

## Research Article

### Study the Relationship between Hemodialysis (HD) Patients and Their ABO Blood Grouping as Well as Screening of Hemodialysis Access-related Bacterial Infections

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**Abstract:** Aim: This study aimed to study the relationship between hemodialysis patients and ABO blood grouping as well as screening for aerobic bacterial infection. Samples of urine and blood were collected from sixty patients who were submitted to Medical City and Al-kahdemiya hospitals in Baghdad in the period between December 2011 and February 2012. The specimens (urine and blood) were cultured on BHI broth and blood culture media (respectively) and bacterial cultures which were obtained were diagnosed to genus and species using biochemical tests and APi system. Eighty percent of urine samples were positive to culturing while (50%) from the blood samples were positive to culturing. The most isolated bacteria from urine were: *Staphylococcus aureus* (23%) and *Escherichia coli* (19.8%) while from blood were *S. epidermidis* (32.6%) and *E. coli* (32.6 %). The percentage of the seroprevalence of *Helicobacter pylori* was 53% of the total number of HD patients and that 60% of these patients who carried *H. pylori* antibodies belonged to O blood group. The results also revealed that (55, 25, 10, 10%) of the HD patients were belonging to (O, B, A and AB) respectively.

**Keywords:** ABO blood groups, Hemodialysis (HD), infection, Urinary Tract Infection (UTI)

## INTRODUCTION

Renal failure describes a medical condition in which the kidneys fail to filter toxins and waste products from blood adequately; dialysis including hemodialysis is a procedure that is a substitute for many of the normal duties of the kidneys (Klahr and Miller, 1998). One of the important complications that HD patients suffer from is bacterial infection, this may be due to the abnormalities that their immune systems pass through and lead to suppress their abilities to fight bacteria including *H. pylori* (Sugimoto and Yamaoka, 2011). *H. pylori* is thought to be the major risk factor for gastrointestinal troubles in dialysis patients (Gür *et al.*, 1999). In spite of that there are factors which enhance the chance of suffering renal failure like: Diabetes, heredity, hypertension, ABO blood group is considered as an important factor in these patients (Al-Hamed *et al.*, 1979). Also there had been found a correlation between the type of ABO blood group and the prevalence of *H. pylori* in HD patients (Rasmi *et al.*, 2011). According to what mentioned above, this study aimed to.

Study the relationship between hemodialysis patients and ABO blood grouping as well as screening for aerobic bacterial infection.

## MATERIALS AND METHODS

**Samples collection:** Samples of urine and blood were collected from sixty patients who were submitted to

Medical City and Al-Kahdemiya Hospitals in Baghdad in the period that laid from December 2011 to February 2012. Blood samples were collected and transferred to a 5mL sterile anticoagulant tubes, taking 1mL of each sample and culturing it in blood culture media, then incubated at temperature 37°C for a period up to 7 days aerobically (in which the growth was observed every day) (Bouza *et al.*, 2007). The urine samples were dealt with for culturing according to a procedure mentioned previously by centrifugation the urine samples from the patients, taking the pellet and culturing it in Brain Heart Infusion broth (MacFaddin, 2000).

**Identification of bacteria:** Bacterial cultures which were obtained from culturing blood and urine samples were identified to genus and species by using morphological and biochemical tests according to established methods (Brenner *et al.*, 2007) and also by using API confirmatory tests.

**Detection of *Helicobacter pylori*:** All the sixty sera collected from patients were examined for the presence of antibodies against *H. pylori* by using *H. pylori* kit (ACON laboratories, Inc). This kit (one step test device) is a rapid chromatographic immunoassay for qualitative detection of antibodies to *H. pylori* in serum (Tytgat *et al.*, 1993). Briefly 3 drops of serum (approx. 100 µL) was transferred to specimen well (s) of test device and after 10 min the formation of two distinct

red lines represented the positivity of the test while appearance of one line (just control line) represented the negativity of the test. Extended time (30 min) was used and the results were read after.

**Performance of ABO/Rh grouping:** ABO/Rh blood grouping was performed by using a commercial kit (supplied by Al-Razi center).

## RESULTS AND DISCUSSION

**Isolation of bacteria from urine and blood:** Eighty percent of urine samples were positive to culturing while only 50% of the blood samples were positive. Culturing of urine and blood samples donated 86 bacterial isolates from urine and 92 bacterial isolates from blood. All these isolates were diagnosed to species according to (Brenner *et al.*, 2007) as shown in Table 1.

The percentages of bacterial isolates prevalence shown in Fig. 1 showed that the highest percentage of isolation in urine was represented by *S. aureus* (23%) followed by *E. coli* (19.8%) of the total number of bacterial isolates while in blood the most isolated bacteria were *S. epidermidis* (32.6%) and *E. coli* (32.6%) (Fig. 1).

Epidemiological studies pointed that the most three commonly seen infectious complications are Urinary Tract Infection (UTI), pneumonia and septicemia in HD patients, UTI is the most common nosocomial infection among chronic hemodialysis population accounting nearly half the nosocomial infections (47%) (Naqvi and Collins, 2006). The higher UTI susceptibility in hemodialysis patients may be explained by a greater incidence of urinary obstructions which in turn leads to infections (Ishani *et al.*, 2005). D'Agata *et al.* (2000) found that the percentage of *E. coli* prevalence in UTIs chronic HD patients was 22% followed by *Enterococcus* (15%), *Staphylococcus aureus* (14%). While we found that *S. aureus* was the highest isolated bacteria (23%) followed by *E. coli* (19.8%) and *Enterococcus* spp. (11.6%).

Bacteremic infections are the major cause of morbidity and mortality in chronic hemodialysis patients (Hoen *et al.*, 1998). The incidence rate of infection with Central Venous Catheters (CVCs) which

were used by the patients of this study is double those of other access type combined (Abdulrahman *et al.*, 2002). The results of our study agreed with other studies which reported that sepsis is the major cause of morbidity between HD patients (Dittmer *et al.*, 1999; Tanriover *et al.*, 2000). Many authors have reported *S. aureus* organisms as the leading cause of bacteremia in HD patients, with differences of its' prevalence that ranged from 52 to 82% (Abdulrahman *et al.*, 2002).

Our findings differ from these studies, *S. epidermidis* prevalence was higher than *S. aureus*., Abdulrahman and his partners mentioned that these findings may point to the emergence of more virulent strains among this group. Epidemiologic studies had reported that 40-60% of hemodialysis patients are carriers of *Staphylococcus* as a normal flora (Ena *et al.*, 1994). And the infection in HD patients are caused by their endogenous flora (National Kidney Foundation (NKF), 1997). This contamination happens in the first place by inadequately trained nurses, high number of dialysis and prolonged duration of catheterization (Pearson, 1996).

Gram negative bacteremia was considered previously to be uncommon among HD patients and 11% prevalence of it was considered to be an outbreak (Taylor *et al.*, 1998; Kairaitis and Jottlieb, 1999).

The 32.6% prevalence of *E. coli* is considered so high in comparison with other studies. This high prevalence of the infection by Gram negative can be expected if we take in consideration the inexperience of the personnel chronic liver diseases and diabetes mellitus that some of our patients suffering from (Abdulrahman *et al.*, 2002).

Preventive strategies to reduce the dangers of nosocomial infections that the HD patients (especially the long term dialysis patients) face must be taken in the near future. Some of these strategies may include vaccination and using antibiotic locked catheters (Shinefield *et al.*, 2002). Recently researchers have discovered that a drug used to treat dialysis catheters instead of heparin which is used now in our hospitals to prevent clotting may help in preventing malfunction of the catheter as well as preventing infection (Hemmelgaran *et al.*, 2011).

Table 1: Bacterial isolates from urine and blood samples collected from HD patients\*

Organisms	Urine samples no. (%)	Blood samples no. (%)	Total no. (%)
<i>Escherichia coli</i>	17 (19.8 %)	30 (32.6 %)	47
<i>Staphylococcus aureus</i>	20 (23 %)	15 (16.1 %)	35
<i>Staphylococcus epidermidis</i>	9 (10.4 %)	30 (32.6 %)	39
<i>Enterococcus</i> spp.	10 (11.6 %)	0 (0 %)	10
<i>Klebsiella oxytoca</i>	9 (10.4 %)	0 (0 %)	9
<i>Klebsiella pneumoniae</i>	2 (2.3 %)	15 (16.1 %)	17
<i>Klebsiella oxytoca ornithin positive</i>	2 (2.3 %)	0 (0 %)	2
<i>Enterobacter aerogenes</i>	4 (4.7 %)	1 (1.3 %)	5
<i>Enterobacter aerogenes</i>	4 (4.7 %)	0 (0 %)	4
<i>Pseudomonas aeruginosa</i>	1 (1.3 %)	0 (0 %)	1
<i>Proteus mirabilis</i>	5 (5.8 %)	1 (1.3 %)	6
<i>Proteus vulgaris</i>	2 (2.3 %)	0 (0 %)	2
<i>Citrobacter freundii</i>	1 (1.3 %)	0 (0 %)	1
Total	86 (100 %)	92 (100 %)	178

\*: No of patients: 60

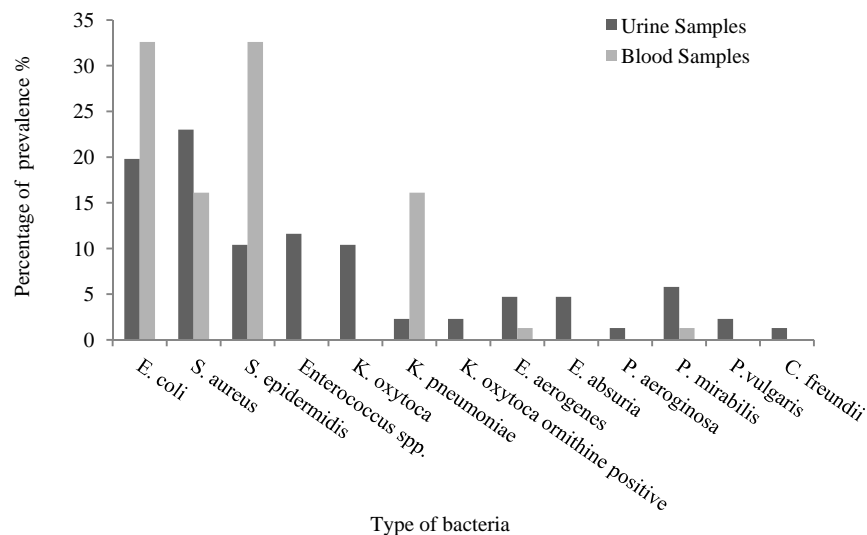


Fig. 1: The percentage of bacterial prevalence (%) in urine and blood samples collected from HD patients

**Helicobacter pylori infection in Hemodialysis patients:** *H. pylori* is thought to be the major risk factor for gastrointestinal troubles in dialysis patients (Gür *et al.*, 1999). *H. pylori* infection in HD patients is common even with the absence of symptoms (Al-Mueilo, 2004). Our study revealed that 53.3% of the patients were positive to *H. pylori* antibodies detection test while 46.7% were negative.

There is a variation in *H. pylori* infection rates among different countries, for example in East Asian countries the percentage of prevalence of *H. pylori* in HD patients was 44.5% while in Europe, Middle East has a wide variations (Sugimoto *et al.*, 2009). A study reported that Iranian HD patients and chronic renal failure had a higher prevalence of *H. pylori* infection 66.2% compared with normal individuals 27.5% (Khedmat *et al.*, 2007). It is unclear whether *H. pylori* infection is directly associated with the progression of chronic renal failure, but some researchers suggest that renal failure may influence *H. pylori* infection (Nakjima *et al.*, 2004). Also it was pointed that the chance of eradication of *H. pylori* infection is very rare so it is recommended to receive combined therapies (Sugimoto and Yamaoka, 2011).

In contrast there are studies revealed that the prevalence of *H. pylori* in long term HD patients lowers as the duration of dialysis increases especially at the first four years (Sugimoto *et al.*, 2009).

Some authors found that there was a correlation between A, B and O groups and *H. pylori* infection in hemodialysis patients (Rasmi *et al.*, 2011). As observed in Table 2 and 3, the results revealed that 53.12% of the positive patients belonged to O blood group while 25% of them were belonging to B blood group and 12.5% of them to a blood group.

In hemodialysis patients ABO blood groups and Rh status may have an impact on the prevalence of

Table 2: Relationship between ABO groups and seropositivity to *H. pylori* in hemodialysis patients

Blood group	Total tested	Sub blood group	Positive to <i>H. pylori</i>	Negative to <i>H. pylori</i>
O	33	O-	3	1
		O+	14	15
A	6	A-	0	0
		A+	4	2
B	15	B-	0	0
		B+	8	7
AB	6	AB-	0	1
		AB+	3	2
Total	60		32	28

Table 3: Percentages of patients subjected to the study

Blood group	Total tested no. (%)	<i>H. pylori</i> positive no. (%)	<i>H. pylori</i> negative no. (%)
O	33 (55%)	17 (53.13%)	16 (57%)
A	6 (10%)	4 (12.5%)	2 (7%)
B	15 (25%)	8 (25%)	7 (25%)
AB	6 (10%)	3 (9.4%)	3 (11%)
Total	60 (100%)	32 (53.3%)	28 (46.7%)

*H. pylori* infection (Rasmi *et al.*, 2011). The associations of ABO blood groups and various diseases were studied before (Garratty, 2000). Linden *et al.* (2008) had novel observations suggested that ABO blood groups and secretor phenotypes are part of human innate immunity against diseases. These phenotypes are represented by the ability and the inability of secreting water soluble glycoproteins which are forms of ABO blood group antigens (Linden *et al.*, 2002).

The researchers divided phenotypes into secretors (representative into AB blood group), weak secretors (representative into A and B groups) and non secretors (representative into O blood group) (Linden *et al.*, 2004), hence infections by *H. pylori* were more reported with non secretor blood group (O blood group) and were less reported with secretor blood group (AB

blood group) and this agreed with our observations (Kanbay *et al.*, 2005).

**The relationship between progression of renal failure and ABO blood groups system:** The distribution of blood groups among hemodialysis patients was studied (observe Table 2 and 3). The percentage of the patients that carried O blood group was the highest (55%) followed by the B blood (25%), A blood group (12.5%) and AB blood group (9.4%). There was a study which compared the frequency of ABO blood groups distribution among 184 patients with renal parenchymal diseases and 3820 apparently healthy subjects, occurrence of renal diseases was mainly in B and O blood groups, renal patients showed a 7% increase in O blood group (4). While in another study the occurrences of renal failure in group O was 69.5% and group B was 42% while AB was zero and 69% was for A blood group (Rasmi *et al.*, 2011).

### CONCLUSION

It was concluded from the study that Urinary Tract Infection (UTI) and bacteremia are common nosocomial infections among HD patients in our hospitals. *S. aureus* was the highest isolated bacteria (23%) in UTI infection while *S. epidermidis* prevalence was higher than *S. aureus* in blood also Gram negative bacteremia prevalence was so high in comparison with other studies if we take in consideration the inexperience of the personnel, chronic liver diseases and diabetes mellitus that some of our patients suffering from. *H. pylori* infection in HD patients is common. It was concluded also that the highest incidence of *H. pylori* infection was in O blood group patients. On the other hand the results also revealed that there was a relation between renal failure and the distribution of ABO blood groups (the occurrence of renal failure in group O was 69.5%).

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