

Assessing Urinary Tract Infections among Patients with Renal Impairment

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ABSTRACT

Recording urinary infections assessing a significant prevalence among patients suffering from renal impairment selected for our study, chronic renal failure may lead to severe complications.

After respiratory infections, urinary infections are the second reason why patients go to infectious pathology consultations. Urinary infections are also the first cause of nosocomial infections. Such infections are common, sometimes treatment-resistant and tend to reiterate.

Thus, we have focused the purpose of our study on recording urinary infection occurrence among people having renal failure. Patients were divided into two groups: one undergoing hemodialysis and the second not undergoing hemodialysis. Topics such as gender and age were also taken in consideration. Bacteriological exams were thus carried out to identify germs responsible of infections and settle a therapeutic approach. This was made possible through an antimicrobial susceptibility testing to evaluate sensibility or resistance of isolated bacteria towards certain antibiotics

Our work was a descriptive and prospective study that took place during a one-year period. Our sample involved 100 patients suffering from renal failure. We recorded criteria such as renal failure type, 40 persons undergoing hemodialysis and 60 not undergoing hemodialysis, men and women, age from 27 to 87 years old. Persons having children or a negative renal check-up were disqualified.

We have pointed out that 64% of patients have urinary infections: 57.15% not undergoing hemodialysis and 42.85 % undergoing hemodialysis. We have also pointed out that Gram-negative bacteria predominance with a 71% rate versus Gram-positive bacteria and that women are more affected than men (64% vs. 36%). Antibiotic susceptibility testing assessed high performance of hydroxyquinoline (nitroxolin 88.8%), macrolides (lincomycine 75.4%), aminosides (amikacin 64.4% and gentamicin 44.4%) as well as synergistins (pristiniamycin 55%). On the other hand, a majority of isolated bacteria assessed a β -lactam antibiotic resistance (penicillin, amoxicillin). Treating symptomatic urinary infection of patients with renal impairment requires particular precautions.

KEY WORDS: urinary infection – renal impairment - bacteria- antibiotics.

1- INTRODUCTION

Non-monitored chronic renal failure and renal dysfunction may lead to severe complications such as urinary infections. According to our study, such infections have a significant prevalence among affected patients. After respiratory infections, urinary infections are the second reason why patients go to infectious pathology consultations. Urinary infections are also the first cause of nosocomial infections. Such infections can have different forms and be located in lower urinary tract (cystitis) or upper urinary tract (pyelonephritis). Such infections are common, sometimes treatment-resistant and tend to reiterate. Urinary tract disorders are characterized by symptoms such as an increasing number of painful urinations generally with a particular smell or color [1].

Thus, we have focused the purpose of our study on recording urinary infection frequency among people having renal failure. Patients were divided into two groups: one undergoing hemodialysis and the second not undergoing hemodialysis. Other topics such as sex, age and medical treatment were also recorded. Cyto-bacteriological exams were also carried out to identify germs responsible of infections and settle a therapeutic approach. This was made possible through an antimicrobial susceptibility testing to evaluate sensibility or resistance of isolated bacteria towards certain antibiotics [2].

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2- MATERIAL AND METHODS

Our work is a descriptive and prospective study that took place during a one-year period. Our sample involved 100 patients suffering from renal failure. Patients were selected after consent. We recorded criteria such as renal failure type, 40 persons undergoing hemodialysis and 60 not undergoing hemodialysis, men and women, age from 27 to 87 years old. Persons having children or a negative renal check-up were disqualified.

Bacteriological urine tests were conducted under aseptic conditions. Any contamination risk with cells or bacteria from other origin (vaginal or rectal) had thus to be excluded. Urine was collected in sterile test tubes [3]. Urine analysis procedure was settled as follows: direct observation (color, aspect and consistency), culture on agar media adapted to isolate bacteria (Hecktoen blood agar), identification of isolated germs through series of conventional biochemical tests and eventually an antimicrobial susceptibility testing. In order to guarantee a better therapeutic index, antimicrobial susceptibility testing was conducted through Mueller Hinton media diffusion method. All tests were duplicated [4].

3- RESULTS AND DISCUSSION

We can point out from our study that urinary infections have a 64% rate among patients suffering from renal failure (Fig. 1).

Patients with compromised immune system having urinary infections may have a reduced or limited antibody synthesis. This is because, among patients with renal failure, compromised immune system is caused by malnutrition, i.e. protein decrease, proteins being azote and amino acids sources [5].

Results are assessed by chemical parameters (Fig. 2) showing a 58% proteinuria and a 27% glycosuria. Glycosuria can be caused by stress driving to adrenaline excessive secretion. As a consequence, adrenaline excessive secretion stimulates glycogen deterioration and liver glucose release, with a 15% hematuria. Such rates in urines come from renal dysfunction or glomeruli filter alteration [6].

Likewise, immune suppressed patients with genitourinary troubles have alkalinized urines. This is caused by urea, favoring urease-positive bacteria proliferation. Among sources of infection, hospital beds are excellent biotopes. This is because patients undergoing dialysis or not undergoing dialysis are active members participating to the hospital biocoenosis and nosocomial infections can be further added to hospitalized patients. Men frequently suffer from urinary infections due to deficient prostatic secretions, because such secretions have an antimicrobial activity [6]. Urinary stasis favors infections, being a urethral peristalsis reduction. Urinary tract abnormalities, either congenital or acquired, can counter physiological expelling of an eventual contamination. This allows thus bacteria implementation, i.e. a urinary infection starting point [7].

Our study assesses that patient's not undergoing hemodialysis have a 57.15% infection rate while patients undergoing hemodialysis have a 42.85% infection rate. Such rates might be explained by a retained diuresis or a high protein rate, both being an indispensable nutritional factor for bacteria growth (Fig.3).

Our study also assesses that women are more affected than men with a 65% versus a 35% infection rate (Fig.4). Physiological and anatomical factors enable urinary infections because women urethra is shorter thus more sensitive to gastro-intestinal colonization infections [8]. Lactobacilli present in vagina of premenopausal women have an effect on vaginal acidity, which is a protection against uropathogen germs. Nevertheless, after menopause, estrogenic impregnation decrease leads to lactobacilli decrease and a pH increase. pH increases responsible of vaginal colonization with *Escherichia coli* and other enterobacteria [9].

Bacteriological analyses assess a predominance of Gram-negative bacteria with a 71% rate versus a 29% Gram-positive bacteria rate (Fig.5). This might lead us to several hypotheses: whether Gram-positive bacteria easily become antibiotic-resistant because they are saprophytic as well as commensal bacteria, whether enterobacteria have urothelium adhesion and fixative properties as well as a certain level of resistance to acidity [10].

Results of analysis to qualify and identify isolated strains assess that first rank Gram-negative bacteria responsible of urinary infections is *Escherichia coli* with a 28% rate (Fig.6). Presence of adhesion parameters allows bacteria to proliferate and we know that such bacteria have virulence factors, particularly with presence of fimbriae or pili (P or P1 type) [11]. *Escherichia coli* being digestive tract bacteria, it can thus spread down to the anus then spread up through the urinary tract [12]. This is particularly true among women because of anatomical reasons.

Antibiotic susceptibility testing assesses hydroxyquinoline (nitroxolin 88.8%) high performances [13]. Such antibiotic has a broad-spectrum activity on Gram-positive cocci and Gram-negative bacilli [14]. Global resistance profile of isolated bacterial strains having an important resistance to macrolides

(Lincomycine 75.4%), are still efficient on Gram-positive cocci and Gram-negative bacilli because of rare needless treatments [15]. Aminoglycosides (amikacin 64.4% and gentamicin 44.4%) as well as synergists (pristinamycin 55%), are major antistaphylococcal dedicated to Gram-positive cocci infections [16]. On the other hand, a majority of isolated bacteria assess a β -lactam antibiotic resistance (penicillin, amoxicillin).

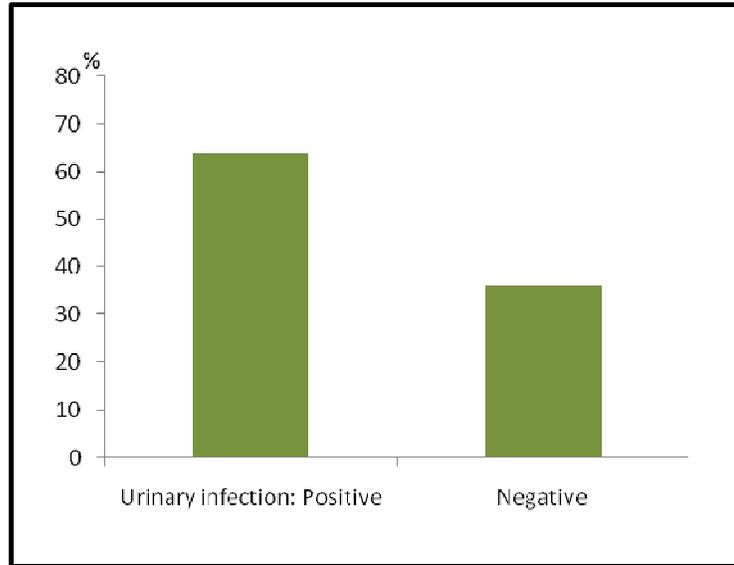


Fig. 1: Urinary infection occurrence among patients with renal failure

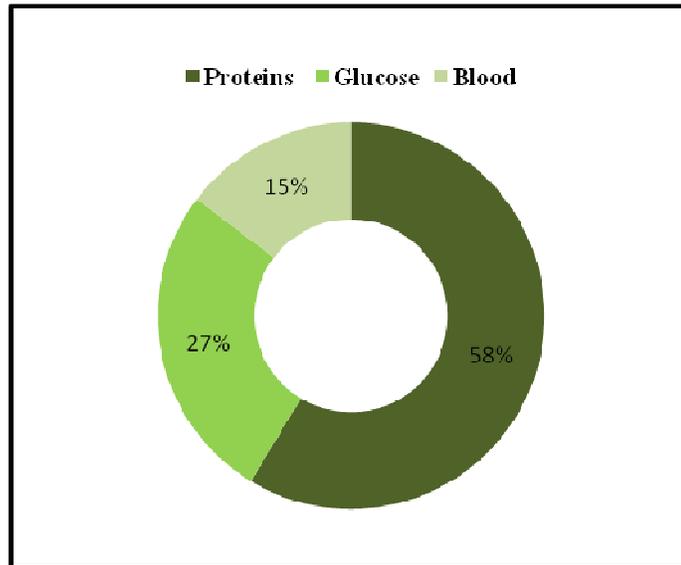


Fig. 2: Results of Labstix strips chemical exams among patients with renal failure

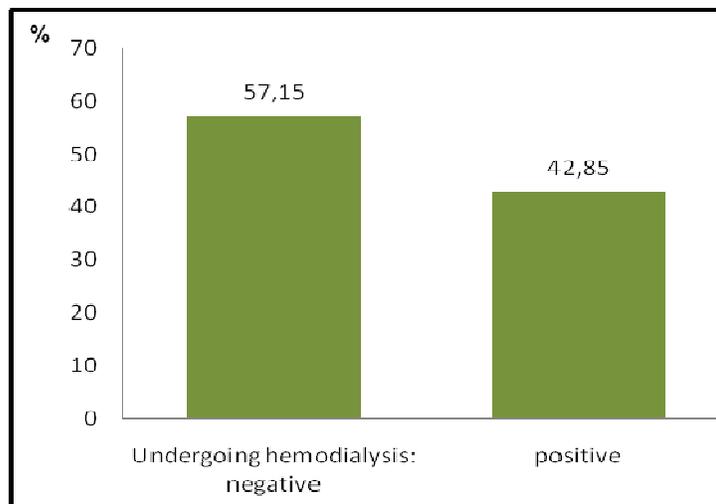


Fig. 3: Urinary infection occurrence among patients

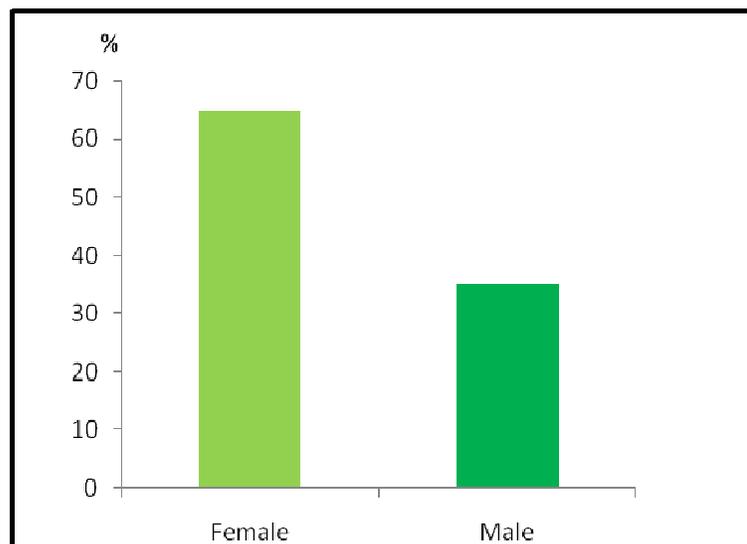


Fig. 4: Urinary infection ratio among patients with renal failure according to gender

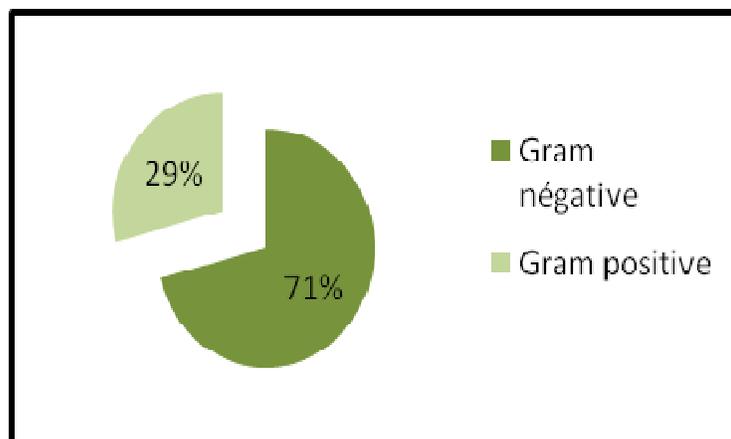


Fig. 5: Gram-positive and Gram-negative bacteria occurrence

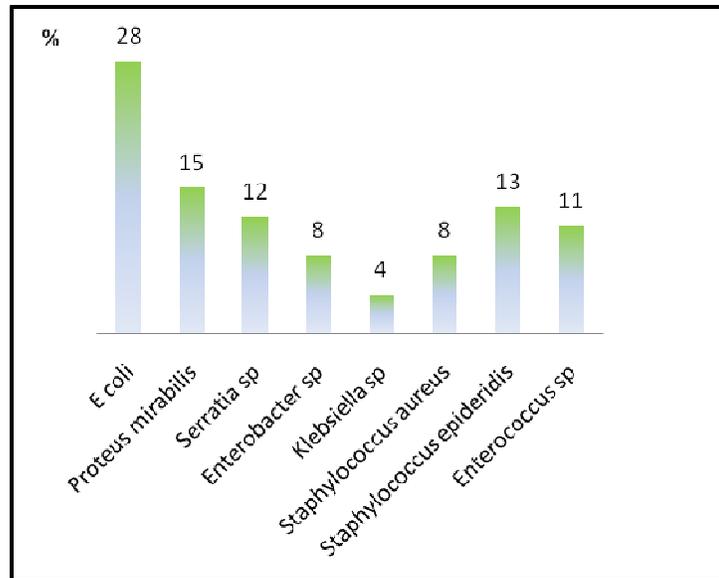


Fig. 6: Isolated bacteria responsible of urinary infections ratio

4- Conclusion

Urinary infections are one of main complications among patients with renal impairment. Considering the evolution of this pathology, we have focused our study on urinary infections prevalence, very frequent among patients with renal impairment (64 %). Such infections are most of the time asymptomatic. Women are particularly more affected than men. Gram-negative bacteria are predominant compared to Gram-positive bacteria (71% versus 29%).

Antibiotic susceptibility testing assesses high therapeutic efficiency of nitroxolin. Antibiotic treatment must systematically be adapted to culture results and function. This is to avoid complications and multiple-resistant germs selection hazard. Symptomatic urinary infection treatment for renal impairment patients requires particular provisions. In certain cases and with certain antibiotics, measuring blood antibiotic rate is indispensable to avoid under-dosing, which is responsible of inefficiency, chronicity or increase of resistance to antibiotics. On the other hand, over-dosing is sometimes responsible of side effects.

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- **No conflict of interest**

- Dr. Ouhiba Moumen Chentouf collaborated in conducting experiments and interpreting results
- To undergo our study, patients were selected after consent. For ethical reasons, their names were kept anonymous.