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Research Article

Urinary Tract Infection and Antibiotic-Resistant Patterns of Isolated Bacteria in Geriatric Patients.

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Abstract:

Age-related risk factors influence the prevalence of urinary tract infections (UTIs) in older people. Therefore, early detection is important to prevent adverse consequences. A retrospective study was conducted on 206 geriatric patients (65 years old and above) who were seen in various clinics at University College Hospital, Ibadan. There were 138 men (67%) and 68 women (33%) in total. A significant growth of $>10^5$ cfu/ml of bacteria was found in a total of 44 (21.4%) samples. Escherichia coli was the most common pathogen isolated (40.9%), and it was followed in order by Klebsiella pneumonia (29.5%), Pseudomonas aeruginosa (13.6%), Klebsiella oxytoca (9.1%), and Proteus mirabilis (6.8%). The distribution of UTI by gender was statistically significant (P = 0.009), with men (33%) having a higher prevalence than women (11%). Most of the isolated bacteria were resistant to the first line of antibiotics, with Escherichia coli showing the highest level of resistance to the commonly prescribed antibiotics. There is a need to step up the campaign against the indiscriminate use of antibiotics to prevent a rise in antibiotic resistance.

Key words: Urinary tract infection (UTIs), antibiotic-resistant, geriatric patients, Escherichia coli.

1.0 Introduction

Urinary tract infection (UTI) is a major cause of community antibiotic prescriptions, particularly in low-income nations, and accounts for a large amount of morbidity and mortality worldwide. The empirical selection of antibiotics for the treatment of UTI frequently contradicts the antibiotic susceptibility of the isolated pathogens (Islam *et al*., 2022). According to Nicolle *et al*. (2005), this infection is a common cause of illness in older people and frequently necessitates needless antibiotic therapy. In particular, when patients arrive with no symptoms, healthcare professionals usually find it difficult to differentiate between a UTI and asymptomatic bacteriuria (Nicolas et al., 2017). According to studies (Robichaud *et al*., 2008; Foxman *et al*., 2002), UTIs are the second most prevalent infection in elderly people living in the community and the most common source of infection in elderly people residing in long-term care facilities.

According to Ruben *et al*. (1995), urinary tract infections (UTIs) cause 100,000 hospital admissions, 1 million emergency room visits, and 7 million office visits annually, accounting for 25% of all infections in geriatric patients. Literature has shown that malnutrition, poor hygiene, and low-income levels are associated with urinary tract infections, and these factors are common in rural settings (Ahmed *et al*., 2008). Urinary pathogens, especially from community patients, have been known to include strains that are resistant to many of the commonly used antibiotics (Orrett *et al*., 2001). Therefore, there is a need for periodic monitoring of the etiologic agents of urinary tract infections and their susceptibility patterns.

1.1Justification of the study

It is a known fact that urinary tract infections are common among geriatric patients. The need to screen this age category will assist in the management of their health. This would also aid in the early detection and treatment of UTIs. Since this age group is less likely to show localized genitourinary symptoms, especially if they stay in long-term care facilities, this could also reduce the epidemic of resistant strains.

2.0 Materials and methods

This study focused on geriatric patients diagnosed with possible urinary tract infections attending different clinics at the University College Hospital, Ibadan. Ibadan is the capital city of Oyo State, a south-western part of Nigeria. It has an average population of over 4 million and is the third-largest state in the country after Lagos and Kano. This city has a good representation susceptibility pattern of all the tribes, religions, and ethnicities of Nigeria.

2.1 Study site: Data was retrieved from records of geriatric patients being screened for UTI in the Laboratory Department of Medical Microbiology and Parasitology.

2.2 Study population: The study was conducted on elderly patients (geriatrics) age 65 or older (OECD, 2023).

2.2 Study Design: This is a retrospective study of geriatric patients being diagnosed with urinary tract infections at the University College Hospital, Ibadan.

2.3 Sample processing: Urine samples (midstream urine) were collected in a sterile universal bottle and kept at 4°C until processing. It was first cultured on both blood agar and cystine lactose electrolyte deficiency (CLED) agar and then spun at 3000 rpm for 5 minutes using a centrifuge. It was decanted, and the sediments were resuspended by vortex and mounted on a clean glass slide for microscopy.

2.3 Statistical analysis: Data were collected and analyzed using WHONET 2022 software.

3.0 Results

A total of 206 geriatric patients were screened over a period of six months, from October 2022 to March 2023. The number of males was 138 (67%), while the number of females was 68 (33%). The age range of the study population is from 65 to 101 years, and they were seen by physicians at different clinics in the hospital for treatment of urinary tract infections.

Table 1 shows the distribution of urine culture results from the geriatric patients. It shows growth patterns across genders. We observed more significant growth in the male gender when compared to the female (P= 0.115128).

Table 2 shows the distribution of isolates across genders. Escherichia coli is more predominant, followed by Klebsiella pneumonia, Pseudomonas aeruginosa, Klebsiella oxytoca, and Proteus mirabilis respectively (P= 0.009006).

Figure 1 shows susceptibility patterns of each isolate to the antibiotics tested. Escherichia coli, Klebsiella oxytoca and Pseudomonas aeruginsa show 100% sensitivity to Colistin. Escherichia coli was sensitive to Amikacin (76.9%), Nitrofurantion (66.7%) and Gentamycin (57.1%) while Klebsiella oxytoca was sensitive to Meropenem (85.7%) and Piperacillin/Tazobactam (66.7%). Klebsiella pneumniae was sensitive to Meropenem (85.7%), Amikacin (54.5%) and Ceftazidime (56.0%) while Pseudomonas aeruginosa was sensitive to Piperacillin/Tazobactam (50.0%),

Figure 2 shows the resistance patterns of the isolates to different antibiotics. We observed that Escherichia coli is resistant to Ciprofloxacin (86.7%), Ceftriazone (62.5%), Augmentin (60.0%), Piperacillin/Tazobactam (60.0%) and Ceftazidime (56.0%) antibiotics, followed by Klebsiella pneumoniae, Klebsiella oxytoca, Pseudomonas aeruginosa, and Proteus mirabilis, respectively. There is more resistance to first-line antibiotics and also observable resistance to some of the second-line antibiotics.

Table 1 shows the distribution of urine culture results from the geriatric patients.

Gender	Male	Female	Total
No Growth	69	30	99
Not Significant ($<10^5$cfu/ml)	36	27	63
Significant ($>10^5$cfu/ml)	33	11	44
Total	138	68	206

P= 0.115128

Table 2: shows the distribution of isolates across genders.

Gender	Male	Female	Total
Bacteria			
E. coli	11	7	18
K. pneumonia	10	3	13
K. oxytoca	3	1	4
Proteus mirabilis.	3	0	3
Pseudomonas aeruginosa	6	0	6
Total	33	11	44

P= 0.009006

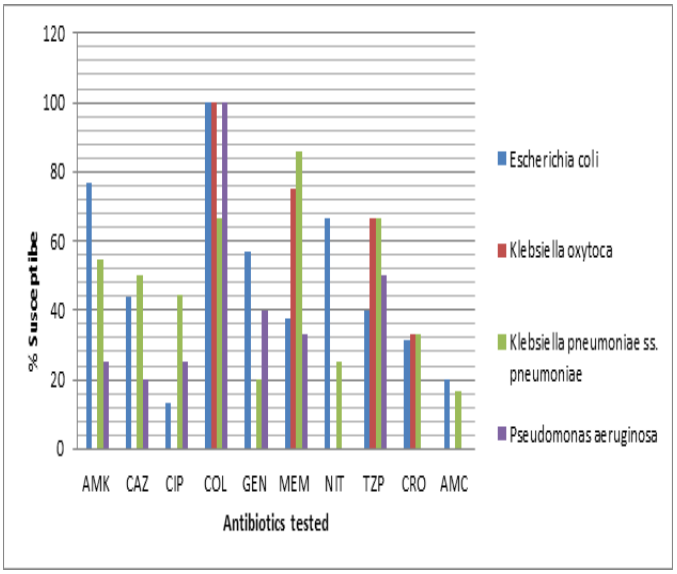

Figure 1: Showing susceptibility patterns of each isolates to the antibiotics tested.

AMK=Amikacin; CAZ=Ceftazidime; CIP=ciprofloxacin; COL=colistin; GEN=gentamycin; MEM=meropenem; NIT=nitrofurantoin; TZP=piperracillin tazobactam; CRO=ceftriazone; AMC=augmentin

Figure 2 shows the percentage susceptible of each isolates to the commonly prescribed antibiotics tested. Escherichia coli shows susceptibility to colistin (100%), Amikacin (76.9%), Nitrfurantoin (66.7%) and Gentamicin (57.1%). Klebsiella pneumonia was susceptibe to meropenem (85.7%), Piperacillin/Tazobactam (66.7%), Colistin (66.7%), Amikacin (54.5%) and Ceftazidime (50.0%). Pseudomonas aeruginosa was sensitive to colistin (100%) and Piperacillin/Tazobactam

(50.0%). Klebsiella oxytoca was sensitive to colistin (100%), meropenem (75.0%) and Piperacillin/Tazobactam (66.7%) respectively.

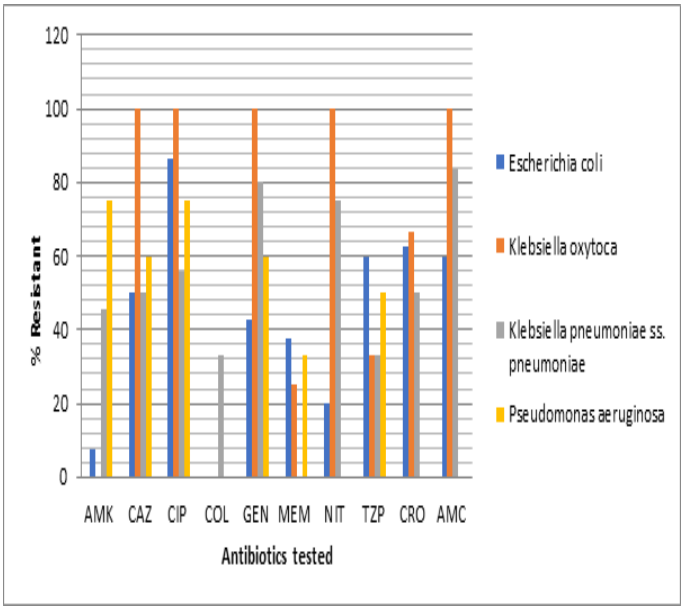

Figure 2: Showing resistance patterns of each isolates to the antibiotics tested.

AMK=Amikacin; CAZ=Ceftazidime; CIP=ciprofloxacin; COL=colistin; GEN=gentamycin; MEM=meropenem; NIT=nitrofurantoin; TZP=piperracillin tazobactam; CRO=ceftriazone; AMC=augmentin

Figure 2 shows the resistance patterns of the isolates to different commonly prescribed antibiotics. We observed that Escherichia coli was resistant to ciprofloxacin (86.7%), Piperacillin/Tazobactam (60.0%), Ceftriazone (50.0%) and augmentin (60%). Klebsiella pneumonia was resistant to augmentin (83.3%), Gentamicin (80.0%), Nitrofurantion (75.0%), Ciprofloxacin (55.6%) and Ceftriazone (50.0%). Pseudomonas aeruginosa was resistant to ciprofloxacin (75%), amikacin (75%), gentamycin (60.0%) and Piperacillin/Tazobactam (50.0%). klebsiella oxytcoa was resistant to ceftazidime (100%), ciprofloxacin (100%), Gentamicin (100%), Nitrofurantion (100%), augmentin (100%) and Ceftriazone (66.7%) respectively.

4.0 Discussion

Urinary tract infections, which are considered to be the second most prevalent infection in both community settings and long-term care institutions, are more likely to affect elderly people (Foxman *et al*., 2002; Aiyegoro *et al*., 2007). The ages of the study's participants ranged from 65 to 101. In this age range, we found a prevalence of UTI of 21.4%. R. Omoregie *et al*. (2010) found a prevalence of 11.03% for UTI in the elderly population, while Saka *et al*. (2018) found a prevalence of 41.0% for the elderly population. According to Curns *et al*. (2005), respiratory infections rank second only to UTIs in elderly populations older than 65.

Males were found to have a higher prevalence of UTI (33, or 75%) than females (11, or 25%). This is similar to what Omoregie *et al*. (2010) reported on the prevalence of UTI among males (82, or 77.4%), and females (24, or 22.6%). However, it is generally accepted that UTI is more prevalent in adult women than males, partly because of their shorter urethra, which reduces the distance that pathogens must traverse before reaching the rest of the urinary tract components (Antonio Guglietta, 2017). This appears to be different in older individuals, where UTI is more common in the male gender, as was observed in this study.

There are possibilities that other factors, such as enlarged prostates, which are frequent in males, could make them more susceptible to UTIs than women are as they age. According to Nicolle (2002) and Shortliffe (2002), the main risk factors for UTI in elderly men were chronic urine retention linked to prostatic enlargement, bacterial prostatitis, and incontinence. A 50:1 female-to-male ratio is prevalent in younger populations, but the ratio is roughly 2:1 in patients over the age of 70 (Andrea and Michael, 2007).

Escherichia coli (40.9%) was the most prevalent bacteria observed in this study, and this is in agreement with 39.02% recorded in a study conducted among the elderly in Benin City by Omoregie R. *et al*. (2010). This was also comparable to a study conducted by Kakde *et al*. (2018), who recorded a 47.36% prevalence of Escherichia coli in their study among hospitalized geriatric patients. The prevalence obtained in this study was higher than the 24.6% reported by Dibua *et al*. (2014). This may be because our study was conducted among elderly patients while his study was focused on the general population. The prevalence obtained in this study was lower compared to the Ronald and Allan (2003) study, which recorded an 80% prevalence of Escherichia coli. Rajagopalan *et al*. (2000) observed that Escherichia coli was the most common, causing 70% of infections in uncatheterized patients. Also in patients with catheters or living in institutions; however, it is found in only 40 percent of cases.

This study shows a high level of resistance in isolates to first-line antibiotics. This is worrisome in that it means more patients would be prescribed second-line antibiotics, of which we observed some level of resistance. We observed antibiotic resistance in Levofloxacin (87.5%), Ceftriazone (55.9%), Nitrofurantion (55.9%), and Cefuroxime (90%), among others, which are first-line drugs usually given in UTI treatment.

The distribution of UTI by gender was statistically significant (P = 0.009006), with men (33%) having a higher prevalence than women (11%). This shows that elderly men are more predisposed to UTIs than their female counterparts. This is in agreement with a study conducted by R. Omoregie *et al*. (2010), who observed prevalences of 77.36% and 22.64% among male and female genders, respectively. In a study carried out by Saka *et al*. (2017) among elderly patients attending the general and medical outpatient clinics of Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria, they observed a UTI prevalence of 70.7% among males and 29.3% among females. The higher prevalence obtained in the above studies could be a result of the inclusion of the elderly age of 60 and above, while in our studies the age was defined as 65 and above.

5.0 Conclusion

This study shows a UTI prevalence of 21.4% among elderly patients, with males having a higher prevalence compared to their female counterparts. Escherichia coli was the dominant isolate responsible for UTIs among these age categories. Most of the isolated bacteria were resistant to the first line of antibiotics, with Escherichia coli showing the highest level of resistance to the chosen antibiotics. There is a need to step up the campaign against the indiscriminate use of antibiotics to prevent a rise in antibiotic resistance.

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