

The prevalence and associated risk factors for blood stream infections in haemodialysis patients

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Abstract : Infection is the main source of complications and the second driving reason for mortality in patients on haemodialysis. The rates of bloodstream infection (BSI) in haemodialysis patients diverge as indicated by the kind of venous access utilized. However, the prevalence and risk factors of BSI in India especially Tamilnadu has been poorly documented. This study was aimed to assess the prevalence and associated risk factors for the advancement of bloodstream infections in patients experiencing haemodialysis in a private hospital, Tamilnadu, India. The study was conducted between January --July 2016, one hundred chronic kidney disease patients on haemodialysis were considered as cases. Twenty patients from the same centre who did not present positive blood culture during the study period were considered as control group. Data were analysed using medcalc statistical software. Out of 100 cases, 73 (63%) patients with Diabetes *Mellitus* (DM):37, DM with HT: 15, Hypertension (HT):13, without DM, HT:08) were observed no BSI and 27 patients (27%) (DM:11, DM with HT: 07, HT:05, NIL DM, HT: 04) had BSI when compared with controls. Out of 27 patients, 19 patients had gram positive (*Staphylococcus aureus*: 14, *Staphylococcus epidermidis*: 05) and 08 had gram negative infections (*Escherichia Coli*: 04, *Pseudomonas aeruginosa*:04). In conclusion, 27% of haemodialysis patients have high risk of bloodstream infections when they have poor controlled diabetes as comorbidity and predominantly with gram positive infections.

Key words: Bloodstream infections, haemodialysis, Diabetes Mellitus, Hypertension, gram positive.

Introduction

Haemodialysis keeps on being a critical treatment alternative for patients with end-stage renal disease. A vital segment of dialysis practice is the utilization of temporary or semi-permanent haemodialysis catheters, which are regularly intertwined by mechanical or infectious complications resulting in patient morbidity or untimely catheter removal^{1,2}. Infection is the main source of morbidity and the second driving reason for mortality among patients on renal replacement treatment³. Bloodstream infections, characterized as culture confirmed presence of microbes growth in the blood which is all around perceived as a vital reason for mortality and case casualty among haemodialysis patients. Be that as it may, couple of late studies have examined the study of disease transmission of circulatory system infections⁴ and late populace based studies are inadequate. The previous studies reports that the utilization of a central venous catheter (CVC), hypoalbuminemia, diabetes mellitus, anemia and female sex are risk components for the advancement of BSI in haemodialysis patients⁵⁻⁹. Gram-positive bacteria mainly *S. aureus* are the most frequently isolated organism in

blood cultures from haemodialysis patients⁸⁻¹⁰. A superior comprehension of prevalence, risk variables, causative microorganisms, and result of BSI in haemodialysis patients could encourage enhanced infection control hones and guarantee proper observational anti-infection treatment. Hence, upgraded data on these clinically critical issues are very pertinent. The aim of this prospective study was to evaluate the incidence and risk factors of BSI in patients on haemodialysis.

Materials and Methods

Prospective data were collected on all haemodialysis catheters inserted patients at the private hospital, Tiruchirappalli, Tamilnadu between January to July 2016. The present study enrolled 100 haemodialysis patients age ranged from 24 to 75 years (Male:67, Female:33). The risk factors of BSI in haemodialysis catheter of patients between the BSI group and the control group who did not develop BSI were compared. The patients were taken after for the span of their remain set up and information about the indications of inflammation on the catheter destinations were acquired every day. All socioeconomic, demographic, clinical and past medical data were obtained from all the study population. The following potential risk factors of all study population were assessed: age, gender, comorbidity, cause of renal failure and route of catheter insertion.

Blood samples of 10 ml drawn from all the study population and cultured on BacT Alert bottle which contains culture media. Cultures yielding 10^3 CFU or more colonies were recorded as positive¹¹. Identification of the causative microorganisms was performed using the automated system (BacT/Alert three-dimensional (3D) (bioMérieux Inc.).

All the statistical analyses were done using medcalc statistical software. This study protocol has been approved by local ethics committee. Also written and informed consents were obtained from the study population prior to the study.

Results

Of 100 patients that participated in the present study, 27 patients had developed BSI. Table 1 showed the baseline characteristics: gender, age, comorbidity and catheter implementation location. In relation to base diseases, patients with diabetes *mellitus* presented an increased risk of developing BSI 11%, diabetes *mellitus* with hypertension 7%, hypertensive 5 % and 4 % had no DM and HT.

Table 1. Baseline, clinical history of study patients.

Characteristics		BSI Positive	BSI Negative
Sex	Male	18	49
	Female	09	24
Age		50.23 ±22.13	54.72 ± 19.28
Comorbidity	DM	11	37
	HT	05	13
	DM with HT	07	15
	NIL DM,HT	04	08
Catheter Implantation Location	Jugular vein	16	10
	Subclavian vein	11	8
	AV Fistula	0	55

.DM: Diabetes mellitus HT: Hypertension Nil: No AV:arteriovenous

As for the Catheter insertion site, there were more catheters implanted in arteriovenous AV fistula (n=55), compared to the jugular vein (n= 26), Subclavian vein (n=19) where patients who had catheter implanted in the jugular vein were 61.5 % more likely to develop BSI than those who had the catheter implanted in a subclavian vein and AV fistula.

The complications related to the use of the catheter that affected the patients undergoing haemodialysis and developed BSI are presented in Table 2. The patients with positive cultures from the skin infection presented a relative risk of developing BSI to the patients with positive cultures from catheter tips. Patients who presented BSI with *Pseudomonas aeruginosa* had a 100 % higher risk of death.

Table 2. Complications related with BSI and without BSI

Complications	BSI Positive	BSI Negative	%
Skin infection	11	30	26.82
Catheter tip infection	07	25	21.8
Septicemia	05	18	21.7
Death	04	0	100

Table 3 showed more detailed results of all bacteria isolated from the bloodstream collected from patients with BSI. From the bloodstream infection, 70.3% were Gram-positive, of which 51.8% were *Staphylococcus aureus* and 18.5% were *Staphylococcus epidermidis*. On the other hand, 29.6 % isolates were Gram-negative, of which 14.8 % were *Escherichia coli* and *Pseudomonas aureginosa* each.

Table 3. Causative organisms for BSI

Name of the Microorganism	% of BSI (No 27)
Gram Positive isolates	70.3 %
<i>S. aureus</i>	14 (51.85 %)
<i>S. epidermidis</i>	05 (18.5 %)
Gram Negative isolates	29.6%
<i>Escherichia coli</i>	4 (14.8 %)
<i>Pseudomonas aeruginosa</i>	4 (14.8 %)

Discussion

All around the evaluated commonness of chronic kidney disease is roughly 8–16% beyond 30 years old. Thus in China, Australia, USA, and Europe, >10% of individuals beyond 30 years suffer from CKD^{12,13}. In India, the pervasiveness is disturbing at 13.2–15.04% in urban grown-up population¹⁴. All out of population of India stands at 125 crores, and right around 60 crores of population are above matured more than 30 years; 10% of 60 crores population, i.e. not less than 6 crore Indians might be affected with CKD. In India, it is assessed that around 100,000 people are experiencing end stage renal disease (ESRD) every year; of which, just around 20,000 individuals get treated¹⁵. Majority are still untraced or going to experience the effects of CKD. This is an extremely severe and grave situation.

As per the Kidney Disease Outcomes Quality Initiative (KDOQI) guidelines, the incidence of BSI should be less than 10% at 3 months and 50% at 1 year¹⁶. Bloodstream infections are a standout amongst the most imperative element influencing morbidity and mortality in patients on haemodialysis. The present study explored the rate, microbiological profile and the risk factors for the development of Bloodstream infections. The commonest segregates among the patients with BSI were Gram-positive organisms (70.3 %) while Gram-negative organisms (29.6%) brought about most of the BSI in hemodialysis (HD) population. The dominance of gram positive organisms in HD Catheter-related bloodstream infection (CRBSI) has been showed in a number of studies. The present study results also observed that the majority of BSI caused by gram positive organisms which united with the recent study¹⁷.

The majority of hemodialysis patients showed a predominant role of *S. aureus* to the risk of BSI¹⁸. In our study also confirmed the same that 51.8% of BSI due to *S. aureus*. Still, the issue of BSI might be to a great extent thought little of in consistently clinical work. Dialysis specialists see single cases and since BSI remains a rare episode they typically don't have an inclination for the occurrence in their dialysis program. Eventually, it is disturbing that cardiologists officially recognized haemodialysis as a vital inclining condition for the development of bacterial endocarditis^{19, 20}. The present study observed that DM as a highest risk factor for BSI which has been also reported by earlier studies²¹.

In conclusion, the incidence of BSI among patients who use a catheter was 27 %. The risk factors for developing BSI in this study were: implantation of the catheter in the internal jugular vein and diabetes *mellitus*. The mortality rate was 100% for patients who developed BSI with *Pseudomonas aeruginosa*. Among the microorganisms isolated, the ones most frequently found were Gram-positive, of which *S. aureus* was the most prevalent (51.8 %).

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