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Research Article

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Prevalence and characterization of urinary tract infections among Algerian diabetics

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ABSTRACT

The present study aimed to evaluate the prevalence of urinary tract infections (UTIs) in a diabetic population from Western Algeria and to define the most common uropathogens and their sensitivity to different antibiotics. Our results showed a high prevalence of 72.66%. Furthermore, the 58-67 group had the highest prevalence (37%) of UTIs. Staphylococcus Sp (60.94%) and E. coli (42.32%) were the most common uropathogens.

Keywords: Urinary tract infections, Diabetes, Algeria, Antibiotics, Uropathogens

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INTRODUCTION

In recent years, new pathologies linked to increased life expectancy such as diabetes or cancer replaced endemic communicable diseases in Algeria [1]. Urinary tract infections (UTIs) are the frequent infections observed in diabetic patients and may result in important complications such as dysuria, kidney damage, or pyelonephritis [2]. Infections also cause considerable morbidity and mortality in patients with diabetes mellitus. They may precipitate metabolic derangements and, conversely, the metabolic derangements of diabetes mellitus may facilitate infection [3]. The successful management of UTI in diabetics depends on the proper identification of the bacteria responsible and the selection of effective antibiotics against them [4]. To our knowledge, few studies have been undertaken to assess the renal function in different pathologies in Algerian population [5].

The objective of the present study was to evaluate the prevalence of urinary tract infections in a diabetic population from Western Algeria, to define the most common uropathogens and their sensitivity to different antibiotics.

EXPERIMENTAL SECTION

A total of 300 diabetic patients were enrolled in our study. The selection was made following their consent. Inclusion criteria were: diabetes (Type I, Type II), both Gender and Age (from 27 years up to 87ans). Non-diabetics, children and patients with current medication use of antibiotics were excluded.

Morning urine has been collected and stored in sterile test tubes at 4 ° C. Urine was centrifuged at 1500 rpm for 5 minutes and then 0.1ml was seeded if different media. The plates were incubated at 37ºC aerobically for 24hrs. The choice of culture media is established according to the interest of study, according to the most involved bacteria in urinary tract infections.

Isolated bacteria were identified using standard cultural, morphological and biochemical techniques. Disc diffusion method was used to assess antibiotic sensitivity of identified microorganisms using Mueller-Hinton agar. The result is considered positive if the diameter of inhibition zone is greater than 2 mm.

RESULTS AND DISCUSSION

Results of bacteriological analysis of urinary tract infections in diabetics

According to our results (Fig01), bacteriological investigation of the 300 diabetic patients showed a prevalence of 72.66% of urinary tract infections. This prevalence may be considered as very important when compared with those reported by previous studies. Chita *et al.* (2013) assessed the prevalence of UTIs among 1470 Romanian hospitalized diabetic patients [6]. They reported a prevalence of 10.7% of UTIs. Prevalence of UTIs we reveal in the present study is higher than 7.9% reported in Canada [7] or 15% reported in Italy [8].

Results of the quantitative analysis (Fig 02) indicated that 43% od diabetic patients had between 10^3 and 10^5 CFU / ml which means the presence of a true IU or prostatitis in men, or cystitis in women. Furthermore, 21, 34% of patients presented a bacteriuria (> 10^5 CFU / ml) and 35, 66% translates bacteriuria (< 10^3 CFU / ml).

Effect of age on distribution of urinary tract infections

When diabetic patients were stratified according to their age, our results showed that the 58-67 years group had the highest prevalence (37%) of UTIs (Fig.03). This may be due to a decrease in urinary flow, incomplete bladder emptying after urination, prolapse (descent) of the bladder and vagina in women or to the prostate's aging in Men (adenoma) [9]. It is well known that in elderly men, the bactericidal activity of prostatic fluid is reduced which promotes bacterial growth. On the other hand, after menopause, the decrease in estrogen impregnation results in a reduction in the number of lactobacilli and an increase in pH responsible vaginal colonization by *Escherichia coli* and other *Enterobacteriaceae* [10]. Furthermore, the female urethra is shorter and exposes women to more urinary infections due to gastrointestinal colonization [11].

The bacteria responsible for urinary tract infections

According to our study, the results show a predominance of Gram-positive bacteria (59%) compared to Gram-negative bacteria (41%) (Fig 04). In uncomplicated UTIs *Escherichia coli* is the leading organism, whereas in complicated UTIs the bacterial spectrum is much broader including Gram-negative and Gram-positive and often multiresistant organisms [12]. Our results reveal that the first Gram-negative bacteria responsible for urinary tract infections is *E. coli* (42.32%). These findings are consistent with those reported by [13]. They found that *E coli* were the most predominant uropathogens (50%) in 500 patients from Nepal. Furthermore, it has been reported that *E coli* remains the first remains the most common aetiological agent of UTIs in North America [14] and Libya [15]. *E coli* is a bacteria of the digestive tract, it can spread (especially in women for anatomical reasons) down to the anus and then back in the urinary tract by multiplying and causing a urinary tract infection [16]. Nowadays, *E coli* is the most common organism causing UTIs in individuals with diabetes [17].

Moreover, we report here that the dominant bacterial genus of urinary tract infections in Gram-positive bacteria was *Staphylococcus Sp* (60.94%). *Staphylococcus aureus* was found to be the common uropathogen in diabetic patients (30%) of both genders in Nigeria [18]. Patients with diabetes are more likely than those without diabetes to be infected with *Staphylococcus aureus* and gram-negative rods [19].

Antibiotic sensitivity of uropathogens identified

Active molecules, especially from natural sources became a promising alternative in the treatment approaches of several diseases such as cancer or diabetes [20-21]. We then tested the sensitivity of isolated and identified uropathogens to different antibiotics. Our results showed that Nitroxoline (Ni) was the most effective. Indeed, 67% of uropathogens responsible of UTIs in diabetic patients included in the present study were sensitive to Nitroxoline. The latter showed a broad spectrum of action against Gram-positive cocci (55.56%) and Gram-negative bacilli (44.44). It has been demonstrated that Nitroxoline was active against most Gram-negative and –positive uropathogenic bacteria, may be due to its ability to chelate with various metallic bivalent cations [22]. With its rapid absorption into the plasma and its subsequent excretioninto urine, (Ni) has a long retention time in urine, thus making it ideal for UTI treatment [23]. Moreover, we found that 44.24% of Gram-negative bacilli were sensitive to Trimethoprim-sulfamethoxazole (SXT). These findings are important since Trimethoprim/sulfamethoxazole (TMP/SMX) resistance remains a serious threat in the treatment of several infections [24]. In recent years, a remarkable increase of antibiotic resistance in uncomplicated UTI has been reported, notably increased resistance seen in *E. coli* to some commonly used antimicrobial agents, particularly to trimethoprim-sulfamethoxazole [25]. Cefazolin (Cz) belonging to the family of cephalosporins, was active against Gram-positive bacteria (61.44%) but it had a lower effect on the Gram-negative bacteria (34%). This antibacterial activity we report here may be due to the ability of this molecule to block the synthesis of peptidoglycan, a component of the bacterial cell wall [26]. Furthermore, 60% of Gram-positive bacteria identified in our study were sensitive to Oxacillin.

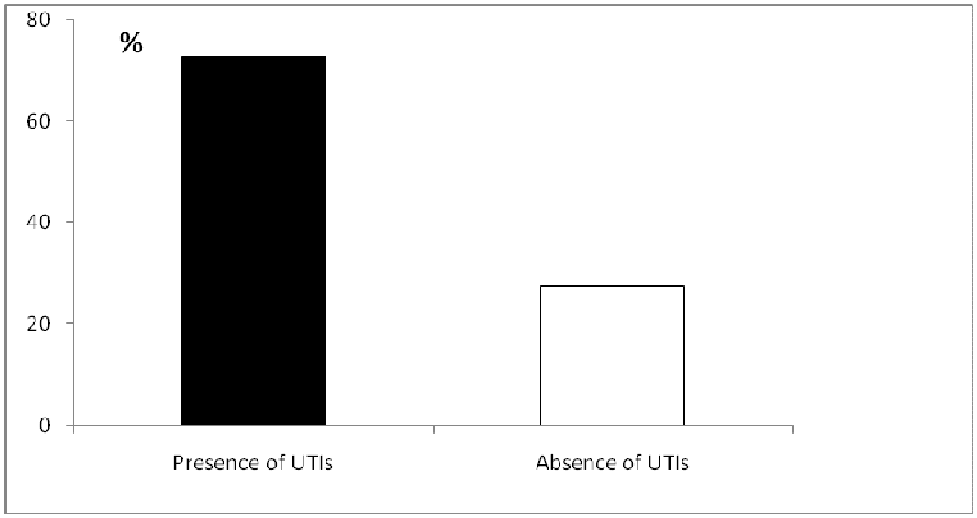

Figure 01: Frequency of urinary tract infections in diabetics

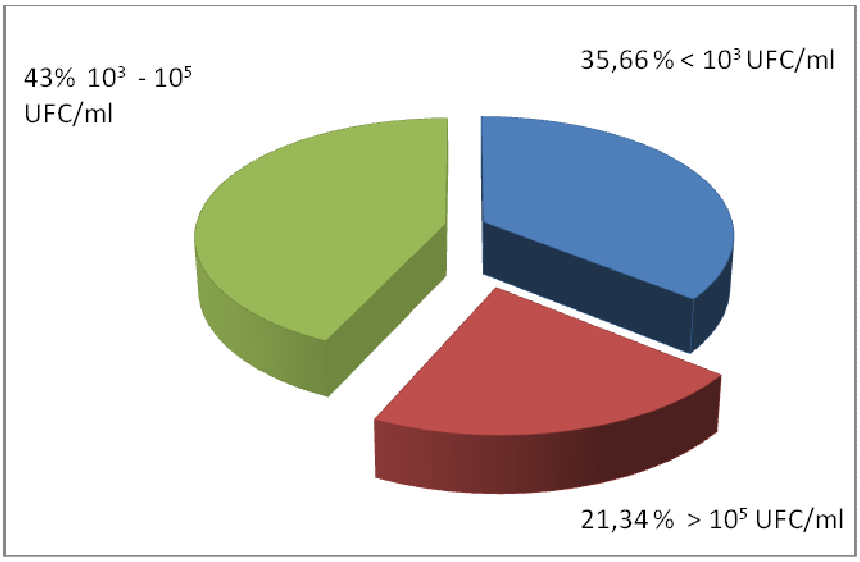

Figure 02: Quantitative analysis of isolated uropathogens

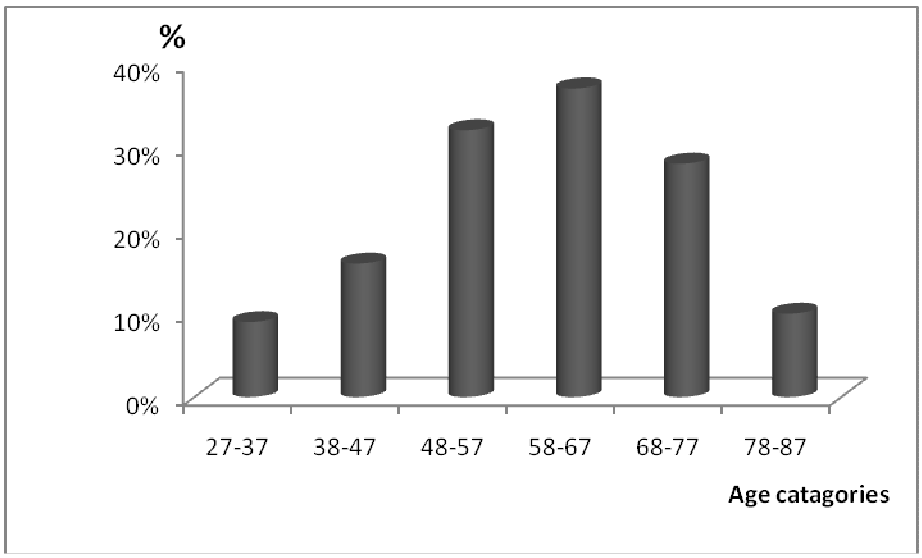

Figure 03: Distribution of UTIs in diabetic patients according to age groups

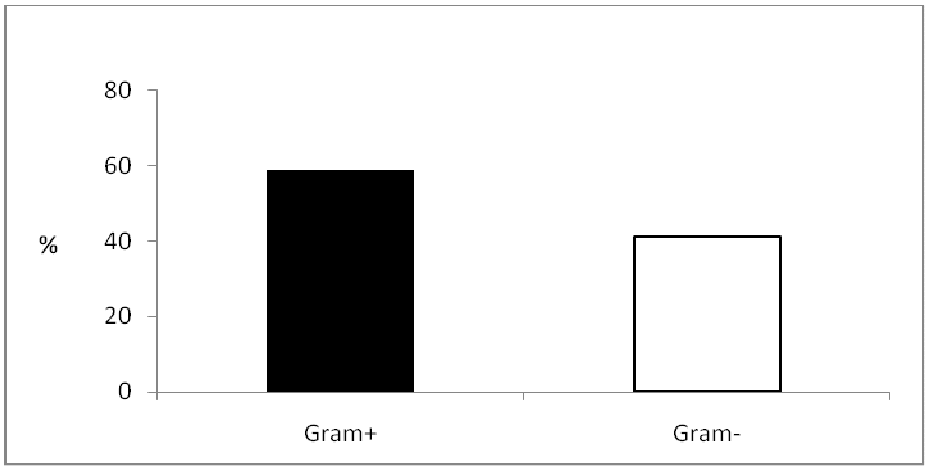

Figure 04: Frequency of Gram positive and negative uropathogens

CONCLUSION

The present study reports a high prevalence of UTIs among Algerian diabetic patients, especially in the 58-67 years age group . We identified the most common uropathogens as *E coli* and *Staphylococcus sp*. The antibiotic sensitivity test shows a high therapeutic efficacy of Nitroxoline. Our findings highlight the necessity of further studies

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