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International Journal of Pharmaceutical Research & Allied Sciences, 2021, 10(1):24-33
https://doi.org/10.51847/c22thdk

Original Article

ISSN : 2277-3657
CODEN(USA) : IJPRPM

Antimicrobial Susceptibility Pattern for Community-Acquired Uro-pathogens among UTI Geriatric Patients

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ABSTRACT

Urinary tract infections (UTI) are the second most frequent infection in the geriatric population, related to an increased likelihood of hospitalization. The current study aimed to determine the spectrum of antimicrobial susceptibility for community-acquired urinary pathogens among geriatric patients. A cross-sectional study was carried at Khartoum state Hospitals, Sudan. Data were collected using questionnaires. Urine cultures and antimicrobial susceptibility were performed, serum levels of IgG were determined using an enzyme-linked immunosorbent assay (ELISA) kit. The overall prevalence of UTI in geriatric was 55%. Gram-negative isolates were significantly highly frequent (67.6%), Escherichia coli was predominant pathogens (46%) followed by Enterococcus faecalis (13%), and Staphylococcus aureus (10%). High resistance to Ampicillin (80- 100%) and low susceptibility to co-trimoxazol and Norfloxacin was revealed in Gram-negative isolates, whereas Gram-negative bacteria showed susceptibility to Amikacin, Gentamicin, Netilmicin, and Piperacillin from (60-100%). The result of IgG antibodies by ELISA suggests that the Esherichia coli antigen may be an antigen with wide cross-reactivity, suitable for use as an objective test to identify Enterobacteriaceae urinary infection. High frequency of significant bacteriuria particularly Gram-negative isolates were revealed in the geriatric population, with an increase of gram-negative isolates and bacterial antibiotic resistance was very common.

Keywords: *UTI, Geriatric, Antimicrobial, Enterobacteriaceae.*

INTRODUCTION

Urinary tract infections (UTIs) is considered a major health problem [1-4], and are in charge for approximately 7 million office visits, 1 million emergency room admission, and 100,000 hospitalizations each year. Also, they account for 25% of all infections in geriatric patients (aged ≥ 65 years), even if they are community members, live in long-term care facilities, or are hospitalized. UTIs are also considered as the most common cause of bacteremia in the elderly and are associated with a high probability of hospitalization [5, 6].

Recent reports revealed a wider etiology of urinary pathogens among geriatrics, and the infection is characteristically polymicrobial, usually with two to five isolates, including *Escherichia coli* (more prevalent pathogens), *P. mirabilis*, *K. pneumoniae*, *Enterococcus*, *Providencia stuartii*, and *M. morganii*. Several other bacterial pathogens and *yeasts* have also been implicated [7]. In geriatric individuals, the diagnosis and treatment of UTIs could be more difficult than in younger people since underlying host characteristics, particularly age, diabetes, spinal cord injury, catheterization, and generalized impairment, can trigger the pathogenesis of such infections [8]. Besides, age-related immune system alteration, including reduced humoral and cellular immune

excitation, could lead to a decrease in capabilities to cope adequately to antigen challenging and preserve immune memory [9]. Thus complications arising from UTIs are much more common in the elderly, varying from bacteremia and abscess to such non-infectious consequences as vomiting, stroke.

Age rise is itself a potential risk for UTIs. This risk is undoubtedly multifactorial, with elevated urinary incontinence and urinary retention levels, hospitalizations and accompanying urinary catheterizations, long-term medical institutionalization, and immune senescence. Potentially modifiable conditions that led to UTIs involve anatomical disorders of the urinary tract, especially those that induce urinary retention (e.g., prostatic hyperplasia), uncontrolled diabetes mellitus, postmenopausal vaginal atrophy, sexual intercourse are potential risks for men and women alike [10, 11]. On the other hand, increasing bacterial resistance to common antibiotics worldwide and the emergence of multi-drug resistant microbes has been a growing public health concern as the result of antibiotic misuse or overuse. Antibiotics are commonly prescribed empirically just before reports of the urine culture are available is still a huge problem. Immediate awareness of the organism that causes UTIs and their patterns of antibiotic resistance is necessary to ensure successful therapy [12, 13].

However, there are many ways through which microbes may enter the urinary tract و and the kidneys, the defensive mechanisms of the innate immune system, in addition to the urothelium urinary tract, comprise the first line of defense against these invading pathogens which enable the urinary tract to remain sterile [14]. Malfunction in such immune mechanisms may develop to acute disease, severe infection, and tissue destruction, which may turn over the intimate host defense into upsetting enemies that trigger disease, as well as long-term complications such as hypertension and chronic kidney disease. Progression of renal scarring and irreversible loss of renal function and tissue damage [15, 16].

The elderly subject with aggressive urinary infection expresses a systemic antibody response to the infecting organism. About 75 percent of elderly subjects with invasive urinary infection shows an antibody rise to the major outer membrane protein of *Escherichia coli*. This is a widely cross-reactive antigen among the Enterobacteriaceae. Patients with no increase generally have markedly elevated initial serum antibody titers, suggesting antibody rise before initial specimen collection. The urine antibody response with invasive infections is more variable, with both increases and decreases observed between acute and convalescent urines [17, 18]. The current study aimed to determine antimicrobial susceptibility pattern for community-acquired uro-pathogens among geriatric patients.

MATERIALS AND METHODS

An analytical perspective cross sectional study was conducted among elderly infected patients with Urinary Tract Infections attending outpatient clinics from different hospitals at Khartoum state, Sudan. Ethical approval was obtained from the Research Ethics Review Board. A structured questionnaire was used for the collection of clinical and demographic data, all participants sign on informed written consent before starting the study.

Study participants and area

Patients suffering from UTI symptoms who attended the referral clinic were contacted to contribute to the study. participants were included in the study according to the following inclusion criteria; both Sexes (males and females), age group ≥ 65 years old, having signs and symptoms of UTI, and their capability to participate in the study. A trained data collectors personnel have interviewed the patients for collection of medical history (recurrent UTI history), demographic data symptoms (dysuria, frequency, urgency, lower abdominal or suprapubic pain, fever).

Samples collection and processing

A total of 180 Blood and urine samples were collected from each study subject. All subjects were requested to provide a midstream urine sample in a sterile screw-capped wide mouth universal container and processed as soon as possible according to the clean catch procedure. In the Microbiology laboratory, each urine sample was directly inoculated on standardized culture media. A standard quantitative (1 µL and 10 µL) loop was used to inoculate urine samples on to Cysteine Lactose Electrolyte Deficient (CLED) agar, MacConkey's and Blood Agar (Oxoid, Basingstoke, UK). Plates were incubated aerobically at 35–37 °C for 24h and the outcome was assessed as significant/non-significant growth, or contaminated (rejected). The remainder of the urine was divided into two parts: the first part was subjected to centrifugation (1500 g for 5 min) to prepare urine debris for direct microscopic analysis of Red Blood Cells (RBCs, hematuria), pus cells (pyuria), epithelial cell counts, casts, crystals and infections with parasites, and fungi when existing. A scant of RBCs (0-2 cell/HPF), pus cells (0–5 cells/HPF),

and few epithelial cells/ LBF may be seen in normal urine. And the second portion was used for dipstick test rapid response urinalysis Reagent Strips (Combi-Screen PLUS, Roche, USA) [19].

Antimicrobial susceptibility test

Antimicrobial susceptibility test was carried out using the disc diffusion (Kirby Bauer) method, Becton Dickinson was used to get antimicrobial agents. Diameters of the inhibition zone were measured with a slide gauge to the nearest millimeter. *Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853 and *Staphylococcus aureus* ATCC 25923 were used as control strains. Test results were only approved once the diameters of the inhibition zone were within the range of standards.

Gram-negative bacteria were tested against the following antimicrobial agents: Amikacin (AK) 30µg, Carbenicillin (PY) 100 µg, Ceftazidim (CAZ) 30 µg, Ceftriaxone (CRO) 30 µg, Gentamicin (GM) 10 µg, Netilmicin (NET) 30 µg, Piperacillin (PRL) 100 µg, Tobramycin(TN) 10 µg, Ampicillin(AP) 25 µg, Cephalothin (KF) 30 µg, Cotrimoxazole (TS) 25 µg, Mecillinam (MEC) 33 µg, Naldixic acid(NA) 30 µg, Nitrofurantoin(NI) 300 µg Norfloxacin (NOR) 10 µg, Cefaclor (CIC) 30 µg.

Blood samples processing

Blood samples were collected under aseptic technique, 5 ml of blood was withdrawn plain container for serum. Blood samples were examined immediately for complete blood count (CBC) using Sysmex KX-21 N, and then cautiously centrifuged (1500 g at 4 °C for 15 min) to remove serum, and stored at −80 ° C for measurement of IgG immunoglobulin.

Detection of Escherichia coli IgG antibodies in the elderly bacteriuric subjects with UTI using (ELISA)

Sonicated *Escherichia coli* (whole cell) is coated to microtiter plate wells. Test serum is then added and specific antibodies bind to the *Escherichia coli* antigens. The bound specific Ab is detected with peroxidase-conjugated anti-human IgG. The addition of the substrate/chromogen causes the color to develop in Ab positive wells and the degree of the enzymatic reaction is proportional to the level of bound conjugated antibodies. Hence, the titer of *Escherichia coli* specific Ab is proportional to the intensity of color development. Two strains of *Escherichia coli* were used for antigen preparation. One strain was isolated from the urine of a 65-y-old man hospitalized with urinary tract infection. The species identification of this strain was used by the API 20 E system. The other strain is a known strain of *Escherichia coli* ATCC (American Type Culture Collection) 25922, which was used for antigen preparation. The two strains of *Escherichia coli* were sub-cultured in peptone water, incubated at 37˚C for 48 hours. The broth is then washed three times by sterile normal saline. The deposit (about 1mL) was transferred to cryotube. The two suspensions were heated in water path at 100˚C, for 2 hours, this step is called heat inactivation. The heat-inactivated antigens were freezed and thawed five times in liquid nitrogen. Antigen concentration equal to 100 mg/Dl was used. The highest dilution of antigen giving a value of 0.8 after 20 minutes of substrate incubation with the strongly positive serum and under 0.4 with the negative serum was used in all subsequent tests. The antigen was used at a dilution of 1:400. Results are expressed as absorbance at 490 nm [20].

Statistical analysis

Data were analyzed using SPSS version 20. In all procedures, p-value ≥ 0.05 was considered the level of significance.

RESULTS AND DISCUSSION

A total of 180 elderly subjects were recruited in the study with the age ranges of 65–89 years with a mean of 77 (±5.3) SD years. 110 participants were male (61%). The overall frequency of UTI study subjects were 99/180 (55 %), Gram-negative bacteria were more prevalent (67; 67.7 %) than Gram-positive bacteria (32; 32.3%). 59 infected patients were asymptomatic (71%) among them male were more prevalent (30). Regarding polymicrobial status, there was a significant association (p-value 0.01); 39 females (47.5%) were diagnosed with single bacteria; all data are summarized in **Table 1**. There was a significant association between gender and isolated Gram-positive and Gram-negative bacteria, where Gram-negative pathogens were more prevalent (67%) **(Table 2)**. **Figure 1** shows the frequency of all isolated uropathogens, among them *Escherichia coli* were predominant isolates (45.4%), followed by *Enterococcus faecalis* (12.1%), *Staphylococcus saprophyticus* (10.1%), *Klebsiella pneumoniae* (8.08%), *Pseudomonas aeruginosa* (5.05%), and *Candida albicans* (5.05%). *Staphylococcus aureus, Proteus mirabilis, Serratia liquefaciens, Citrobacter freundii, Enterobacter cloacae, Providencia stuartii,* and

Morganilla morganii isolates were less frequent **(Figure 1)**. **Table 3** shows the antimicrobial susceptibility pattern for more prevalent isolated gram-negative bacteria. The susceptibility pattern of Gram-negative bacteria showed that most of the isolates were sensitive to *Amikacin, Gentamicin, Netilmicin,* and *Piperacillin* from (60-100%) as well as high susceptibility to Penicillin subgroups such as Piperacillin, Carbenicillin, and Ampicillin in isolated gram-negative bacteria, although there is high resistance rate (77%) of *E .coli* isolate to Carbenicillin. Regarding Cotrimoxazole, *E. coli* also demonstrated a high level of resistance (57%). Coagulase-negative staphylococci as well as *S. aureus,* the dominant Gram-positive isolates (69.2 percent), were susceptible to almost all antibiotics evaluated. The resistance patterns of the isolates were found to be 100% for Mecillinam and Naldixic acid, and 80% for Nitrofurantoin, 60 % for Ampicillin, and 50 % for Ceftazidime. In addition, *S. aureus* was 80% resistant to Ampicillin **(Figure 2)**. In **Figure 3** regarding the measurement of *Escherichia coli* IgG antibodies in the elderly bacteriuric subjects, using ELISA, among 45 serum samples of *Escherichia coli*-infected participants, only 28 (62,3%) of samples gave ratios above three times the mean negative value and considered as positive.

Table 1. Demographic features of Geriatrics patients

Characteristic	Total number of participants N=180 (%)	Infected patients n= 82 (%)							
		Bacteriuria infected case				Polymicrobial infected case			
		Asymptomatic n=59 (%)	Symptomatic n=23 (%)	Total	p. value	Single n=68 (%)	Mix n= 14 (%)	Total	p. value
Gender									
Male	110 (61%)	30 (36.6%)	12 (14.4%)	42 (51%)	0.45	29 (35.3%)	2(2.4%)	31(37.8%)	0.01
Female	70 (39%)	19 (23%)	21 (26%)	40(49%)		39(47.5%)	12 (14.6%)	51(62.2%)	
Age Groups									
65-69 years old	118 (66%)	30 (36.6%)	19 (23.2%)	49 (59.7%)		30 (36.6%)	8 (9.7%)	38 (46.3%)	
70-79 years old	43(24%)	14 (17%)	2 (2.4%)	16 (19.5%)	0.03	23 (28%)	2 (2.4%)	25 (30%)	0.87
80-89 years old	19 (10%)	15 (18.3%)	2 (2.4%)	17 (20.7%)		15 (18.3%)	4 (4.9%)	19 (23%)	

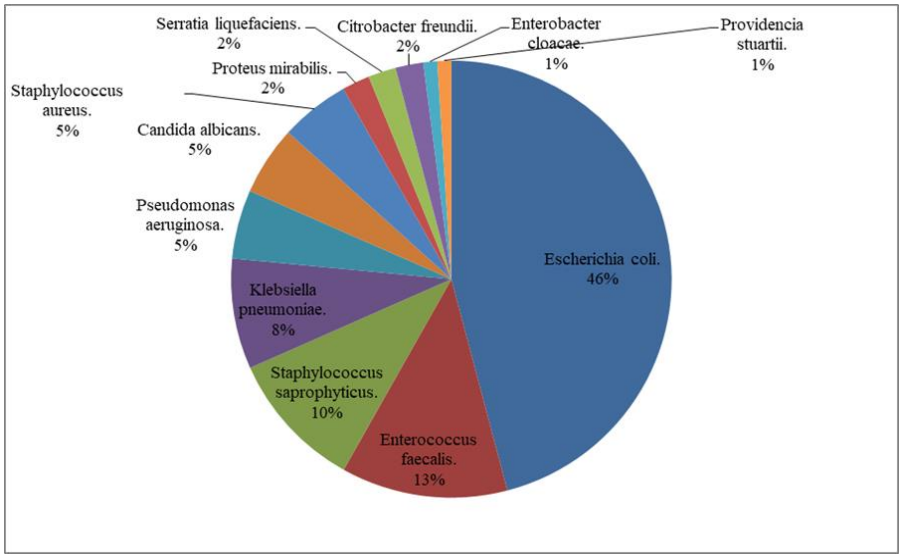

Figure 1. Percentage of isolated uropathogens among Geriatrics patients

Table 2. Frequency of Gram-positive and Gram-negative isolated uropathogens

Characteristics	Isolated Uro-pathogens n=99 (100%)		p. value
	Gram positive bacteria n= 32(%)	Gram negative bacteria n=67 (%)	

Gender			
Male	10 (10.1%)	33 (33.3%)	0.052
Female	22 (22.2%)	34(34.3%)	
Age Groups			
65-69 years old	17 (17%)	29 (29%)	0.543
70-79 years old	10 (10%)	23 (23%)	
80-89 years old	5 (5%)	15 (15%)	
TOTAL	32 (32%)	67 (67%)	

Table 3. Antimicrobial Susceptibility pattern of predominant *isolated bacteria* from the urine of Geriatric patients suffering from UTI.

Antimicrobial tested	**Interpretation**	**Escherichia coli n= (45)**	**Enterococcus faecalis n=(12)**	**Klebsiella pneumoniae n=(8)**	**Pseudomonas aeruginosa n=(5)**	**Proteus mirabilis n=(2)**
Amikacin (AK) 30 µg	S	36 (80%)	1 (8%)	6 (75%)	5 (100%)	2 (100%)
	I	3 (7%)	2 (17%)	00	00	0
	R	6 (13%)	9 (75%)	2 (25%)	00	0
Carbenicillin(PY) 100 µg	S	6(14%)	5(42%)	00	5 (100%)	2 (100%)
	I	4(9%)	2 (16%)	00	00	0
	R	35 (77%)	5 (42%)	8 (100%)	00	0
Ceftazidime(CAZ) 30 µg	S	27 (60%)	3(25%)	4 (50%)	1 (20%)	2 (100%)
	I	2 (4%)	1 (8%)	1 (13%)	00	0
	R	16 (36%)	8 (67%)	3 (37%)	4 (80%)	0
Ceftriaxone(CRO) 30 µg	S	30 (66%)	2(17%)	5 (63%)	2 (40%)	2 (100%)
	I	4 (9%)	3 (25%	2 (25%)	2 (40%)	0
	R	11 (25%)	7 (58%)	1 (12%)	1 (20%)	00
Gentamicin (GM) 10 µg	S	30 (66%)	00	6 (75%)	5 (100%)	2 (100%)
	I	00	1 (8%)	00	00	0
	R	15 (34%)	11 (92%)	2 (25%)	00	0
Netilmicin (NET) 30 µg	S	26 (58%)	00	6 (75%)	5 (100%)	2 (100%)
	I	9 (20%)	3 (25%)	00	00	0
	R	10 (22%)	9 (75%)	2 (25%)	00	0
Piperacillin (PRL) 100 µg	S	11 (25%)	6(50%)	4 (50%)	5 (100%)	2 (100%)
	I	1 (2%)	1 (8%)	1 (12%)	00	0
	R	33 (73%)	5 (42%)	3 (38%)	00	0
Tobramycin (TN) 10 µg	S	22(49%)	00	5 (63%)	5 (100%)	2 (100%)
	I	3 (7%)	1 (8%)	1 (12%)	00	0
	R	20 (44%)	11 (92%)	2 (25%)	00	0
Ampicillin (AP) 25 µg	S	9 (20%)	6 (50%)	0	1 (20%)	2 (100%)
	I	00	1 (8%)	0	00	0
	R	36 (80%)	4 (42%)	8 (100%)	4 (80%)	0
Cephalothin(KF) 30 µg	S	1 (2%)	4 (33%)	6 (75%)	5 (100%)	0
	I	11 (25%)	00	00	00	0
	R	33(73%)	8 (67%)	2 (25%)	00	2 (100%)
Cotrimoxazole (TS) 25 µg	S	16(37%)	6 (50%)	4 (50%)	2 (60%)	0
	I	3 (6%)	1 (8%)	1 (12%)	0	0
	R	26 (57%)	5 (42%)	3 (38%)	2 (40%)	2 (100%)
Mecillinam(MEC) 33 µg	S	20(44%)	2 (17%)	4 (50%)	1 (20%)	00
	I	8 (17%)	1 (8%)	0	0	0
	R	17 (39%)	9 (75%)	4 (50%)	4 (80%)	2 (100%)
Naldixic acid (NA) 30 µg	S	8 (17%)	1 (8%)	4 (50%)	00	2 (100%)
	I	7 (16%)	1 (9%)	1 (12%)	2 (40%)	0
	R	30 (67%)	10 (83%)	3 (38%)	3 (60%)	0
Nitrofurantoin(NI) 300 µg	S	31 (69%)	8 (67%)	4 (50%)	1 (20%)	0

	I	5 (11%)	1 (8%)	1 (12%)	0	0
	R	9 (20%)	3 (25%)	3 (38%)	4 (80%)	2 (100%)
Norfloxacin (NOR) 10 µg	S	19 (43%)	2 (17%)	4 (50%)	1 (20%)	2 (100%)
	I	1 (2%)	4 (33%)	1 (12%)	2 (40%)	0
	R	25 (55%)	6 (50%)	3 (38%)	2 (40%)	0
Cefaclor (CIC) 30 µg	S	13 (31%)	2 (17%)	5 (63%)	3 (60%)	2 (100%)
	I	4 (9%)	1 (8%)	1 (12%)	00	0
	R	28 (60%)	9 (75%)	2 (25%)	2 (40%)	0

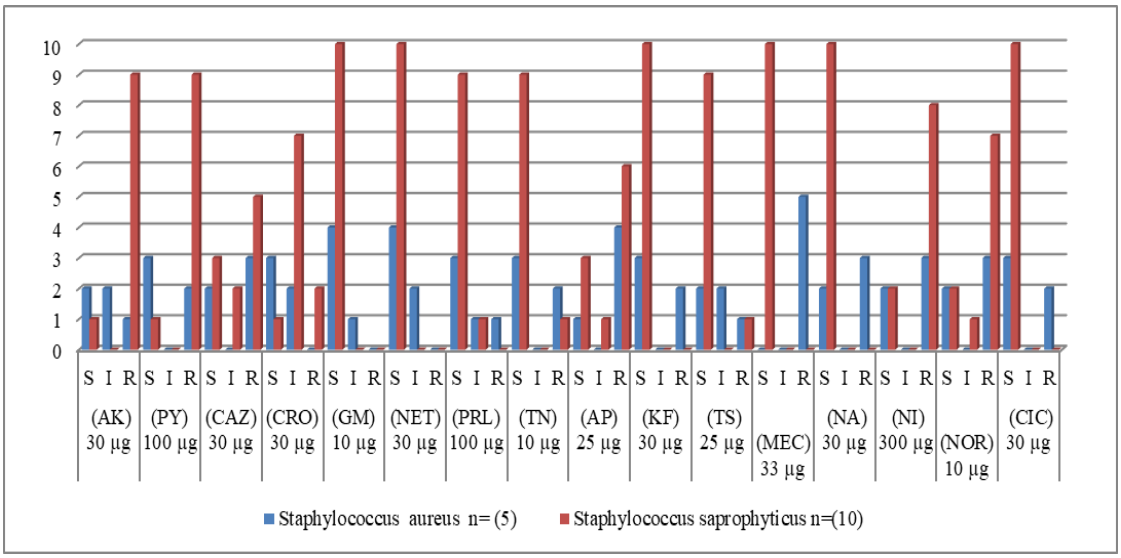

Figure 2. Antimicrobial Susceptibility pattern of gram-positive bacteria isolated from the urine of Geriatric patients suffering from UTI.

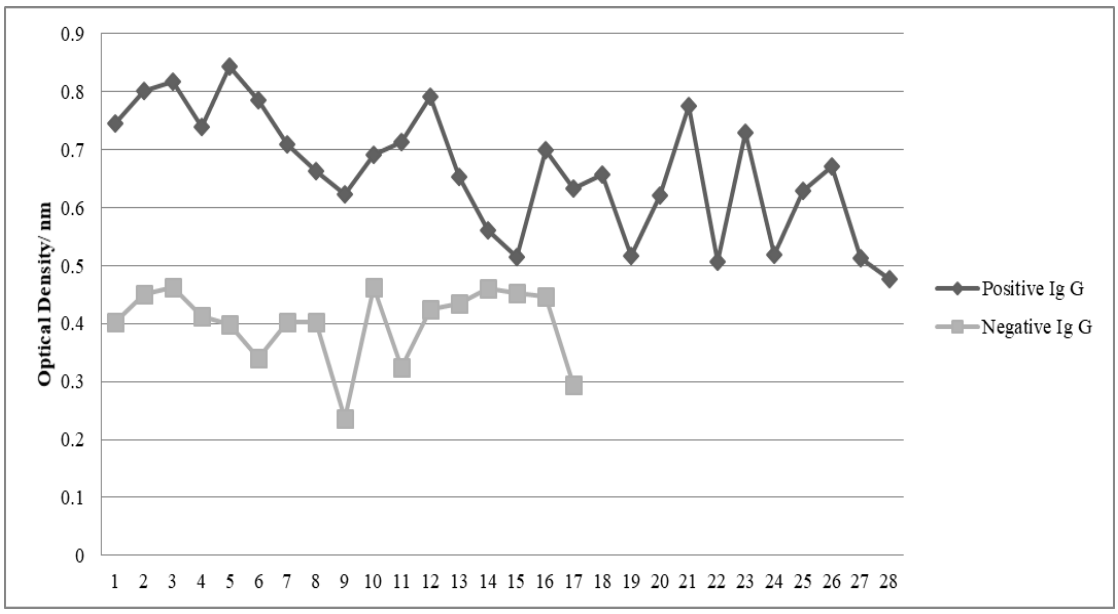

Figure 3. *Escherichia coli* IgG antibodies in the elderly bacteriuric subjects with urinary tract infection, by using an enzyme-linked immunosorbent assay (ELISA).

UTI is the most common infection in the elderly and most frequent bacterial infections of older adults [8]. Out of 180 urine samples collected during this study, 82 (45.5%) patients had urine samples with significant bacteriuria and asymptomatic bacteriuria was more prevalent (71%), specifically in males more than females; our findings confirmed by Nicolle *et al*. [21] who concluded that asymptomatic bacteriuria in older is common.

The majority of participants were male (61%), this is more or less near to Biggel *et al*. [22], although it conflicts with previous studies [23, 24] and a general knowledge state that the prevalence of bacteriuria is approximately 3

times higher in female than male elderly populations. A general conclusion verified that female patients due to their genital anatomy were more predisposed to urinary infection. The possible justification for our findings is that elderly populations are not homogeneous, their degree of health and level of functional ability vary widely, so one extreme is subjects who are well, fit and active with no significant disease or economic or functional limitations to activity. At the other extreme are severely impaired, who require complete assistance. Regarding the polymicrobial status of isolated uropathogens; urine cultures with various species have been detected in our study, and it was significantly more prevalent in females (62.2%). Certainly urine cultures with three or more species are normally considered contaminated in clinical routine, and a new sample is recommended and cases of possible polymicrobial are suggested when composed of *E. Coli* and one or two other species, all above the 105 CFU/ml threshold. Such cases of polymicrobial bacteriuria contain species such as *S. haemolyticus*, *S. epidermidis*, along with *L. delbrueckii*, which are recognized to be part of the normal skin and periurethral flora, they might indicate contamination. Alternatively, as such gram-positive organisms have been reported to cause UTI and polymicrobial infections have been shown to arise in the elderly, these may be actual cases of polymicrobial bacteria, our finding supports the same conclusion reported by Kline *et al*. [25]. These data indicate a great susceptibility to colonization among elderly people, combined with reduced spontaneous resolution correlated with other populations.

With regard to age, a significant relationship (P value=0.03) between bacteriuria and increasing age was reported, which attributed to the multiple factors: (i) deformities in the urinary tract, (ii) urinary and fecal incontinence, (iii) exhausted immune system and then immune dis-regulation, (iv) disability, (v) uncontrolled diabetes, (vi) endocrine changes, and (vii) decrease bactericidal activity of prostatic fluid in men and hormonal changes in females [26]. The related diseases that exist with increased frequency in Geriatrics are definitely critical aspects leading to the bacteriuria burden [27]. These findings justify our result as we found an increased prevalence of bacteriuria, two times in diabetics elderly compared with nondiabetics elderly. The major route of infection for all ages is due to bacterial colonization of the periurethral area, and subsequently the bladder. While gut and possibly vagina in women remain a potential reservoir for uro- pathogens [28]. The overall frequency of UTI infected participants is 55% with a wide variety of Gram-negative species (67.6%) isolated from the elderly population both male and female with UTIs, with a significant association with female gender (p. value 0.052). these are in line with Rowe *et al*. [29], and De Vecchi *et al*. [30].

Escherichia coli is the most predominant (45.4%) bacterial species revealed among geriatric patients under study, followed by E. *faecalis*. This is the same as globally confirmed data [31]. But it is higher than finding detected by Ipe *et al*. [32] who found that *Escherichia coli* is prevalent species (80 and 60%) for community-dwelling and institutionalized older adults, respectively. This discrepancy may be because our study involved participants from community-acquired infections not long-term residents as documented.

Other gram-negative Enterobacteriaceae, non-fermentative bacteria such as *Klebsiella pneumoniae*, *proteus*, *Citrobacter freundii*, *Morganella morganii*, *providencia* species, and *Pseudomonas aeruginosa* are frequently identified; somewhat it is the same as findings obtained by Hu *et al*. [33] who concluded that Enterobacteriaceae were common and accounted for a total of 34.8% of cultures, specifically *Proteus* (14.6%), *Klebsiella* (13.9%), and *Providentia* (3.7%).

Gram-positives such as Coagulase-negative *Staphylococci* are frequently isolated in urine culture as well as *Enterococcus faecalis*; the same result was obtained by Biggel *et al*. [22]. On the other hand, antimicrobial susceptibility against uro-pathogens among the elderly commonly using antibiotics has become increasing leaving physicians with very few drug options for the treatment of urinary tract infection [34, 35]. In the present study, susceptibility pattern of Gram-negative bacteria showed that most of the isolates were sensitive to Amikacin (100%), and Gentamicin; this conflicts with study done by [34] who revealed that the susceptibility pattern for Gram-negative bacteria were amoxicillin-clavulanic acid (70 %), chloramphenicol (83.3 %), gentamicin (93.3 %), and co-trimoxazole (73.3 %).

Escherichia coli strains have become a problem in urology; fortunately, 50-80% of the isolated strain of *E. coli*, as well as other gram-negative pathogens, were susceptible to tested aminoglycosides drugs. The third-generation cephalosporin shows high activity against isolated gram-negative bacteria. But *Escherichia coli* isolates were resistant to Ampicillin, 77% to Carbenicillin, 73% to Piperacillin and Cephalothin, 67% to Nalidixic acid, 60% to Cefaclor, 57% to Cotrimoxazole, 55% to Norfloxacin, and high resistance to β. lactams (80%). On the other hand, there was a high susceptibility of Penicillin subgroups such as Piperacillin, Carbenicillin, and Ampicillin against isolated gram-negative bacteria. Although Carbenicillin is resistant against 77% of *E. coli* and 100% of *K. pneumoniae* strains, this has a conflict with general knowledge state that effectiveness of *Carbenicillin* against

bacteria responsible for causing urinary tract infections including *Pseudomonas aeruginosa, Escherichia coli*, and some *Proteus* species. This is the same result revealed by De Vecchi *et al*. [30] and Kahlmeter *et al.* [36]. Resistance against sulfamethoxazole/trimethoprim, and nitrofurantoin was acceptable in the case of the most frequent bacteria (except for E. coli) despite the fact that these antibiotics were used more frequently in the last few years to reduce the usage of fluoroquinolones and Cephalosporin, at least in the less severe, uncomplicated cases. Therefore, they may still be effectively used to replace fluoroquinolones in non-empirical therapy of uncomplicated lower UTIs. Significant increase in the resistant percentage of E. coli against Mecillinam, Naldixic acid and Norfloxacin was observed, and astonishing fact that *Proteus mirabilis* was 100% susceptible to ceftriaxone and ceftazidime, which can be explained by the low number of *Proteus mirabilis*- positive cultures, our finding is in agreement with Magyar *et al*. [37]. Organisms of increased antimicrobial resistance are more common in the hospitalized population. This is due to several contributing factors including the high intensity of antimicrobial use, large reservoirs of bacteria, and facilitation of transmission by close staff and resident contact within the hospitals. Gram-positive, *Staphylococcus aureus* (5 isolates) were susceptible to Gentamicin and Netilmicin, 60% to Carbenicillin, Ceftriaxone, Piperacillin, Cephalothin, and Cefaclor. But were resistant to Mecillinam, 80% to Ampicillin, 60% to Ceftazidime, Tobramycin, Naldixic acid, Nitrofurantoin, and Norfloxacin. *Enterococcus faecalis* showed high resistance to aminoglycoside (75-92%). This finding disagrees with [12, 34] who reported high sensitivity 100% to amoxicillin-clavulanic acid and 85 % to gentamicin. This alarming fact implies that multidrug resistance was observed to be very high to the commonly used antibiotics, which indicates antibiotic resistance has been identified as the result of antibiotic use and abuse [38], which suggests that first-line empiric treatments, routinely used for the treatment of UTIs in elderly. Among 45 serum samples of *Escherichia coli* infected participants, only 28 (62,3%) of samples gave ratios above three times the mean negative value and considered as positive. The crude antigen used, show cross-reaction (false negative and false positive) with other sera of the bacteriuric subject (infection caused by other gram-negative bacilli and gram-positive cocci that cause UTI). These original findings demonstrate that *Esherichia coli* antigen may be a broad-cross-reactivity antigen appropriate to be used as an objective test to detect Enterobacteriaceae urinary infection following purification of *Escherichia coli* MOMP (major outer membrane protein). The same outcome was reported by Nicolle LE [39].

CONCLUSION

High frequency of significant community-acquired bacteriuria particularly Gram-negative isolates were revealed in the geriatric population. Bacterial antibiotic resistance was very common in elderly patients where some antibiotics that have been commonly used to date in the treatment of UTIs proved to be of little value in the empirical treatment of these infections. From this perspective, the increased resistance to antibiotics indicated that the empirical antibiotic protocols may require to be optimized according to regional evidence, and thus it illustrates the value of urine culture and, where possible, specific therapy.

ACKNOWLEDGMENTS : This publication was supported by the Deanship of scientific research at Prince Sattam bin Abdulaziz University.

CONFLICT OF INTEREST : None

FINANCIAL SUPPORT : None

ETHICS STATEMENT : None

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