

## Infections Related to Chronic Kidney Failure Patients

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### ABSTRACT

Chronic kidney failure patients who are on dialysis treatment have an increased risk of infection. Due to their immunocompromised condition 100% patients have high erythrocyte sedimentation rate above 25 mm/hr by westergen method. High ESR indicates that patients are suffering from severe infections. They all are anemic due to deficiency of erythropoietin into the body. It has been found that people with anemia are at high risk of developing chronic sore kidney disease (CKD). These patients have reduced immunity to fight against infections. It is reported that 50% patients that are on dialysis have Staphylococcal infection. The sources of infection in blood are may be from urinary tract infection and respiratory tract infection and the prevalence of tuberculosis has also been estimated to be much higher among hemodialysis patients.

**Keywords:** Immunocompromised, chronic kidney disease, hemodialysis, coronary heart disease.

### INTRODUCTION

Kidney is a filtering organ which filters our blood and excretes waste products from our body. If it fails to maintain proper functioning then many kidney problems will arise. One of the major concern among public health is chronic kidney disease which is affecting approximately 11.5% of population (Coresh, 2007). Chronic kidney disease is associated with increased risk of kidney failure, cardiovascular disease, severe infection and mortality (Warnock, 2010). These association may give rise to additional risk and abnormalities such as enhanced coagulation, increased inflammatory factors and endothelial dysfunction (Go, 2004).

Microbial infections occur in chronic kidney failure patients include bacteremia, triggering Inflammation and sepsis (Dellinger, 2008). The patients with chronic kidney failure and are on dialysis treatment are at greater risk for many diseases for several reasons. Bacteremia, sepsis and viral infection are the most important, factor which increases the mortality and morbidity in these patients (Powe, 1999). Chronic kidney Patients have reduced immunity to fight against infection. Although the white blood cell counts

in the typical

Laboratory testing profile may be normal but the white blood cells of dialysis patients which are the first line of defense do not function properly or normally. There are two main types of white blood cells: Neutrophils and lymphocytes. Though Neutrophils are primarily involved in protecting against bacterial infections but bacteria may survive to develop infections in patients (Powe, 1999).

Infections caused by Bacteria are common like tuberculosis, listeriosis, salmonella, septicemia, intra-abdominal infections, UTIs infections and viruses can cause infections like Hepatitis B and Hepatitis C, influenza cytomegalovirus and mononucleosis & HIV. Staphylococcal infections are particularly common as it is a normal inhabitant of the skin and considered as opportunistic organism. When these Bacteria gain access to the bloodstream they frequently spread to bones, joints and the heart, causing potentially lethal destruction of these tissues. The rate of skin and nasal carriage of *staphylococcus aureus* in dialysis patients are 50 % (YuVL, et al. 1986).

Patients with impaired kidney are more susceptible to develop urinary tract infections (UTIs). Once the kidneys fail to produce enough urine, the flushing of organism from urinary tract is impaired. Patients with renal failure may have other urinary tract abnormalities which make them more prone to develop UTIs; these include kidney cysts which become infected, obstruction in the urinary tract lead to stagnation of urine occurs and reflux of urine in the bladder to move backwards into kidneys and increases the chance of infection in the bladder that will reach to the upper urinary tract where it is more severe and expected to spread into the blood (James *et al.*, 2010).

The prevalence of tuberculosis has been estimated to be as much as Tenfold higher among kidney failure patients. Tuberculosis in these patients is disseminated and it may be without chest x-ray Abnormalities. The mortality rate of tuberculosis has been expected to be as high as 40% (Sarnak and Jaber, 2000).

There is an increase in ESR in some disease, such as leishmaniasis, rheumatoid, arthritis, most inflammatory disease, tuberculosis, but in some disease like mental disease, it is normal. ESR may be decreased in polycythemia Vera and in several liver diseases. Drugs such as corticoids, salicylates etc, may also reduce ESR thus an indicator of pathological condition or obscure. Recently, it has been studied from a reported that chronic kidney disease (CKD) increases the chance of coronary heart disease (CHD) events in anemic people (Liverman *et al.*, 1988).

Diabetic patients who are more prone to kidney failure may have additional immune defect as well in vascular disease which also promote certain types of infections principally fungal infections and infections caused by anaerobic organism that can lead to gangrene. The best way to defend against many kinds of infection is to build understanding about the increased

risk and recognizes the signals of disease so that infections can be treated efficiently. Dialysis patient should avoid the prolong use of catheter which are associated with frequent and serious infection.

## MATERIALS AND METHODS

### ***Determination of Erythrocyte Sedimentation***

**Rate:** Transfer 0.5ml of the anticoagulant sodium citrate solution in a clean test tube. Collect 2ml of venous blood in a disposable syringe. Remove the needle from the syringe and transfer the blood of the tube containing anticoagulant mix well gently. Draw the anticoagulant blood to the 0 marks of chemically clean westergen pipette and lace it in a westergen rack. Make sure that the pipette stands vertically and evenly in the Grooves provided for it. Record the calibration on the upper level of the settled erythrocytes at the end of one hour.

***Determination of Hemoglobin:*** The procedure used was given under. Draw 3cc blood from vein of arm into the 5cc syringe. Then inoculate 0.2ml of EDTA into the CBC bottle then also add 3ml. Shake well after mixing blood with EDTA. After that place bottle into automated blood sysmex analyzer and start the machine.

### ***Isolation and Identification of Organisms:***

First collect the sample of each patient directly through the vein puncture by the help of tourniquet. Inoculate the 10ml blood of each patient in separate BHI 50ml broth which is air tight. Incubate all bottle of inoculated BHI broth for 24 hours at 37°. Take MacConkey, SDA & blood agar for each patient's Microbiological examination and streaking all agar plate then incubate for 24 hours. After 24 hours observe the growth on agar plate. Gram stain all different Colonies appeared on agar plates.

## RESULTS & DISCUSSION

By our investigation on chronic kidney failure patients we observed the high ESR (erythrocyte sedimentation rate), in all patients having high

erythrocyte sedimentation rate above 25mm/hr by westergen method shown in Figure: 1

There is an elevated erythrocyte sedimentation rate (ESR) greater than (>25 mm/h) in almost all patients with the nephrotic syndrome (Bathon *et al.*, 1987). Two percent of patients have an ESR above 60 mm/h, while 20 percent have elevations to above 100 mm/h. This condition is usually associated with disorders such as infection, cancer (particularly if metastatic), or collagen vascular diseases such as temporal arthritis (Sox and Liang, 1986). When the pre- and post values of dialysis are similar, increasing ESR is not affected. (Shusterman, 1985).

All of these patients also have low hemoglobin level into their blood determined (Table -I).

We have determined hemoglobin concentration into their blood then we have found all of them have low hemoglobin concentration (<10gm/dl). It is mainly due to deficiency of erythropoietin hormone into the body. Early complication of chronic kidney disease (CKD) is anemia which is coupled with a increased morbidity and mortality due to cardiovascular

disease. Amongst the several factors which contribute to anemia, the most important one is erythropoietin deficiency. Despite the broad availability of safe and effective treatment, anemia in CKD patients remains under diagnosed. Treatment of anemia with exogenous erythropoietin is related with improvements in outcome and hence should be aggressively pursued. Iron in CKD patients should be appropriately treated prior to erythropoietin treatment (Mayers *et al.*, 2003).

We also screened their blood to identify the possible infections present into their blood after 72 hours of incubation in BHI broth and after streaking on MacConkey agar we does not found any growth after further incubation while on Blood agar we found growth of three different patients' sample. On blood agar we observed pin pointed colonies on and beta hemolysis also occurred around all colonies. While on SDA the same patient's samples showed the growth as the growth was observed on blood agar also. It was appeared as a large creamy pin pointed colonies. While all samples do not exhibit growth on MacConkey agar. After performing gram staining we observed

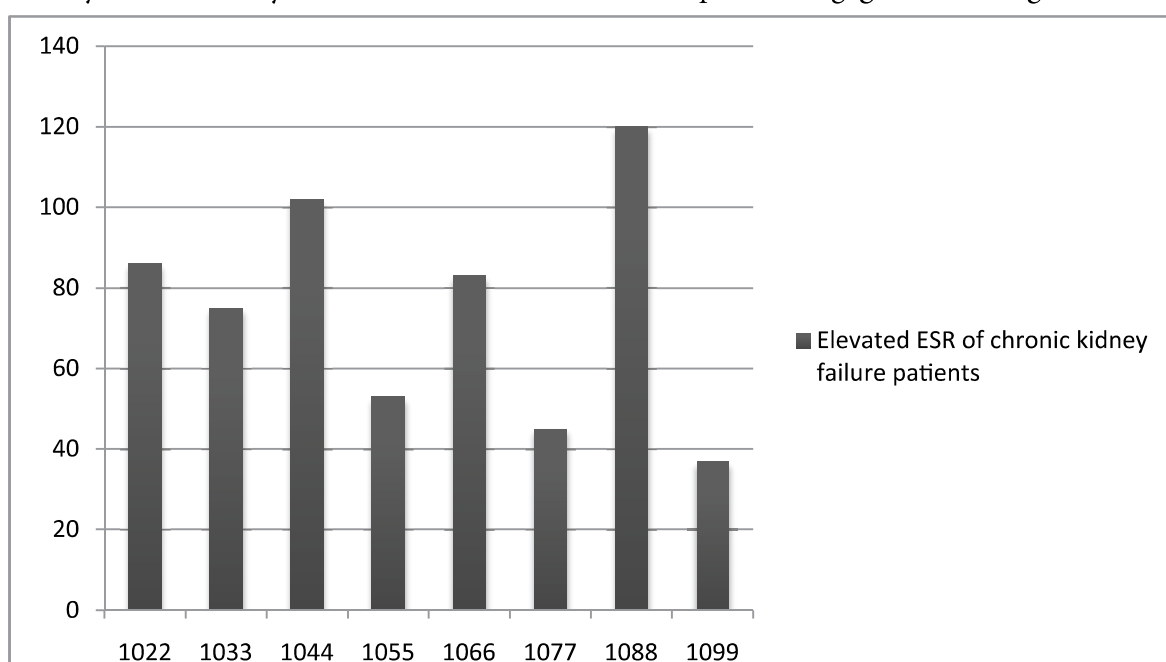


Figure 1. Elevated values of ESR

Table I. Hemoglobin of Patients

PATIENT's ID	OBSERVED HEMOGLOBIN CONCENTRATION	NORMAL RANGE
1022	8.4 g/dl	Normal range should be between 12 to 16 g/dl
1033	5.4 g/dl	
1044	8.0 g/dl	
1055	9.7 g/dl	
1066	7.7 g/dl	
1077	12.1 g/dl	
1088	9.2 g/dl	
1099	7.5 g/dl	

the same result of all colonies of blood agar as well as SDA we observed gram positive cocci in bunches (in tetrads).

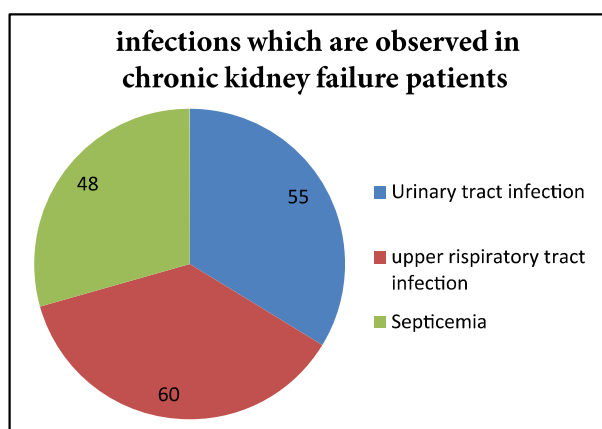
The interesting finding is that they all have same infection means they all are suffering from staphylococcus infection. The skin and nasal Carriage Rate of *Staphylococcus aureus* in hemodialysis patients are 50 % (YuVL, 1986).

Infections by bacteria called Staphylococcus are particularly common. Staphylococcus is a normal inhabitant of the skin but, given the decreased resistance to infection by Staphylococcus that often occur in patients

with kidney disease, these bacteria are much more likely to invade the body. Once these bacteria have access to the blood stream, they frequently spread to bones, joints and the heart, causing potentially lethal destruction of these tissues.

### CONCLUSION

According to our study we conclude that infection acquiring ratio is high in chronic kidney failure patients because they are usually on hemodialysis treatment through machine and catheter they acquire infection and they also have immunocompromised condition due to usually imbalance of leukocyte. High level of erythrocyte sedimentation rate indicates that they acquiring infection they also have low hemoglobin level due to lack of erythropoietin in the body, low hemoglobin level cause cardiac problem due to immunocompromised condition mostly they acquire staphylococcus infection through catheter and other sources usually they have urinary tract infection and also upper respiratory tract infection and some time septicemia through UTI's and URT they may reached to blood stream. We conclude that 50% patients have *Staphylococcus aureus* infection in study. Thus, the problem can be divided by creating level of awareness. It is



**Figure 2.** Infections in chronic kidney failure patients

recommended to control hemoglobin of these patients by giving erythropoietin level so that patients can save from heart problems then after by proper cleaning of catheter they can also save from infection if they acquiring UTI or URT they should cure them.

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