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Microbiology

Prevalence of Bacteriuria, Candiduria, and Antibiotics Susceptibility Patterns Among Diabetic Versus Non-Diabetic Patients

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ABSTRACT

Aim of the work: Assessment of the microbial species from diabetic and nondiabetic illness and their antibiotics susceptibility patterns.
Materials and Methods: Two hundred urine specimens were collected from illness in a duration period extending from July 2018 to July 20119 at Badr University Hospital-Helwan, Cairo, Egypt. Samples were collecting cultivated on MacConkey, blood agar, and Sabouraud dextrose media. The microbial isolates were identified by microbiological methods. The antibiotic sensitivity was evaluated by the VITEK 2 compact automatic system and disk diffusion method.
Results: Only 120 samples exhibit growth with a prevalence rate of 60%, from total samples collected. The results revealed UTIs were found to be significantly higher in diabetic illness (79%) compared to nondiabetic illness (41%). One hundred and twenty microbial species were recovered from collected urine specimens (79 from diabetic and 41 nondiabetics). Pathogenic bacteria & Candida were represented with 96 isolates (80.0 %) and 24 isolates (20.0), respectively. Among the 96 bacterial isolates, Escherichia coli constituted, Escherichia coli (72.80%), Klebsiella pneumonia (22.88%), and Staphylococcus aureus (4.16%). Meropenem, imipenem, trimethoprim/ sulphamethoxazole, and norfloxacin highly effective antibiotics against E. coli and Klebsiella pneumonia while amoxicillin, erythromycin, and vancomycin low effective.
Conclusion: Diabetes disease a remarkable factor that stimulates UTIs. Higher frequency resistance to antibiotics in this study renders its indecency for empirical treatment and development of new empirical treatment.

Keywords*: UTIS; diabetics; nondiabetics; antibiotics; resistance.*

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INTRODUCTION

Urinary tract infections (UTIs) have long been recognized as a significant problem in nondiabetic patients and more dangerous in diabetic illness. In the world, three hundred and seventy-one million people have diabetes and it is estimated that by 2030 reach five hundred and fifty-two million.[1,2]

Diabetes is one of the top ten chronic diseases that cause death in the world.[3] Even though both males and females are susceptible to UTIs, but the females high susceptible to UTIs compared with males. More than 50% of females will develop UTIs in their lifetime and one from three females requires antibiotics due to UTIs. [4,5]

Escherichia coli are predominating bacteria causing UTIs. Classification of *Escherichia coli* was found belong to the family Enterobacteriaceae and represented 75 to 90% of UTIs.[6] Major studies worldwide revealed that *Escherichia coli* is responsible for most UTIs.[7] *Escherichia coli* responsible for UTI in females and males is 58.2% and 31.4%, respectively.[8]

UTIs are initiated with *Escherichia coli*, which is a sitting in the gastrointestinal tract.[6] Commensal *Escherichia coli* acts as a storage of resistant genes and ability transferred to another pathogen bacteria.[9] Guidelines of the (IDSA) the advice antibiotics for the treatment of UTIs is sulphamethoxazole/ trimethoprim where the resistance spread is <10-20% recommend drug is ciprofloxacin.[10]

Aimed of the present study to assessment spread UTIs among nondiabetic and diabetic illness, a characterization the most spread microbes causing for it, and their antibiotics susceptibility patterns.

MATERIALS AND METHODS

Two hundred urine specimens were collected from diabetic and nondiabetic patients in a duration period extending from July 2018 to July 20119 at Badr University Hospital-Helwan, Cairo, Egypt. The collected specimens were processed by microbiological methods and were cultivated on MacConkey agar, blood agar, and Sabouraud dextrose media. All media were readily obtained from (Oxoid, England).

Assessment and Purification of Microbial Isolates
The plates containing MacConkey agar, blood agar, and Sabouraud dextrose media were inoculated with the collected clinical urine samples and were incubated at 35°C for 24 and 48h. The grown colonies were selected, picked up, purified, and then transferred to agar slants containing the same medium. The purified microbial isolates were subjected to a scheme of experimental identification.

Identification of Microbial Isolates.
The pure cultures were characterization based on morphology, physiology, and biochemical tests using Microbiological Methods 8th Bergey's Manual of Systematic Bacteriology[11,16] Characterization was confirmed by VITEK 2 compact automated system (Biomerieux Inc., Marcy I'Etoile, France)**.** Candida isolates were identified using chromogenic agar media.[12]

Antibiotic sensitivity Testing
Susceptibility of bacterial isolates to antibiotics was accompanied with a VITEK 2 compact automated system (Biomerieux Inc., Marcy I'Etoile, France) and disk diffusion method according to (CLSI) recommendation in 2015.[13,16]

RESULTS

In this study, the cultivation of collected urine specimens on MacConkey agar, blood agar, and Sabouraud dextrose agar media revealed that UTIs were significantly higher infected with a ratio of 60% from total samples collected from diabetic and non-diabetic (Figure 1).

The specimens were collected from diabetic illness showed a highly infected with percentage (79%) compare with nondiabetic (41%). Female urine samples high infected rates in diabetic and nondiabetic patients compare with male samples (Figure 2).

One hundred and twenty microbial species recovered from positive urine specimens from diabetic and nondiabetic illness were included in the study. Pathogenic bacteria & *Candida* were represented by 96 isolates (80.0 %) and 24 isolates (20.0), respectively. Among the 96 bacterial isolates, *Escherichia coli* constituted (72.80%), *Klebsiella pneumonia* (22.88%), and *Staphylococcus aureus* (4.16%) (Figure 3).

Out of the 96 bacterial isolates, 63 (52.47) isolates were recovered from diabetic and 32 (26.65) bacterial species were isolated from nondiabetic patients. Out 24, *Candida* species; 23(19.15) isolates were recovered from diabetic patients and 1 (.833) isolates were recovered from nondiabetic. The results were obtained from samples collected revealed that nondiabetic male and female infected with Gram-negative bacteria and candida, while diabetic samples infected with both Gram-(negative and positive) bacteria, and candida (Figure 4).

The antibiotic sensitivity patterns of Gram-negative bacterial species recovered from diabetic and nondiabetic illness showed that highly resistant to amoxicillin, erythromycin, and vancomycin. *Klebsiella pneumonia* isolates were found highly resistant to ceftazidime, cephradine, cefadroxil, cephalexin, ampicillin/sulbactam, and trimethoprim/sulphamethoxazole than *Escherichia coli* isolates. Gram-positive bacteria *Staphylococcus aureus* was found to be resistant to amoxicillin but highly sensitive to amikacin, ciprofloxacin, gentamycin imipenem levofloxacin, meropenem, and norfloxacin. The highly effective antibiotics against *E. coli* and *Klebsiella pneumonia* were recovered from diabetic and nondiabetic illness were found to be meropenem, imipenem, trimethoprim/sulphamethoxazole, and norfloxacin (Figure 5,6,7,8 and 9).

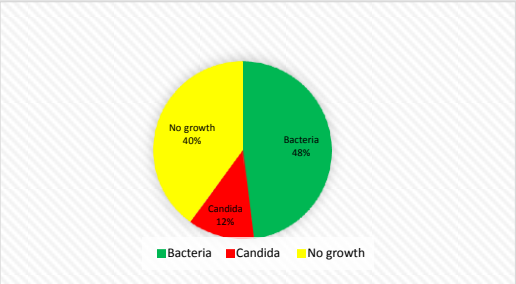

Fig. 1: Prevalence infection rate of urine specimens collected from diabetic and nondiabetic illness.

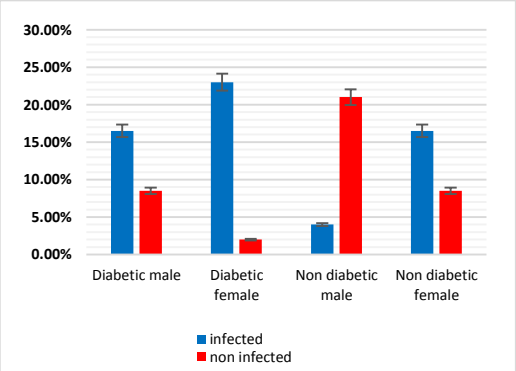

Fig. 2: Prevalence of infected urine samples from diabetic and non-diabetic patient's male and female

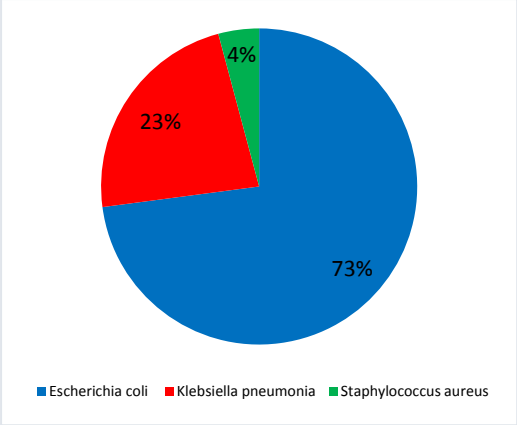

Fig. 3: Prevalence of bacterial species rate in infected samples.

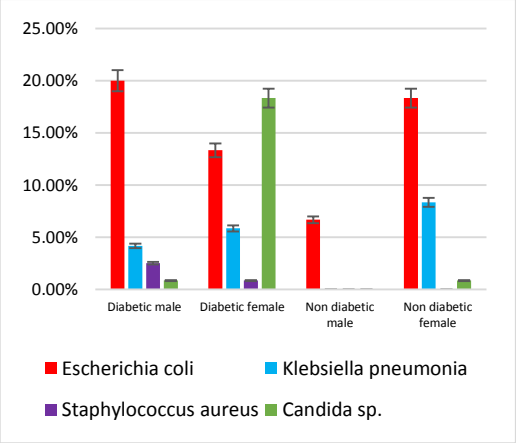

Fig. 4: Prevalence rate of bacterial species and candida in infected urine samples from diabetic and nondiabetic patients.

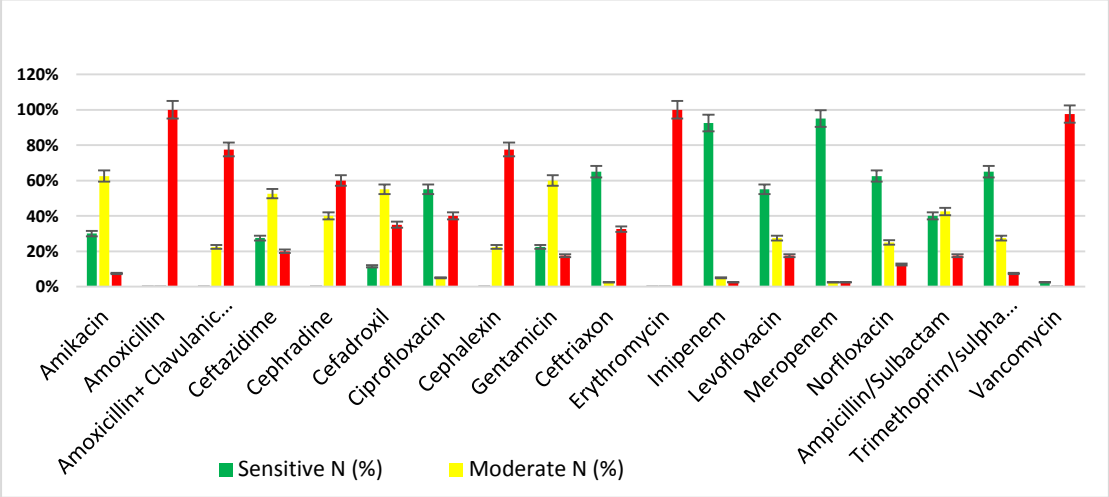

Fig. 5: Antibiotics profile of *E.coli* recovered from urine specimens diabetic illness male and female.

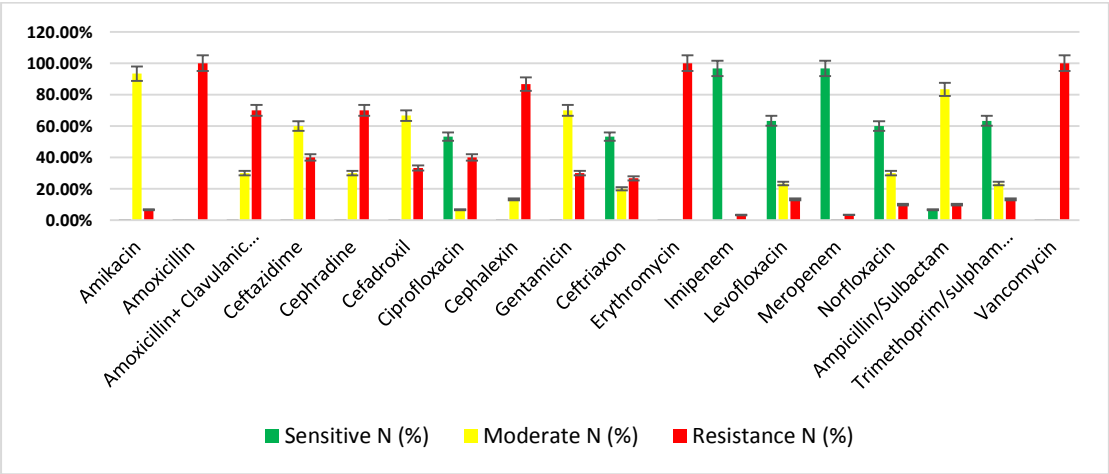

Fig. 6: Antibiotics profile of *E.coli* recovered from urine specimens nondiabetic illness male and female.

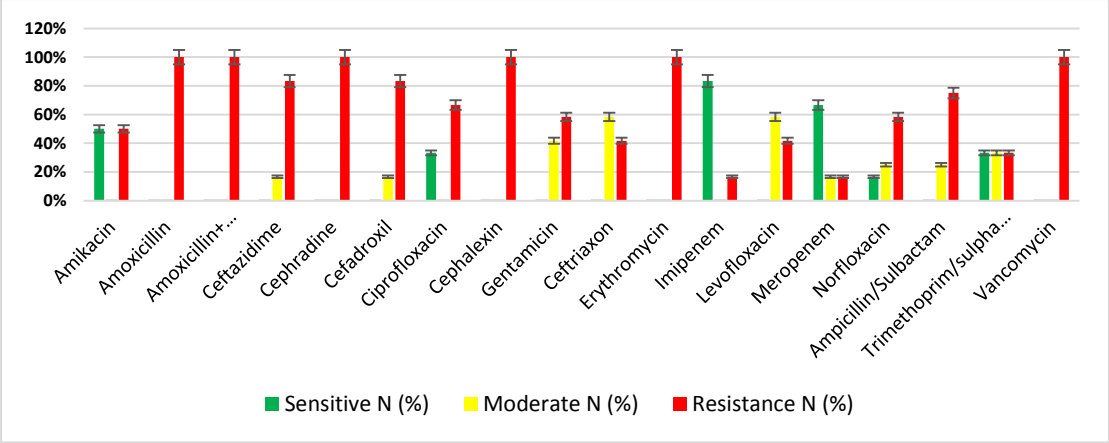

Fig. 7: Antibiotics profile of *Klebsiella pneumonia* isolated from urine samples diabetic patient's male and female

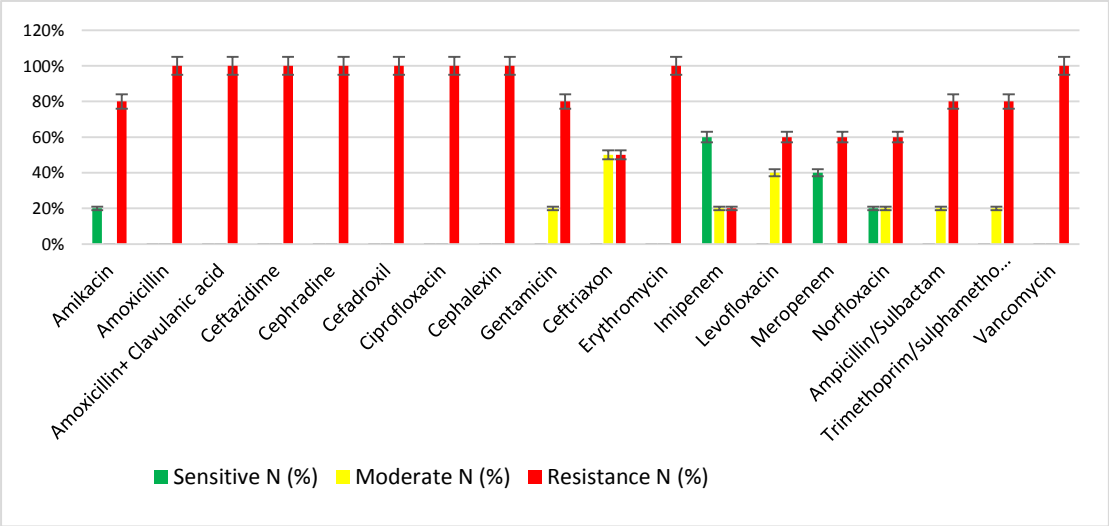

Fig. 8: Antibiotics profile of *Klebsiella pneumonia* isolated from urine samples nondiabetic patient's male and female

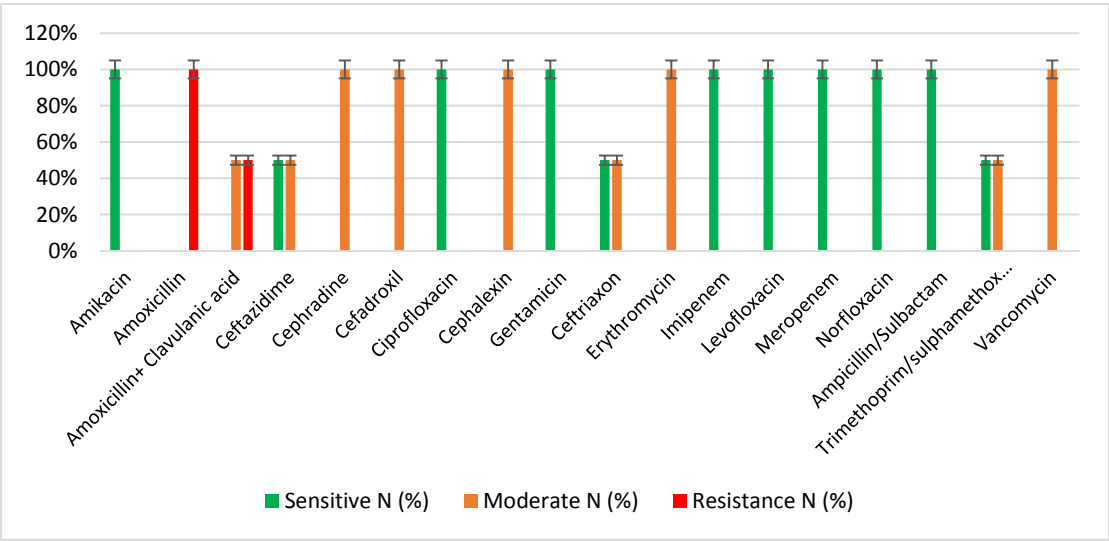

Fig. 9: Antibiotics profile of *S. aureus* recovered from urine specimens diabetic illness male and female

DISCUSSION

SMILE & FS-LASIK were extremely effective, safe In our study, the widespread presence of UTIs in non-diabetic and diabetic illnesses was 60% with a prevalence of 48% high remarkable bacteriuria and 12% candiduria. The spread rate from non-diabetic 32% bacteriuria and 1% candiduria whereas illness 64% bacteriuria and 23% candiduria. However, this finding difference with the results recorded from India (32%) 17and similar results from Iraq (49.1%) 18 and Pakistan (51%).[19] The causing for this variance in the average of bacterial UTIs etiologies may be dissimilarity in, the ecology, community-habits, the quality of individual hygiene, or methodology used. Candida sp. is a general displaying factor of UTIs in diabetic illness. [20,21]

In this study, remarkable candiduria was found to be 23% in diabetic and 1% in nondiabetic. This findings difference with results recorded in Ethiopia (8.3%) 20, and King Saudi Arabia (12%).[22]

In this study, Escherichia coli is the most common bacterial species and its pervasiveness was 58.29% with a discrepancy 33.31% from diabetic and 24.98% non-diabetic, similar to this study, Escherichia coli was also the most predominate bacteria with a ratio (69%).[23] Al-Asoufi et al., 2017 reported that E. coli is causing UTIs with a prevalence rate (44.8%) in diabetic and non-diabetic illnesses.[24]

The second frequently isolated bacteria were found to be Klebsiella pneumonia constituted (18.32%) from total microbial isolate, (10%) from diabetic and (8.32%) from nondiabetic illness. Karmaker et al., 2016 reported that Klebsiella pneumonia is responsible for UTIs with a prevalence rate (8%) in diabetic patients.[25] In the present study, Staphylococcus aureus is responsible for UTIs with a prevalence rate (4%) in diabetic patients, not present in nondiabetic patients. Kumar et al. (2019) reported that coagulase-positive Staphylococcus from urine samples of diabetic with a prevalence rate of 5.7% and 11.1% from nondiabetic patients.23 In this study, Candida sp. represented 12% from total microbial isolates, 11.17 %, 0.83% from diabetic and nondiabetic. A high prevalence rate of candiduria 84.2% was reported by Yismaw et al., 2013.[26]

In our study, diabetic illness high UTIs rate compare with nondiabetic. In a prior study, diabetes considerable hazard factors have been initiating as a stimulating factor for UTI in illness with diabetes.[27] In the present study, multidrug resistance bacteria (MDRB) were discovered. Meropenem, imipenem, trimethoprim/sulphamethoxazole, and norfloxacin most effective antibiotics against bacterial isolates. The antimicrobial resistance profile of the uropathogens, we observed that most Escherichia coli strains were resistant to amoxicillin, erythromycin, and vancomycin in both diabetic and nondiabetic patients. Raya et al., 2019 recorded the highest resistance bacterial isolates from UTIs to amoxicillin followed by ciprofloxacin and cotrimoxazole in diabetic and nondiabetic illnesses.[28] Also, Wang et al., 2013 reported that Escherichia coli resistance to second- and third-generation cephalosporins were predominant in diabetic illness. Imipenem, nitrofurantoin, and amikacin were found to be highly effective antibiotics against Escherichia coli.[29]

Klebsiella pneumonia were found high resistance to amoxicillin, amoxicillin /clavulanic acid, ceftazidime, cephradine, cefadroxil, cephalexin, ampicillin/sulbactam, erythromycin and vancomycin in both diabetic and nondiabetic patients. Thiraviam et al., 2014 isolated Klebsiella sp. from the urine culture of diabetic and nondiabetic patients which exhibit a variable resistance pattern to chloramphenicol, ampicillin, and streptomycin.[30] In this study, Staphylococcus aureus exhibit high sensitivity to amikacin, ciprofloxacin, gentamycin imipenem levofloxacin, meropenem, norfloxacin, ampicillin/sulbactam but 100% resistance to amoxicillin. Woldemariam et al., 2019 reported that S. aureus 100% sensitive to nitrofurantoin, however 100% resistance to ampicillin, trimethoprim/sulphamethoxazole, and penicillin.[31] Sertaç et al., 2018 isolated multidrug resistance Staphylococcus sp. from the ocular surface of patients with diabetes.[32]

CONCLUSION

UTIs are less in the nondiabetic people as compared to their diabetes. Diabetes is a chronic disease a significant stimulates UTI. E. coli was the most frequent bacteria causing UTIs. The most effective antibiotics against bacteria species recovered from diabetic and nondiabetic illnesses were found meropenem, imipenem, trimethoprim/ sulphamethoxazole, and norfloxacin.

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