PREVALENCE OF URINARY TRA CT INFECTION AMONG HYPERTENSIVE PATIENTS ATTENDING ENUGU STATE UNIVERSITY TEACHING HOSPITAL

NWOBODO H.A, OFILI VERA .C

Department of medical laboratory science

Medical microbiology

Enugu state university of science and technology

Correspondence: Ofili Vera .c

ABSTRACT

Hypertension is a significant risk factor for urinary tract infections (UTIs), due to potential kidney damage and decreased immune function. The aim of this study is to determine the prevalence of urinary tract infections (UTIs) among hypertensive patients attending outpatient clinics at ESUTH. This is a cross sectional study involving qualitative and quantitative data collection carried out within July to November, 2024 among 100 hypertensive patients (male and female) aged 30-80 years. Socio-demographic and clinical data which includes age, sex, duration of hypertension and other relevant medical history were collected using a questionnaire. Mid-stream urine samples were collected using sterile universal bottle of 10ml. The sample were handled and processed in accordance with standard laboratory procedures to avoid contamination. The urine samples were cultured on MacConkey's agar and blood agar respectively. Significant bacteriuria was determined by the standard wire loop method of 2mm. Cultures plates were incubated at 37 degrees for 18-24 hours. All cultures showing significant growth were characterized and antibiotic susceptibility was then performed to determine their susceptibility patterns. Data analysis was done using chi square. The overall prevalence of UTIs among hypertensive patients was 79 % (79/100) comprising of female (53%) and male (26%). Escherichia coli was the most prevalent pathogen accounting for 42cases (53%), followed by Staphylococcus spp. with 22 cases (27.8%) and Klebsiella spp. with 15 cases (19.0%). Escherichia coli showed sensitivity to Ciprofloxacin (47.6%), Gentamicin (40.5%) and sulfamethazole (31.0%) with resistance rates of Amoxicilin (95.2%), Chloramphenicol (85.7%) and Cetriazole (76.2%) respectively. Klebsiella exhibited sensitivity to Ciprofloxacin (60%), Gentamicin (46.7%), and Ceftriaxone (53.3%) respectively with resistance rate of Clarithromycin (100%) and Ofloxacin (93.3%). Staphylococcus spp. Showed

sensitivity to Ceftriaxone (78.3%), Erythromycin, levofloxacin and Ciprofloxacin ranging from 43.5% to 47.8% with resistance rate of Cloxacillin (73.9%), Clindamycin (78.3%) and Cephalexin (65.2%).The findings of this study showed both resistance and susceptibility, resistance to commonly used antibiotics is consistent with previous studies. These findings underscore the impact of antibiotic misuse which contributes to resistance and emphasize the necessity of susceptibility testing to guide antibiotic therapy. It is recommended that health facilities should implement routine antimicrobial susceptibility testing to guide the selection of effective antibiotics for treating UTIs in hypertensive patients.
Keywords: Urinary tract infections, Hypertension, Antimicrobial susceptibility, Antimicrobials resistance, prevalence

INTRODUCTION

Urinary tract infections (UTIs) are infections of the urethra, bladder, ureters, or the kidneys which comprises the urinary tract. Clinically, UTIs can be categorized as either complicated or uncomplicated depending on underlying host factors. In complicated UTIs, the underlying host factors such as age, catheterization, and diabetes mellitus predispose a patient to complicated UTIs, also less virulent uropathogens (that rarely cause disease in a normal urinary tract) can cause significant damage to an abnormal urinary tract. However, uncomplicated UTI refers to the occurrence of bacterial infection in patients with normal structural and functional urinary tract (Nicolle, 2005; Prakash and Saxena, 2013; Sheyin et al., 2016).

Urinary tract infection is the commonest of all bacterial infections affecting humans throughout their life span. Twenty to thirty five percent of all females experience at least one episodes of UTI sometimes in their lives. It affects all ages but have a particular impact on females of all ages, males at the two extreme of life, renal transplant patients and anyone with functional or structural abnormalities of the urinary excretory system. It produces a range of clinical effects ranging from pyelonephritis to asymptomatic bacteriuria and even the so called symptomatic abacteriuria. In Nigeria, UTIs are a common health concern among

hypertensive patients, presenting a complex interplay between cardiovascular health and urinary system function. A study by (Oladeinde et al. 2011) found that the prevalence of UTIs among patients attending a tertiary health institution in Edo State, Nigeria, was 39.69%. UTIs are more common in hypertensive patients, possibly due to shared risk factors like diabetes and kidney problems. A study by Chukwuonye et al. (2015) found that 34% of hypertensive patients had a history of UTIs, compared to 22% of non-hypertensive individuals. Females have a higher risk for UTIs than most males, probably because of their anatomy; other risk factors for UTIs include any condition that may impede urine flow (e.g., enlarged prostate, congenital urinary tract abnormalities and inflammation). Patients with catheters or those who undergo urinary surgery and men with enlarged prostates are at higher risk for UTIs Symptoms and signs of UTI vary somewhat depending on sex, age and the area of the urinary tract that is infected; some unique symptoms develop depending on the infecting agent.

The common etiologic agents of UTI include enterobacteriacae like *E.coli* and *klebsiella species,* as well as gram positive organisms like staphylococci and *enterococci* and *Candida albicans* in patients with underlying physiological debilitations. Studies carried out in Enugu, Yola, Zaria and Ife show that these are the same etiological agents isolated in the Nigeria.

1. MATERIALS AND METHODS

This is a cross sectional study involving qualitative and quantitative data collection carried out within July to November among 100 hypertensive patients (male and female) aged 30-80 years. Ethical clearance and informed consent were obtained. Socio-demographic and clinical data which includes age, sex, duration of hypertension and other relevant medical history were collected using a questionnaire. Clean catch Mid-stream urine samples were collected using sterile universal bottle of 10ml. The sample were handled and processed in accordance with standard laboratory procedures to avoid contamination. The urine samples were cultured on MacConkey's agar and blood agar respectively. Significant bacteriuria was determined by the standard wire loop method of 2mm. Cultures plates were incubated at 37 degrees for 18-24 hours. All cultures showing significant growth were characterized and antibiotic susceptibility

was then performed to determine their susceptibility patterns. Data analysis was done using chi square.

2. RESULT

Table 3.1 shows the prevalence of urinary tract infection (UTI) in the study population. Out of 100 hypertensive patients examined, 79 (79.0%) were found to have UTIs, indicating a high prevalence of the infection within this group.

Table 3.1: Prevalence of Urinary tract infection in the study population.

Variables	**Prevalence**	
	N	**%**
Hypertensive patients examined	100	100.0
Presence of Urinary tract infections	79	79.0

Table 3.2 shows the distribution of pathogens responsible for urinary tract infections (UTIs) among hypertensive patients. Escherichia coli was the most prevalent pathogen, accounting for 42 cases (53.2%), followed by Staphylococcus spp. with 22 cases (27.8%) and Klebsiella spp. with 15 cases (19.0%). This indicates that E. coli is the primary pathogen responsible for UTIs among hypertensive patients.

Table 3.2: Distributions pathogens responsible for UTIs in hypertensive patients.

Pathogens	**Frequency**	**Percentage (%)**
Escherichia coli	42	53.2
Klebsiella spp	15	19.0
Staphylococcus spp	22	27.8

Figure 3.1: Gender distribution of pathogens responsible for UTIs in hypertensive patients.

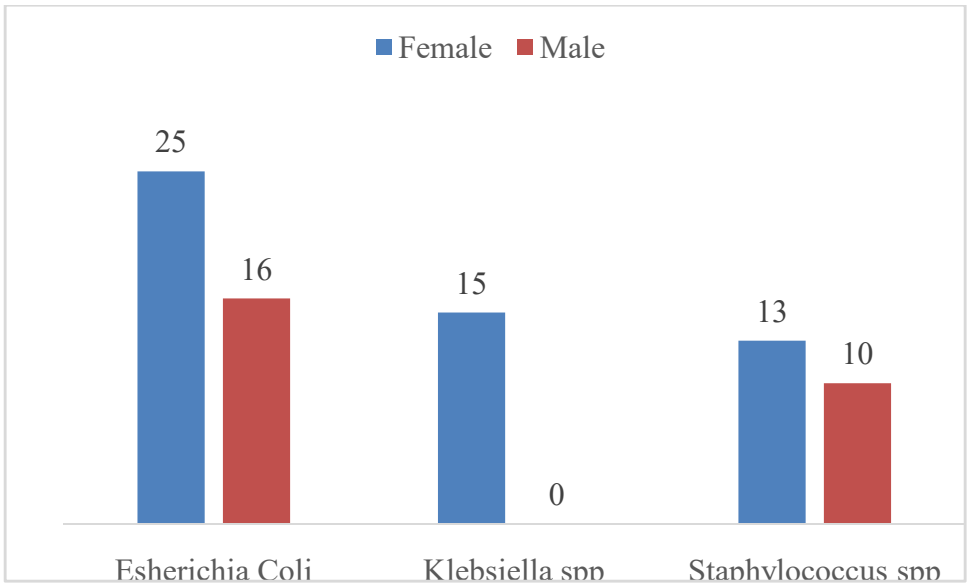

Table 3.3: Antimicrobial susceptibility pattern of *Escherichia coli* in hypertensive patients.

Antibiotics	Sensitive	Resistant
Nitrofurantoin	3(7.1)	39(92.9)
Gentamicin	17(40.5)	25(59.5)
Ciprofloxacin	20(47.6)	22(52.4)
Chloramphenicol	6(14.3)	36(85.7)
Ofloxacin	5(11.9)	37(88.1)
Clarithromycin	0(0)	42(100)
Pefloxacin	1(2.4)	41(97.6)
Ceftriaxone	10(23.8)	32(76.2)
Amoxicillin	2(4.8)	40(95.2)
Streptomycin	1(2.4)	41(97.6)
Sulfamethazole	13(31.0)	29(69.0)

The antimicrobial susceptibility pattern of *Escherichia coli* isolates from hypertensive patients reveals varying levels of resistance and susceptibility to commonly used antibiotics. High resistance rates were observed for Clarithromycin (100%), Pefloxacin (97.6%), Amoxicillin (95.2%), Nitrofurantoin (92.9%), and Ofloxacin (88.1%), indicating limited effectiveness of these antibiotics in treating *E. coli* infections among hypertensive patients. Chloramphenicol and Ceftriaxone also exhibited significant resistance rates of 85.7% and 76.2%, respectively.

In contrast, Ciprofloxacin and Gentamicin demonstrated relatively higher effectiveness, with susceptibility rates of 47.6% and 40.5%, respectively. Sulfamethazole also showed moderate susceptibility at 31.0%.

Table 3.4: Antimicrobial susceptibility pattern of *Klebsiella species* in hypertensive patients.

Antibiotics	**Sensitive**	**Resistant**
Nitrofurantoin	0(0)	15(100)
Gentamicin	7(46.7)	8(53.3)
Ciprofloxacin	9(60.0)	6(40.0)
Chloramphenicol	0(0)	15(100)
Ofloxacin	1(6.7)	14(93.3)
Clarithromycin	0(0)	15(100)
Pefloxacin	0(0)	15(100)
Ceftriaxone	8(53.3)	7(46.7)
Amoxicillin	0(0)	15(100)
Streptomycin	0(0)	15(100)

The antimicrobial susceptibility pattern of *Klebsiella* species isolated from hypertensive patients shows high resistance rates to several commonly used antibiotics. Complete resistance (100%) was observed for Nitrofurantoin, Chloramphenicol, Clarithromycin, Pefloxacin, Amoxicillin, and Streptomycin, indicating that these antibiotics are ineffective against *Klebsiella* in this group. Ofloxacin also demonstrated a high resistance rate of 93.3%.

However, moderate effectiveness was observed with Ciprofloxacin, which showed a susceptibility rate of 60.0%, and

Gentamicin and Ceftriaxone, with susceptibility rates of 46.7% and 53.3%, respectively.

Table 3.5: Antimicrobial susceptibility pattern of *Staphylococcus specie* in hypertensive patients.

Antibiotics	Sensitive	Resistant
Erythromycin	11(47.8)	12(52.2)
Ceftriaxone	18(78.3)	5(21.7)
Ampicillin	3(13.0)	20(87.0)
Cloxacillin	6(26.1)	17(73.9)
Levofloxacin	10(43.5)	13(56.5)
Cephalexin	8(34.8)	15(65.2)
Ciprofloxacin	11(47.8)	12(52.2)
Gentamicin	10(43.5)	13(56.5)
Ofloxacin	11(47.8)	12(52.2)
Clindamycin	5(21.7)	18(78.3)

The antimicrobial susceptibility pattern of Staphylococcus species isolated from hypertensive patients highlights varying levels of resistance and susceptibility to different antibiotics. High resistance rates were observed for Ampicillin (87.0%), Cloxacillin (73.9%), Clindamycin (78.3%), and Cephalexin (65.2%), indicating limited effectiveness of these antibiotics against Staphylococcus infections among hypertensive patients.

In contrast, Ceftriaxone demonstrated the highest effectiveness, with a susceptibility rate of 78.3%. Moderate susceptibility rates were noted for Erythromycin, Ciprofloxacin, Ofloxacin, Gentamicin, and Levofloxacin, each with susceptibility rates ranging from 43.5% to 47.8%.

4. DISCUSSION

Urinary tract infections (UTIs) are a significant health concern among hypertensive patients in Nigeria, reflecting a complex relationship between cardiovascular health and urinary system function (Oladeinde*et al*., 2011). This study recorded a UTI prevalence of 79% among hypertensive patients, which is notably

higher than the 39.69% reported by Oladeinde*et al*. (2011) in a study conducted at a tertiary health institution in Edo State, Nigeria. Similarly, a study by Chukwuonye et al. (2015) found that 34% of hypertensive patients had a history of UTIs, compared to 22% among non-hypertensive individuals. The observed discrepancies in prevalence rates may be attributed to differences in study populations, geographic locations, and sample sizes.

The results of this study revealed that *Escherichia coli* (52.3%) was the most common pathogen responsible for UTIs in hypertensive patients, followed by *Staphylococcus spp.* (27.8%) and *Klebsiella spp.* (19.0%). These findings are partly similar to those of Oluremi et al. (2011), who reported *Escherichia coli* (46.7%), *Klebsiella spp*. (13.3%), and *Staphylococcus aureus* (13.3%) as the predominant pathogens. This similarity may be attributed to the ubiquitous role of *Escherichia coli* as a primary uropathogens, likely due to its unique virulence factors, including fimbriae that aid in adhesion to the urinary epithelium, as well as its ability to form biofilm and evade the host immune response (Oladeinde*et al*., 2011; Foxman, 2010). Additionally, hypertensive patients may exhibit altered immune responses due to their comorbid conditions and frequent use of medications, potentially increasing their susceptibility to infections by opportunistic pathogens such as *Klebsiella* and *Staphylococcus* species (Chukwuonye*et al*., 2015).

The findings of this study, showed both resistance and susceptibility in Escherichia coli, Klebsiella spp., and Staphylococcus spp. isolated from hypertensive patients with urinary tract infections (UTIs). The high resistance of E. coli to Amoxicillin, Nitrofurantoin, and Ofloxacin, along with Klebsiella spp. and Staphylococcus spp. resistance to commonly used antibiotics, is consistent with previous studies. For instance, a study by Adeyemi *et al*. (2020) found that E. coli exhibited significant resistance to Amoxicillin (60.5%) and Ofloxacin (55%) in UTI cases. This high level of resistance can be attributed to the overuse and misuse of these antibiotics, particularly in both hospital and community settings. The misuse, often without proper susceptibility testing, accelerates the development of resistance.

Despite the high resistance observed, Escherichia coli, Klebsiella spp, and Staphylococcus spp. isolates demonstrated good susceptibility to Ciprofloxacin and

Gentamicin, which is consistent with findings by Adeoye *et al*. (2019) and Zhang *et al*. (2021). These antibiotics showed a high degree of effectiveness against the isolates, with Ciprofloxacin showing 72.5% susceptibility in E. coli, and Gentamicin demonstrating 68.9% susceptibility in Klebsiella spp. The continued effectiveness of these antibiotics can be attributed to their broad-spectrum bactericidal properties. Ciprofloxacin targets bacterial DNA synthesis, while Gentamicin inhibits protein synthesis, both of which are essential processes for bacterial survival. These mechanisms of action make Ciprofloxacin and Gentamicin effective even against some multidrug-resistant strains, maintaining their status as first-line treatments for UTIs in many regions (Oladeinde*et al*., 2011).

4.1 CONCLUSION

This study has revealed that UTIs are a significant concern among hypertensive patients, with a recorded prevalence of 79%, significantly higher than other reported rates in different regions. This discrepancy may be due to differences in geographic locations, patient demographics, or sample sizes of the studies. The predominance of *Escherichia coli* (52.3%) as the causative pathogen aligns with its established role as a primary uropathogens due to its virulence factors, including fimbriae for epithelial adhesion and biofilm formation.

Additionally, the study demonstrated that while *E. coli* showed high resistance to Amoxicillin, Nitrofurantoin, and Ofloxacin, it retained notable susceptibility to Ciprofloxacin (72.5%). Similarly, *Klebsiella spp.* and *Staphylococcus spp.* displayed significant resistance to several antibiotics but showed susceptibility to Gentamicin (68.9% in *Klebsiella spp.*). The observed susceptibility patterns likely reflect the specific mechanisms of action of these drugs, such as Ciprofloxacin's inhibition of bacterial DNA synthesis and Gentamicin's inhibition of protein synthesis, which remain effective against some resistant strains.

These findings underscore the impact of antibiotic misuse, which contributes to resistance, and emphasize the necessity of susceptibility testing to guide antibiotic therapy. Further research is warranted to explore regional differences in resistance patterns and optimize treatment protocols for hypertensive patients with UTIs.

4.2 RECOMMENDATION

Based on the findings of this study, the following recommendations are proposed:

1. Health facilities should implement routine antimicrobial susceptibility testing to guide the selection of effective antibiotics for treating UTIs in hypertensive patients. This will help reduce the misuse of antibiotics and mitigate the development of resistance.
2. Public health initiatives should focus on creating awareness about the dangers of self-medication and improper antibiotic use, particularly for managing UTIs. Such campaigns can educate individuals on the importance of seeking medical advice and adhering to prescribed treatments.
3. Policymakers and healthcare institutions should strengthen antibiotic stewardship programs, emphasizing the regulation of commonly misused antibiotics such as Amoxicillin and Nitrofurantoin.
4. Further research should be conducted to explore regional variations in antimicrobial resistance patterns and their correlation with local antibiotic prescribing practices. This will enhance the understanding of resistance trends and inform targeted interventions.

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