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Identification and Antibiogram of Bacteria Associated with Urinary Tract Infection amongst Apparently Healthy Students in Afe Babalola University

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Abstract

Background: Urinary tract infections (UTIs) are a major public health concern, particularly in underdeveloped nations. It is one of the most prevalent infections in human, with patterns of antibiotic resistance and the distribution of etiological agents changing periodically and regionally. This sought to determine the frequency and profiles of antibiotic-resistant microorganisms among student at Afe Babalola University in Ado-Ekiti, Ekiti State, Nigeria, who appeared to be in good health, in order to discover uropathogens.

Methods: Ninety (90) clean-catch midstream early morning urine specimens were collected, cultured and the isolated organisms were identified using con95ventional microbiological techniques within two hours of collection.

Results: Twenty (22.2%) of the 90 urine specimens that were examined were positive for uropathogens. The most often isolated species were *S. aureus*, with 15 (16.67%), *K. pneumonia*, with 3 (3.33%), and *P. aeruginosa, P. mirabilis*, with 1 (1.11) each. It was shown that women experienced UTIs more frequently than men did, with 28 (20%) against 2 (2.22%). Gram-positive organisms were highly resistant to streptomycin, but Gram-negative organisms were very resistant to levofloxacin. The most effective medications were imipenem, cefexime, ceftriaxone, and nalidixic acid for Gram-negative organisms and ampicillin, roxithromycin, cloxacillin, tetracycline, and co-trimoxazole for Gram positive isolate.

Conclusion: There is a high level of antibiotic resistance among uropathogens in our environment. As a result, better antibiotic management and ongoing surveillance are required.

Keywords: Antibiogram, Uropathogens, UTI, students, Ekiti

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Introduction

Urinary tract infection (UTI) refers to conditions in which the whole or parts of the urinary tract in humans are infected with uropathogens.[1] It often presents with nonspecific heterogeneous symptoms.[2] Urinary tract infections (UTIs) are infections that can occur in the urethra (urethritis), bladder (cystitis), or kidneys (pyelonephritis) and are one of the world's most common infectious diseases, affecting 150 million people each year, with significant morbidity and high medical costs (e.g., it has been estimated that the economic burden of recurrent UTIs in the United States is more than $5 billion each year).[3]

UTIs can be classified as either uncomplicated (uUTIs) or complicated (cUTIs). Uncomplicated (uUTIs) or complicated (cUTIs).[4] An uncomplicated urinary tract infection (UTI) is a bacterial infection of the bladder and associated structures. Patients with uncomplicated UTIs have no structural abnormality of the urinary tract and no comorbidities such as diabetes, an immunocompromised state, recent urologic surgery, or pregnancy. An uncomplicated UTI is also known as cystitis or a lower tract UTI. Bacteriuria or pyuria alone without symptoms does not constitute a UTI. Typical UTI symptoms include urinary frequency, urgency, suprapubic discomfort, and dysuria. While very common in women, UTIs are uncommon in circumcised males.[5] Many uncomplicated UTIs will resolve spontaneously without treatment, but patients often seek therapy for symptom relief.[6] Therapy aims to prevent infection from spreading to the kidneys or progressing into an upper tract disorder such as pyelonephritis, which can destroy delicate structures in the nephrons and eventually lead to hypertension.[7]

The major classes of UTI are the non-complicated UTI, which are as a result of compromised immune status of infected individuals and immunocompromised UTIs which are active invasion of the urinary tract by pathogenic organisms.[8] cUTIs are defined as complicated when they are associated with urinary tract abnormalities that increase susceptibility to infection, such as catheterization or functional or anatomical abnormalities unlike straightforward UTIs, complicated UTIs arise in individuals with pre-existing abnormalities within their urinary tract. These abnormalities can be structural, functional, or metabolic. They can encompass the lower urinary tract (bladder, urethra) or the upper tract (ureters, kidneys), or both.

Importantly, complicated UTIs are associated with significantly higher treatment failure rates and can cause damage that predisposes to recurrent infections.[6] The pathogenesis of complicated UTIs is multifaceted. Structural abnormalities such as calculi (stones), infected cysts, abscesses in the kidneys or bladder, specific forms of pyelonephritis, spinal cord injuries, and the presence of catheters can all contribute. Metabolic and hormonal imbalances like diabetes and pregnancy can also complicate UTIs.

Additionally, patients with compromised immune systems, such as transplant recipients (particularly kidney transplants) and those with HIV/AIDS, are more susceptible. Furthermore, unusual pathogens, such as yeast, can cause complicated UTIs. The rise of healthcare-associated complicated UTIs is a growing concern. *P. mirabilis* is a frequently isolated bacterium in these cases. It possesses the ability to form a biofilm, a sticky substance that allows it to adhere to both the inner and outer surfaces of catheters.

Other factors contributing to *P. mirabilis* adherence include pili and fimbriae, hair-like structures on its surface. Additionally, its production of urease and haemolysins further enhances its pathogenic potential. Pyelonephritis, an inflammation of the kidney, typically results from bacterial migration from the bladder to the kidney tissue, often facilitated by vesicourethral reflux (abnormal backward flow of urine). In uncomplicated pyelonephritis, both bacterial invasion and kidney damage are confined to a specific region. However, in complicated infections, the entire kidney can become involved. If left untreated, the bacteria can potentially enter the bloodstream, leading to a serious condition known as bacteraemia.[9]

Urinary tract infections (UTIs) are the most common type of infections in outpatients which mostly affect adult women of reproductive age, but is also common in males.[10] UTIs have constituted a serious economic and public health burden in terms of mortality, morbidity, increased cost of treatment and healthcare and increased days of hospitalization.[11,12] In addition, UTIs are reputed to be the most common infection globally and Nigeria has its share of the global burden.[13,1] The epidemiology of UTI spans across different age groups that includes children, adults, the elderly, pregnant women and overall immune-compromised individuals.[14,1]

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UTI is also associated with certain risk factors and co-morbidities which include diabetes among the different age groups.[15] Each year, about 150 million people worldwide develop UTI, with high social costs, and roughly eleven-million cases reported in the U.S. each year, the costs are estimated at $5 billion annually.[16] In the Pediatrics', it is a common infection and can be particularly severe in infants aged less than 3 months.[17] UTIs are infections in the urinary tract which are commonly caused by microbes including viruses, fungi and bacteria (protozoa) but the latter is the most common cause of UTIs.

The urinary tract constitutes the kidney, ureter, bladder and urethra. Infection in the urethra is called urethritis, in the bladder is known as cystitis while in the kidney is called pyelonephritis.[18] There are three main categories of UTI: uncomplicated, complicated, and asymptomatic. Uncomplicated UTIs occur in healthy individuals with normal urinary systems. These typically target the bladder and cause uncomfortable symptoms like burning during urination. In contrast, complicated UTIs affect people with underlying conditions or anatomical abnormalities. Urinary tract infection (UTI) is one of the commonest communicable diseases in Nigeria and the World. Treatment of UTI is easy if antibiotics are used rationally.

All UTI's are normally considered complicated with the consideration that the infection has ascended to the upper urinary tract. Therefore, culture and analysis of antibiotic susceptibility pattern is more effective in the management of UTI because it aids in modification of the treatment plan. The emergence of antibiotic resistance against commonly prescribed antibiotics in the treatment of UTIs is an ongoing concern worldwide. Several factors including; inappropriate use of antibiotics, availability of counterfeit drugs in the market, non-adherence to the standard treatment guidelines by clinicians and lack of laboratory resources for culture and sensitivity, have been attributed to the growing resistance to antibiotics Poor monitoring of antibiotic prescription and use in the treatment of UTI is a major contributor to antibiotic resistance. If attempt is not made to stop the progression of antimicrobial resistance, there is a greater risk for developing UTI-related multi drug resistant (MDR) strains. Globally, surveillance of antibiotics on UTI is reported to be uncoordinated. A situation that has led to fragmented or lack of accurate information on antibiotic resistance.[19]This research is important for the general awareness on antibiotics sensitivity profile in the general population in the university, also sensitization on the misuse of commonly known antibiotics by students in the university environment.

The project is expected to provide valuable data on the prevalence of asymptomatic Urinary tract infections and the antibiotics sensitivity profile among students in Afe Babalola University and the commonly known isolates causing the infection to aid presumptive treatment. The findings will contribute to the understanding of antibiotics resistance in this specific population and help in designing effective infection control measures. This study aimed to investigate the prevalence of UTI infection, isolate the bacteria involved and carry out the antibiotics sensitivity on them among apparently healthy students in the study area, determine the prevalence of asymptomatic UTIs among apparently healthy students, identify bacterial isolates responsible for UTIs in this population, evaluate the prevalence of asymptomatic UTIs with respect to age and gender and investigate the antibiotics sensitivity patterns of the isolated bacteria. The project has contributed to the body of knowledge on the prevalence of asymptomatic UTI infection and provided an insight into the commonly known isolates and provided insights into the antibiotic's sensitivity profile among students in a university setting and improve the management of UTIs in this demographic.

Materials and Methods

Study Area

This study was conducted at the main campus of Afe Babalola University, Ado-Ekiti in Ekiti State. It is located on 130 hectares of land at an altitude of over 1500 feet above sea level which provides a cool and ideal climate of learning and sport activities. Ado-Ekiti, the study area, is located at about 48 kilometres north of Akure, Ondo state capital, about 344 kilometres north of Lagos (Nigeria) and about 750 km south-west of Abuja, the Federal Capital Territory (FCT). Ado Ekiti is the Ekiti state capital, and a Local Government Headquarter in one of the sixteen Local Government Area in Ekiti State. It lies within Latitude 7°10' and 7°45' north of the Equator and Longitudes 5°10' and 5°28' east of the Greenwich meridian.[20]

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Sample Size

The sample size was determined using the following mathematical formula propounded by Akinbodewa,[21] (1965): N=$(z^2\,pq)/d^2$

Where Z = Confidence level at 95%; N = Minimum sample size; D = Acceptable error (5%); P = Estimated prevalence = 11%; Q = 1-p. Substitute into formula, N = $(1.96\,x\,0.11\,x\,(1-0.11))/\ 〖0.05〗^2$; N = 77

Study Design

A cross-sectional study was conducted to identify the bacteria associated with UTI among apparently healthy student in Afe Babalola University, random sampling technique was applied in this study. This study was conducted within the duration of January 2024 to march 2024, by random selection of apparently healthy student in Afe Babalola University.

Sample Collection

Following informed consent, from students aged 15-25years were provided with sterile universal containers and educated on how to collect a clean mid-stream-urine (MSU). Samples were collected early in the morning and preserved in a portable cooler lined with ice pack and transported to the laboratory within 30 minutes. The process was repeated each time with a different set of students until a sample size of 90 was attained.

Inclusion Criteria

Students who had not taken an antibiotic in the last two month(s), who consented to participate

Exclusion Criteria

Students who are on antibiotics treatment for one ailment or another, and those who have visible symptoms of UTI and are undergoing treatment and also students who did not give their consent

Laboratory Diagnosis

Sample Collection

According to the procedure of Frank Chinegwundoh 2018.[22] the participants were given instructions on how to collect midstream urine: to clean the head of the penis with a sterile wipe, if uncircumcised, to retract the foreskin first. They are to flush out the first urine into the toilet, then collect the mid urine into the sterile bottle, the last part is flushed into the toilet, the same process should be followed for the females but the vagina should be rinsed with water before the collection process.[22]

A sterile universal bottle was used to aseptically collect twenty milliliters of clean catch morning mid-stream urine from the male participants. Proper labeling was done with the subject laboratory number and time of collection properly shown on the sample. Analyzing of the sample was done in less than 3 hours after the sample was brought to the laboratory.

Macroscopy

The samples were examined for colour and turbidity, these were recorded according to age groups.

Microbial Culture

All samples were inoculated onto Cystine Lactose Electrolyte Deficient (CLED) agar and MacConkey Agar using standard loop technique. Hence a sterile calibrated wire loop, which holds 1/500 ml (0.002 ml), was used to inoculate a loopful of urine on a quarter plate using streaking technique. Each sample was inoculated in duplicates. The plates were incubated in an inverted manner, aerobically at 37°C for 24 hours. After the incubation period, each plate was examined for pure isolates. An average colony count of 25 and above in pure growth was considered significant.

Identification of the UTI isolates

After culturing the colonies were identified using the following:

Gram stain

This investigation was used to segregate gram positive organisms from gram negative organisms. Urine was centrifuged at 2000rpm for 2 minutes and the deposit used to make bacterial culture smears on a clean slide. They were then placed on a staining rack; heat fixed then flooded with crystal violet and allowed to stand for 30 seconds. The slide was then rinsed with water for 5 seconds and then covered with iodine. They were allowed to stand for 1 minute and then rinsed with water. Decolourization was done using 95% ethanol for 15 seconds, followed by rinsing with water this process is also known as solvent treatment. Neutral red was then used as a counter stain. It was flooded for about 60 seconds and the slides rinsed with water and blot dried using a filter paper. Examination was done under a microscope at x100 under oil immersion.[23]

Catalase Test

This test was used to differentiate *Staphylococcus* from *Streptococcus* species. On a clean microscope slide, drop approximately 2 drops using Pasteur pipette of 3%

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hydrogen peroxide. A sterile wire loop was used to pick a single pure colony from both CLED and MacConkey agar. The suspected bacteria were placed on the 3% hydrogen peroxide. Evolution of oxygen bubble was observed for a positive sample.[24]

Coagulase Test

Differentiate coagulase producing *Staphylococcus aureus* from non-coagulase producing Streptococcus. Anticoagulated (EDTA) human plasma was allowed to warm to room temperature. Plasma (0.2ml) was placed into test tubes; 0.8 ml of test broth culture was added into each test tube. After mixing, they were incubated at 370C. Examinations were done after 1 hour, and if there was no clotting, examination was done again after 3hrs.If still there was no clotting, the tests were left at room temperature overnight and examined again the next day.[25]

Indole and Citrate Utilization Test

These set of tests were used to differentiate members of the family Enterobacteriaceae. Indole test determines the presence or absence of the tryptophanase enzyme which breaks down tryptophan broth. Kovac's reagent was added to the tryptone broth and if indole is present, red coloration forms at the top.[25]

Citrate utilization test was used to detect the presence of bacteria that utilize citrate as the sole source of carbon, Simon citrate medium was put in bijou bottles in a slant position to prepare slopes. A straight wire loop was sterilized, and then the slant streaked after the test organism was suspended in normal saline and the butt stabbed. Incubation was done at 35^0C for 48 hours. Change in colour of the medium to bright blue was considered for presence UTI.[25]

Oxidase test

It was used to determine if a bacterium is producing the enzyme cytochrome oxidases. When a colony of the test organisms was smeared onto a reagent strip that had p-Phenylenediamine it was oxidized to give a purple colour by oxidase positive organisms.[25]

Urease test

It's a test for identifying urease producing bacteria, which breaks down urea, to give ammonia and carbon dioxide through hydrolysis. The ammonia released changes the media to alkaline, changing the colour of the indicator to pink red.[26]

Antibiotic Susceptibility Testing

An antibiotic susceptibility test was carried out on culture plates. Mueller-Hinton agar (Oxide, Hampshire, England) following the Kirby-Bauer disk diffusion method.[27] Turbidity standard equivalent to McFarland 0.5 was prepared. 1.1% v/v solution of sulphuric and 1% v/v solution of barium chloride was prepared. Then 0.6 ml of the prepared barium chloride was added to 99.4ml of the sulphuric acid solution and mixed. Turbidity shown by the inoculum was adjusted to match that of the standards. Single isolated colonies were identified and transferred to this tube while adjusting the turbidity until they match. Using a sterile cotton swab dipped in this suspension, streaking was completed on Muller Hinton culture plate, ensuring even spread of the bacteria.[28]

After the agar dried, sterile forceps was used to place the antibiotic disks of different concentrations on the culture plates. To warrant maximum contact, the disc was gently pressed on the agar followed by incubation at 370C for 24 hours. The zones of inhibition diameters for each antibiotic was then measured using a ruler and recorded in millimeters *E. coli* ATCC 25922, *P. aeuroginosa* ATCC 27853, *S. aureus* ATCC 29123, were used as standard strains. The interpretation was done according guidelines provided.

Data Analysis

Data was analyzed with SPSS version 20 (IBM Corporation, Armonk, NY, USA). Proportions of bacterial isolates and antibiotic sensitivities and resistances were presented as frequency tables. Prevalence rates of bacteria isolates was calculated as the frequency of identification of the bacterial species divided by the total number of all the bacteria species identified. Resistance rates was calculated for each antibiotic and each bacterial isolated by dividing the number of resistant isolates by the total number of isolates.[29] The overall resistance rate of each antibiotic was calculated as the number of bacteria resistant to antibiotics over the total number of bacteria isolates tested.[30] Chi-square test of association was used to compare the proportion of bacterial isolates with patients' age and sex, with the level of significance P set as < 0.05. Multiple antibiotic resistances (MAR) index was calculated for each isolate as the number of antibiotics to which the isolate is resistant/the total number of antibiotics against which the isolate is tested.[31]

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Ethical Consideration

Ethical approval was obtained from the Ethics Committee of Afe Babalola University.
Protocol number; ABUADHREC/12/02/2024/343.

Results

Socio-demographic characteristics of the subjects

Table 1 shows the socio-demographic characteristics of the subject studied. Among the ninety subject, 36 (40%) were males, while 54 (60%) were females. With respect to age group, 4 (4.44%) belong to age group 14-16 years, 68(75.56%) belong to age group 17-21 years, while 18 (20.0%) belong to age group 22-26 years. According to level of study, 9 (10%) were in 100 level, while 15 (16.67%) were in 200 level, 16 (17.78%) were in 300 level, 16 (17.78%) were in 400 level and 34 (37.77%) were in 500 level

Table 1. Socio-demographic characteristics of subjects

Variables	Frequency	Percent (%)
Gender		
Male	36	40.00
Female	54	60.00
Age (years)		
14 – 16	4	4.44
17 – 21	68	75.56
22 – 26	18	20.00
Level of study		
100	9	10.00
200	15	16.67
300	16	17.78
400	16	17.78
500	34	37.77
College of study		
MHS	47	52.22
ENG	7	7.78
Law	10	11.11
Pharmacy	7	7.78
Sciences	8	8.89
SMS	11	12.22

MHS=Medical and Health Sciences
ENG=Engineering

Clinical details of the subjects

Table 2 showed the clinical details of the subject. When asked if they know what urinary tract infection UTI is, 68 (75.56%) of the subject said yes while 22 (24.24%) said no. Among the subject, 13 (14.44%) have experienced urinary tract infection UTI while 77 (85.56%) haven't experienced urinary tract infection UTI. When asked if they had experienced urinary tract infection UTI 11 (12.22%) said they have experienced it once while 2 (2.22%) have experienced urinary tract infection UTI twice. Among the subject, 2 (2.22%) were currently on antibiotics while 98 (97.78%) were not on antibiotics. When asked the type of antibiotics taken, 2 (2.22%) were taking amoxicillin antibiotics.

Table 2. Clinical characteristics of subjects

Variables	Freq	Percent (%)
Do you know what urinary tract infection UTI is?		
Yes	68	75.56
No	22	24.24
Have you ever experienced urinary tract infection UTI?		
Yes	13	14.44
No	77	85.56
If yes, how many times have you had it?		
Once	11	12.22
Twice	2	2.22
Are you currently on antibiotics?		
Yes	2	2.22
No	98	97.78
If yes, what antibiotics are you taking?		
Amoxicillin	2	2.22

Microorganisms Isolated from the study

Table 3 showed the prevalence of microorganisms isolated in the study. The result obtained showed that of the 20 organisms isolated in this study, 15 (16.67%) were *S. aureus,* 3 (3.33%) were *K. pneumoniae*, 1 (1.11%) was *P. aeruginosa*, while 1 (1.11%) was *P. mirabilis* respectively.

Table 3. Microorganism isolated from sample

Organism	Freq	Percent (%)
Klebsiella pneumonia	3	3.33
Proteus mirabilis	1	1.11
Pseudomonas aeruginosa	1	1.11
Staphylococcus aureus	15	16.67
Total	20	22.22

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Antibiotics susceptibility pattern of Organisms Isolated

Table 4 showed the antibiotics susceptibility pattern of Gram-positive organisms isolated. The result obtained showed most of the following pattern; Ciprofloxacin (68.8%), Ofloxacin (56.3%), Levofloxacin (62.50%), Erythromycin (62.4%) etc.

Table 4. Antibiotics susceptibility pattern

Antibiotics	Sensitivity Freq (%)	Intermediate Freq (%)	Resistant Freq (%)
Ciprofloxacin	11 (68.8%)	1 (6.2%)	4 (25.0%)
Ofloxacin	9 (56.3%)	2 (12.5%)	5 (31.2%)
Levofloxacin	10 (62.50%)	4 (25.0%)	2 (12.50%)
Streptomycin	3 (18.8%)	0 (0%)	13 (81.2%)
Ampicillin	16 (100.0%)	0 (0%)	0 (0%)
Roxithromycin	16 (100.0%)	0 (0%)	0 (0%)
Gentamicin	8 (50.0%)	2 (12.5%)	6 (37.5%)
Cloxacillin	16 (100.0%)	0 (0%)	0 (0%)
Cefotaxime	13 (81.2%)	3 (18.8%)	0 (0%)
Tetracycline	16 (100.0%)	0 (0%)	0 (0%)
Erythromycin	10 (62.4%)	3 (18.8%)	3 (18.8%)
Co-Trimoxazole	16 (100.0%)	0 (0%)	0 (0%)

Table 5 showed the antibiotics susceptibility pattern for Gram-negative organisms isolated. The result obtained showed most of the following patterns: Cefexime (100%), Nitrofurantoin (83.3%), Imipenem (100%) etc.

Table 5: Antibiotic susceptibility of Gram-negative Organisms

Antibiotics	Sensitivity Freq (%)	Intermediate Freq (%)	Resistant Freq (%)
Cefuroxime	5 (83.3%)	0 (0%)	1 (16.7%)
Ampiclox	5 (83.3%)	0 (0%)	1 (16.7%)
Cefotaxime	5 (83.3%)	1 (16.7%)	0 (0%)
Imipenem	6 (100.0%)	0 (0%)	0 (0%)
Ofloxacin	1 (16.7%)	1 (16.7%)	4 (66.6%)
Cefexime	6 (100.0%)	0 (0%)	0 (0%)
Nalidixic Acid	6 (100.0%)	0 (0%)	0 (0%)
Ceftriaxone	6 (100.0%)	0 (0%)	0 (0%)
Levofloxacin	1 (16.7%)	0 (0%)	5 (83.3%)
Nitrofurantoin	5 (83.3%)	1 (16.7%)	0 (0%)
Amoxicillin	5 (83.3%)	1 (16.7%)	0 (0%)
Gentamycin	0 (0%)	2 (33.3%)	4 (66.7%)

Discussion

The study examined ninety samples from students at Afe Babalola University in Ado-Ekiti who appeared to be apparently healthy. The purpose of the study was to determine the prevalence of UTIs among the participants, the bacteria that cause UTIs, and the antibiotic sensitivity patterns of the bacteria to particular medications. During the data collection period, 20 students (22.22%) at Afe Babalola University had urinary tract infections, while 70 students (77.78%) showed no growth (Table 3). This prevalence is in good agreement with the 21.4% as reported.[32] in Ilorin, Nigeria. In the southwest of Nigeria, Oluwafemi *et al.*'s[33] earlier study found a prevalence rate of 43.6%, whereas study[33] found a prevalence rate of 77%. When compared to the findings of Shrestha *et al.*[34] In Nepal, which showed a 16% prevalence rate, these numbers are greater. According to this study in (Table 1), women experience UTIs more frequently than men do 28 (20%) versus 2 (2.22%). This result is consistent with Wasio *et al*[35] earlier

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research conducted.[36,37] The physiological and structural differences between males and females may be the cause of the higher frequency of UTI among female patients in the current study when compared to male patients.[38] However, the larger distance between the anus and urethral meatus as well as the dry environment in male urethra, which inhibits microbial development, may be responsible for the lower incidence of UTI in men.[39,40]

According to (Table 1), the prevalence of UTIs in the age group 17–21 years was (75.56%) which could be due to poor toilet hygiene. The high prevalence within the age group could be attributable to high sexual activity as reported.[41,42] Based on the study's findings in (Table 3), it was found that 15 (16.67%) of the samples had *S. aureus*, 3 (3.33%) had *K. pneumoniae*, 1 (1.11%) had *P. aeruginosa*, and 1 (1.11%) had *P. mirabilis*. This outcome is comparable to that of Onyebueke *et al.*'s[43] study on UTIs in Enugu, where *Staphylococcus* species were the most common isolates (29%). This result is in conflicts with studies conducted in the past,[36] which found that *E. coli* was the most common cause of UTIs in the Southeast with a rate of 65.6%, and Ajayi,[44] which discovered that *K. pneumonia* is a significant bacterium linked to patients with symptomatic UTIs in Ekiti State.

The pattern of antibiotic susceptibility exhibited by the Gram-positive organisms identified in this investigation indicates a significant level of resistance to streptomycin among the isolates. This contradicts the findings of Nerurkar *et al.*,[45] who investigated drug susceptibility patterns and bacterial pathogens in UTIs. In (Table 4) Levofloxacin exhibited a high level of resistance to the isolated Gram-negative microbes, as indicated by their antibiotic susceptibility pattern. This is consistent with the findings of Timothy *et al.*,[46] who investigated the pattern of antibiotic resistance in bacterial isolates from UTI cases involving both hospitalized and out-of-hospital patients at a tertiary healthcare institution in Southwestern Nigeria. This result conflicts with a prior study by Ajayi[44] that found that Gram-negative bacteria had significant levels of resistance to gentamicin, chloramphenicol, and sulphonamides. A related study conducted in 2016 by Ali *et al.*[47] discovered a low frequency of ampicillin and tetracycline resistance. It should be noted that the susceptibility of UTIs to antibiotic treatment varies depending on the clinical setting and geographic location, much as the causes of UTIs. The high rate of antibiotic resistance found in this study; we might infer have been caused over time by the indiscriminate use of antibiotics as well as the ingestion of inferior medications.

Strengths and limitations of the study

This study was able to establish the prevalence of uropathogens amongst ABUAD students and the careless use of antibiotics without prescription and its consequential effect and serves to drives antimicrobial resistance.

Implications of the findings of the study

The results of the study revealed high level of antibiotic resistance among uropathogens in our environment, as such, better antibiotic management and ongoing surveillance are required. In respect to this study, these are some recommendations, students should maintain proper hygiene, by washing of their under wears properly and cleaning the toilet properly before usage. It is advisable that routine checkup should be encouraged whenever urinary tract infection is suspected in other to give the best treatment. In order to prevent or decrease resistance to antibiotics, the use of antibiotics should be kept under supervision and should be given in appropriate doses for an appropriate period of time.

Conclusion

The prevalence of urinary tract infection in apparently healthy students of Afe Babalola University in this study was 22.22 %. The study shows that *S. aureus* has the highest occurrence both in male and female while *P. mirabilis*, *K. pneumonia* and *P. aeruginosa* were seen in females only. In respect to age, it was seen that in age group 17-21 years had the highest frequency, while age group 14-16 years had the lowest frequency. In the antibiotic susceptibility testing streptomycin and levofloxacin was highly resistance to the isolates, while ampicillin, roxithromycin, cloxacillin, tetracycline, co-trimoxazole, imipenem, cefexime, nalidixic acid and ceftriaxone were highly sensitive to the isolates.

Declarations

Authors' Contribution: Conceptualization and design-Egbebi AH, Ofotoku DE, Data Collection- Ofotoku DE, Ogunyemi OM, Agu CC, Data Analysis-Egbebi AH, Akinsey JF, Oluboyo BO, Ayuba SB Write up-Egbebi AH, Akinsey JF, Oluboyo BO, Ayuba SB

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