Original Article

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# Incidence of bacterial infections in chronic kidney disease patients admitted in nephrology unit of Kathmandu Medical College Teaching Hospital

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**Abstract**

**Background:** Infectious diseases are one of the leading causes of morbidity and mortality in chronic kidney disease patients, second only to cardiovascular causes. As the incidence of chronic kidney disease is increasing, the number of deaths due to infectious disease is also increasing. Infectious disease includes infection, bacteremia and sepsis in chronic kidney disease patients.

**Objective:** To assess the incidence of bacterial infections in chronic kidney disease patients.

**Methodology:** A prospective cross-sectional study was done among all chronic kidney disease patients admitted over 6 months in Nephrology Unit of Department of Medicine, Kathmandu Medical College Teaching Hospital.

**Results:** 58 patients were admitted with infectious diseases, out of which 6 patients (10.34%) died during treatment while 1 patient (1.78%) left against medical advice. Infection in patients undergoing dialysis (5D) was much more compared to stage 4 or 5chronic kidney disease patients (58.62% vs. 13.79% vs. 17.24% respectively). 19 patients (32.76%) had pneumonia, 16 patients (27.56%) had Urinary Tract Infection while 12 patients (20.70%) had sepsis. Although sepsis was less prevalent compared to pneumonia/ Urinary Tract Infection, deaths due to sepsis was very high.

**Conclusion:** The incidence of bacterial infections in chronic kidney disease patients is still high despite all the improvements in infection control and dialysis practices, and still lots is left to be done to reduce the morbidity and mortality caused by infections in chronic kidney disease patients.

**Key words:** CKD; Pneumonia; Sepsis; UTI

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## INTRODUCTION

The burden of Chronic Kidney Disease (CKD) is ever increasing in Nepal and it is estimated that yearly 3000 new patients have CKD[1]. Infections in CKD are one of the leading causes of morbidity and mortality secondary to cardiovascular diseases. However, in recent times the trend is changing with much importance now being given to the prevention of infections by timely screening and vaccination[2]. The inflammatory state of CKD also predisposes patients to develop additional complication like atherosclerotic diseases aggravating cardiovascular complications[3].

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CKD patients are liable to infections because of multitudeof reasons and few important ones include profound uremia, impaired host defense mechanism, anemia, malnutrition, use of immunosuppressant drugs, hypo-responsiveness to vaccines etc (Figure 1). The CKD patients have more infectious events because of uremia, which results in altered primary host defense mechanisms and thus increases the risk of bacterial infections[4]. In addition, the Neutrophils proliferated due to CKD exhibit impaired chemotaxis, oxidative metabolism, phagocytosis, and degranulation resulting under-regulated programmed cell death which is seen epidemiologically even more is End Stage Renal Diseases (ESRD)[5]. Vascular accessing catheters, unsterile techniques, faulty dialyzers, iron overload and the procedure itself are amongst other risk factors associated with dialysis[6].

This study was conducted to know the incidence of bacterial infections in CKD patients admitted in Nephrology Unit of Kathmandu Medical College Teaching Hospital (KMCTH) and to identify the common infections that led to their mortality.

## METHODOLOGY

This was a prospective cross-sectional study conducted over a period of six months, from 1st January 2017 – 30thJune 2017, among patients admitted to Nephrology Unit of KMCTH. Ethical clearance was taken from Institutional Review Committee (IRC) of KMCTH and no form of funding or remuneration was involved for the study. Purposive sampling technique was used for the selection of cases following informed written consent given by the individuals involved in study. Urine and blood samples and chest x-rays of all admitted patients were sent for screening of infections. All the investigations sent were part of management guidelines and only the individuals with results positive for infection were advised for blood and urine culture and sensitivity for confirmation of infections. The data collected were analyzed for results using Statistical Package for the Social Sciences (SPSS) version 23.

## RESULTS

Within the duration of study, a total of 204 patients were admitted in Nephrology Unit out of which 58 (28.44%) individuals had infectious disease. Mean age of among these 58 individuals was 58.31 years and female predominance was trivial (53.45%). Six out of these individuals succumbed to death (10.34%) during treatment. Infectious disease was prevalent among dialysis patient (58.62%) compared to other stages of CKD. Descriptive demography of the patients is illustrated in Table 1.

**Table 1: Socio-demographic Characteristics**

| S.N | Variables | Patients with Infections: n (%) |
|---|---|---|
| 1. | **Age** | |
| | 15-30 | 07 (12.09%) |
| | 31-45 | 08 (13.79%) |
| | 46-60 | 10 (17.24%) |
| | 61-75 | 23 (39.66%) |
| | >75 | 10 (17.24%) |
| 2. | **Gender** | |
| | Male | 27 (46.55%) |
| | Female | 31 (53.45%) |
| 3. | **Stage of CKD** | |
| | IIIrd Stage | 6 (10.35%) |
| | IVth Stage | 10 (17.24%) |
| | Vth Stage (Not under Haemodialysis) | 8 (13.79%) |
| | Vth Stage (Under Haemodialysis) | 34 (58.62%) |
| | **Total** | **58** |

Among these 58 individuals with infectious diseases, incidence of Pneumonia was found to me maximum followed by Urinary Tract Infection (UTI). A more detailed description of infectious diseases associated with CKD amongst these individuals is given in Table 2.

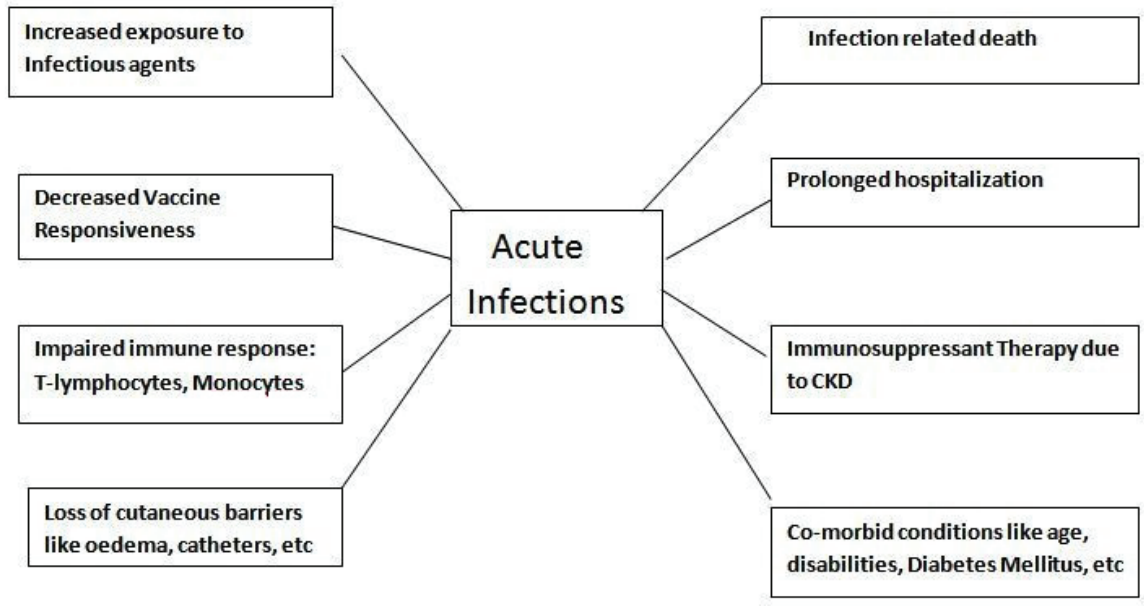


**Figure 1:** Risk factors and complications of Infections in Kidney Diseases[7]

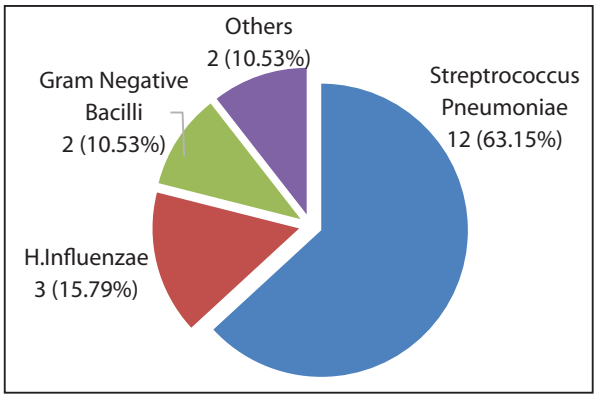


**Figure 2:** Causative organism of Pneumonia in hospitalized CKD patients

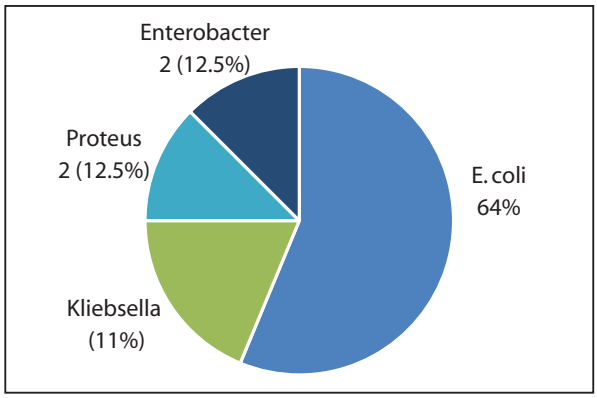


**Figure 3:** Causative organisms of UTI in hospitalized CKD patients

**Table 2: Incidence of various infections among the patients**

| S. No | Infectious disease associated with CKD | n (%) |
|---|---|---|
| 1. | Pneumonia | 19 (32.76%) |
| 2. | Urinary Tract Infection (UTI) | 16 (27.56%) |
| 3. | Sepsis | 12 (20.70%) |
| 4. | Acute Gastroenteritis (A.G.E) | 04 (06.90%) |
| 5. | Tuberculosis | 03 (05.20%) |
| 6. | Peritonitis | 02 (03.40%) |
| 7. | Meningitis | 02 (03.40%) |

These infectious conditions were brought about by various bacteria which were isolated using blood and urine culture and sensitivity. Figure 2 and 3 depict the causative organisms and their prevalence among CKD patients with Pneumonia and Urinary Tract Infection respectively.

During treatment of the patients with infectious diseases associated with CKD, progression to sepsis secondary to Pneumonia (n=4) and UTI (n=3) was found among 7 individuals. 2 patients undergoing Continuous Ambulatory Peritoneal Dialysis (CAPD) developed E. coli induced peritonitis. Among 3 individuals diagnosed with tuberculosis, 2 improved with anti-tubercular therapy while one succumbed to death due to dissemination of the tuberculoses bacteria into multiple organs besides 5 others who died of sepsis.

## DISCUSSION

This study showed that, although there have been many improvements in dialysis techniques and infection-controlpractices, the incidence of bacterial infections is still high (12%) among CKD patients mostly due to decreased immune response.Also it is more predominant in CKD patients undergoing hemodialysis (58.6%) which was probably due to dialysis-related problems[6] like repeated skin puncture and reduced immunity. Admission rates of CKD patients under hemodialysis were nearly twice than that of non-dialysis CKD patients which was also observed by Naqvi and Collins[5]. Despite sepsis being the less common cause of admission (20.7%), the rates of death due to sepsis was very high (50%) which highlights the fact that infectious illnesses are a major cause of mortality in CKD patients. Repeated infections acts as a stimulus which causes activation of inflammatory pathways resulting in aggravation of other complications like atherosclerosis and precipitating cardiovascular complications, thus causing more morbidity and mortality among CKD patients. This also implies that despite having various antibiotic protocols, immunization and treatment guidelines, infectious complications are still a big burden, both in developing and developed countries[2]. Hence the patients, families and caregivers should be more aware of the initial signs and symptoms of infections and should be provided with regular education and information to reduce the incidence of infections. A meticulous patient management should be done by medical professionals and increased attention to infections prevention should be included as a protocol to improve the well-being of the patients.

Viasus et al. in 2011 conducted observational study among 203 patient of CKD and concluded that Streptococcus pneumoniae is the most common causative agent for pneumonia in CKD patients followed by H. influenza leading to morbidity and mortality[8] which is similar to our study findings. In the study conducted by Lia et al., Patients with pre-dialysis chronic kidney disease have a 1.52 fold increased risk of contracting

pneumonia as compared to those with non-chronic kidney disease[9]. Present study is analogous showing pneumonia as most common opportunistic infection among CKD patients.

A cross sectional study performed by Chaudhary et al. at National Kidney center of Nepal on 2016 showed E.coli as the most common pathogen causing UTI in CKD patient. Proteus vulgaris and Klebsiellaoxytoca was second and third most common causative agent respectively, for UTI in CKD patients.[10] In our study second most common pathogen was Klebsiella species which was followed by Proteus infection. Our study couldn't further specify which species of Klebsiella and Proteus infection were more common in causing UTI in CKD patient. The recent study conducted in western Nepal by workers Jaiswal et al. found E coli as most common pathogen causing UTI with 30% culture positivity[11]. Study done by FalahSet al in CKD patients concluded E. coli as most common causative agent of UTI in CKD patient undergoing hemodialysis followed by klebsiella[12].

## CONCLUSION

Most commonly seen infectious illnesses were Urinary Tract Infection (UTI), pneumonia and sepsis in descending order of prevalence[3] in CKD patients. However, the rate of deaths showed opposite pattern with more deaths occurring due to sepsis. The most common opportunistic infection in CKD patient was Pneumonia leading to morbidity and mortality. Streptoccous pneumonia and H. influenzae are most common pathogens for pneumonia in CKD patient. Second common infection was found to be UTI in CKD patient. Prevalence of E. coli and Klebsiella were most common causing UTI in CKD patient. So, prevention of infection and prophylaxis measures such as vaccination against pneumonia and antibiotic prophylaxis for sepsis and uro-sepsis are required in CKD patients.

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