterial complications occur primarily during the first trimester of hemodialysis sessions. This was probably related to the access vascular, the principal infection found in our cohort. Compared to the time of onset of infection, infections occurred early in our series. In Brazil infectious in hemodialysis patients occurred on average after 12 hemodialysis sessions [9,10]. Our results were influenced by the absence of a native vascular access. The majority of the patients arrived lately at the hospital with an advanced stage of CKD. But, almost of them didn't have medical nephrology-follows up and didn't have a native fistula [11]. So that obliges them to start hemodialysis with central venous catheter in emergency. According to the literature, infectious risk with central venous catheter is 6 to 7 times higher than native arterio-venous fistula [10]. The chronic hemodialysis patient has an increased susceptibility to be infected due to their disease and to hemodialysis sessions linked to vascular access [7]. The risk of contracting infection in hemodialyzed patient is greater than in non-hemodialyzed patient [12,13]. In one Malagasy study, severe infection related to catheter were the most frequent complication observed in vascular access in Hemodialysis Center, it was identified in 76% of the cases and was due mainly to the using of the catheters with exceeding duration [6]. In another recent study, Rafik H et al. reported an incidence of 5.76/1000 days - catheter and diabetes mellitus was the only risk factor. The occurrence of infection was significantly more frequent in the left femoral and was observed on catheters exceeding recommendation's use times in 77.7% of cases [14]. Hajjar J et al. found in their report case that the incidence of catheter was 6.5 per 1000 days / patient [15].

According to the site of infection, 42.2% of infections were found in femoral catheters, followed by lung infections (21.3%) and urinary tract infections (12.5%). The use of central venous catheters especially femoral site are frequent in Madagascar. In one side, the lack of nephrology follows up to prepare the patient for a renal replacement therapy is the principal reason. In the other side, the majority of the patients are admitted in Hospital with vital signs as acute edema pulmonary or severe dyspnea due to metabolic ketoacidosis that's obliging nephrologists to choose femoral site. A French study reported 83.2% of cases with vascular access infections and 30.4% with urinary tract infection [15]. Vascular access was the major source of infection in chronic hemodialysis patients, ac-counting for 47% of infections [12]. An American series revealed that urinary tract infections were in first place (47%), followed by catheter infections (28%) and pulmonary infections (19%) [12]. These different results conclude that patients may contract infections independent on hemodialysis.

*Staphylococcus aureus* was incriminated in 34.36%, followed by *Escherichia coli* in 9.38%. In our study, we have identified a large predominance of multi-resistant bacteria that etiology would be probably multifactorial like self-medication of some patients, immunodepression and the level of hospital hygiene precisely the lack of some materials inducing the emergence of multi-resistant bacteria. The same profile was reported by other series: 22 to 60% *Staphylococcus aureus* and 10 to 18.75% *Escherichia coli* [15,16]. *Staphylococcus aureus* is found almost at all sites, nasal carriage is common in chronic hemodialysis: 32 to 82% of patients and this germ

is encountered on: vascular access, urinary tract infections, broncho-pulmonary infections. *Escherichia coli* occurs almost exclusively in urinary tract infections [12,16,17].

Any neither septic shock nor endocarditis was reported in our population. A study in Sao Paulo found 37.23% septicemia and 28.72% bacterial endocarditis caused by *Staphylococcus aureus* [9]. *Staphylococcus aureus* infections often tend to develop towards septicemia with joint and valvular involvement [7,18]. Our data result probably from the fact that all our patients have benefited early antibiotherapy, probabilistic in the first time then adjusted according to the test sensibility.

*Staphylococcus aureus* found in our study was multiresistant but sensitive to aminoglycosides, vancomycin and rifampicin. In fact, resistance to methicillin was found in 43.4% of infections with *Staphylococcus aureus* [9].

*Escherichia coli* retained sensitivity to Cephalosporins of 3rd generation and aminoglycosides but were resistant to quinolones. This profile deserves attention with the evolution of the susceptibility of the germ to the quinolones in the general population [19-21].

All patients were cured with a favorable improvement and survival rate was in 100%. But vigilance using an early anti-biotherapy is the rule because infection is a major cause of morbidity and mortality in hemodialysis [22]. In France, 15% of deaths were reported and in Brazil, 15 out of 27 cases of valvular endocarditis were fatal in chronic hemodialyzed patients [23].

## Conclusions

The infection in hemodialysis is multifactorial. In this present study, it occurs in 33.8%. In Madagascar, Infection occurs mainly after the first forty dialysis session. The vascular access using femoral catheter is the main source of infection in hemodialysis, followed by pulmonary infection. It deserves special monitoring in our center. The presence of nephrological follows-up is strongly recommended from stage 3B of CKD. Preparing for extra-renal therapy including vascular protection and creating a native arteriovenous fistula have to be anticipated from stage 4. A part, hemodialyzed patients may attract different infection independent on hemodialysis. Early antibiotherapy adjusted according to the test sensibility induces a favorable improvement. Vaccinating systematically all hemodialyzed patients to a good way for preventing pulmonary infection. Renal transplantation with living donor, the best and less expensive treatment than chronic hemodialysis is now in progress, in collaboration with Malagasy Government. Certainly our study has its limits because it was carried out in one of the eight hemodialysis centers in Madagascar, but our results may serve as a preliminary data concerning hemodialysis and its bacterial complication.

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Study concept, interpretation of data drafting of the manuscript: Eliane Mikkelsen Ranivoharisoa, Benja Ramilitiana.

Critical revision of the manuscript for important intellectual content: Rivo Rakotoarivelo, Willy Franck Harilalaina Randriamarotia.

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All of the authors declare to have any conflict of interest.

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