OCCURRENCE OF URINARY TRACT INFECTION AMONG INMATES AT PANKSHIN CORRECTIONAL CENTER

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ABSTRACT

Urinary tract infections are the most commonly encountered bacterial infections in clinical practice. It is yet to be fully examined in correctional centers. We determined the occurrence of urinary tract infection among inmates in Pankshin correctional center Nigeria. A cross-sectional study was conducted among 190 prison inmates. Freshly-voided mid-stream urine from each inmate was collected and cultured on MacConkey agar and 5% Blood agar and incubated at 37°C for 24h. Isolates were identified by standard microbiological techniques. Antimicrobial susceptibility testing was performed by Kirby-Bauer disc diffusion method. Data were analyzed using SPSS version 17 package and the Chi-square test. The prevalence of urinary tract infection was 20.0%. The commonly isolated bacteria were Staphylococcus aureus (33.3%), Klebsiella pneumoniae (20.8%), and Escherichia coli (18.8). Exactly 9.4% of isolates were Gram negative bacilli and 3.6% Gram positive cocci ($P<0.05$). Gram negative isolates were more sensitive to Gentamicin followed by Zithromax. Gram positive cocci showed maximum sensitivity to Ciprofloxacin and Gentamicin. All Gram positive cocci were resistant to Tetracycline and Ampicillin. The prevalence of urinary tract infection in Pankshin correctional center Nigeria was 13.5%. Staphylococcus aureus was the commonest isolate. Gentamicin and Ciprofloxacin were the most useful antibiotics and could be used as first line drugs for treatment of Urinary tract infection among inmates in correctional centers.

Keywords: Urinary Tract Infection, Inmates, Antibiotic Susceptibility Testing, Pankshin correctional center, Nigeria

1. INTRODUCTION

The Nigerian Correction Service is statutorily expected to take into lawful custody all those duly certified to be so kept by courts of competent jurisdiction, Produce suspects and other prisoners in courts as and when due, Identify the causes of their anti-social disposition, set in motion mechanisms for their training and reform, so as to return them to the society as law abiding citizens at discharge and administer Prisons Farms and Industries for this purpose and in the process generate revenue for the government.

Inmates in developing countries live in extremely poor conditions. Due to dilapidated facilities, the risk of acquiring, activation or aggravation of already existing infection usually increases in prisons [3]. Prisoners are more susceptible to disease owing to poor healthcare, overcrowding, high risk behaviors, poor nutrition, lack of potable water, poor personal and environmental hygiene and low level immunity due to stress [4, 5].

Urinary tract infection (UTI) is a disease of public health importance affecting more than 150 million people [1] with a financial burden of about $6 billion worldwide each year [2]. It is one of the most common infectious diseases, second to upper respiratory tract infections [3]. Urinary tract infections have been studied extensively in diverse communities and among different age groups [8-10] but it is yet to be fully explored among inmates whose health are often neglected.

This study therefore, seeks to determine the occurrence of urinary tract infection among inmates in Pankshin correctional center Nigeria.

2. MATERIALS AND METHODS

2.1. Study Area

This cross-sectional study was conducted among inmates in Pankshin correctional center Nigeria between July 2024 and October, 2024. Pankshin correctional center Nigeria is a Minimum center located in Pankshin Town of Plateau State of Nigeria.

2.2. Study Participants

A total of 190 inmates participated. Age of the subjects ranged from 25 years to 60 years.

2.3. Methods

The socio-demographic characteristics of the inmates were obtained using structured questionnaires. Urine samples were collected from each participant. Prior to urine collection, participants were instructed on how to aseptically collect a clean catch mid-stream urine into a sterile screw-cap universal container to avoid contamination.

2.4. Sample Processing

The bacterial counts in the urine samples were determined by semi-quantitative method using a calibrated inoculation loop of 4mm internal diameter. A loopful (0.001 ml) of mid-stream urine was inoculated unto the surface of well-dried MacConkey agar and 5% Blood agar plates. After overnight incubation at 37°C, culture plates that yielded bacterial counts of $> 10^5$CFU/ml were considered as significant [11]. Isolated organisms were characterized and identified using standard laboratory methods including colonial appearance, microscopy and biochemical techniques [11]. Corresponding ATCC strains were used as reference standard during biochemical identification of isolated uropathogenic bacteria.

2.5. Antibiotic Susceptibility Testing

Antibiotic susceptibility testing was performed by the Kirby-Bauer disc diffusion method [12]. Ten commercially available antibiotic discs were used at their respective concentrations and include Ciprofloxacin (10µg), Gentamicin (10mg), Norfloxacin (10µg), Amoxil (30µg), Tetracycline (30 µg), Erythromycin (30 µg), Nalidixic acid (30µg), Ampicillin (10µg), Streptomycin (30 µg) and Zithromax (10µg). After seeding respective test organism on Muller

Hinton Agar plate and with the aid of a sterile forceps, each antibiotic disc was placed on the surface of the medium. The diameter of inhibition zone around the disc was recorded after incubation at 37°C for24h. The reference standard was used for the inspection of isolate sensitivity/resistance pattern. The results of the antibiotic susceptibility tests were interpreted following the National Committee for Clinical Laboratory Standards [13].

2.6. Data Analysis

The data were analyzed using SPSS version 17 package. Frequency tables were obtained for selected variables and statistical test of significance was performed using Chi-square test. $P < 0.05$ was considered statistically significant.

2.7. Ethical Clearance

Ethical clearance was sought and obtained from the Chief Comptroller of Pankshin correctional center Nigeria. A support letter from Biology Department Federal College of Education Pankshin was also sent to the Chief Comptroller. Inmates consented to participate in the study.

3. RESULTS

A total of 190 prison inmates, whose age ranged from 21 years to 60 years enrolled in the study. The inmates were all males. The age group most infected were 31-40 year old (5.3%) while the least infected were those 61 years and above (0.5%) (P< 0.05).

Illiterate prison inmates (50.0%) and the ones who completed primary school only (27.2%) had the highest prevalence of urinary tract infection. The length of time in prison is significantly associated with urinary tract infection. Inmates incarcerated for 1yeardd were most infected (30.7%) as presented in Table 1. Out of the 190 urine samples examined, 25 (13.5%) yielded bacterial counts $> 10^5$CFU/ml, indicating significant growth of uropathogens. Exactly 9.4% of the isolates were

Gram negative bacilli while 3.6% were Gram positive cocci

(Table 2). As presented in Table 3, Staphylococcus aureus was the most common isolate (33.3%) followed by Klebsiella pneumoniae

(20.8%), Escherichia coli (18.8%) and the least frequent Pseudomonas aeruginosa (6.3%).

Antibiotic susceptibility testing of Gram negative bacilli revealed that Gentamicin was the most sensitive antibiotic. It was followed by Zithromax and the least sensitive antibiotic was Streptomycin (Table 4). Results for the susceptibility pattern of Gram positive cocci showed that maximum sensitivity was seen in Ciprofloxacin and Gentamicin. All the Gram positive cocci resisted Tetracycline and Amoxil (Table 5)

Table 1. Socio-demographic characteristics of inmates at Panksin correctional center Nigeria

Variables	No examined (%)	No of UTI positive (%)	No of UTI negative (%)
Gender	190 (100)	25 (13.2)	165 (86.8)
Male	190(100)	25 (13.2)	165 (86.8)
Female	0	0 (0)	0 (0)
Age group			
20-30	35 (18.4)	6 (3.2)	29 (15.2)

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31-40	65 (34.2)	10 (5.3)	55 (28.9)
41-50	72 (37.9)	6 (3.1)	66 (34.7)
51-60	16 (8.4)	2 (1.0)	14 (7.4)
61-70	2 (1.0)	1 (0.5)	1(0.5)
Level of education			
Illiterates	10 (5.2)	5 (50)	5 (50)
Completed primary school	44 (23.1)	12 (27.2)	32 (72.7)
Completed secondary school	60 (31.5)	8 (13.3)	52 (86.6)
Tertiary	0	0	0
Marital Status			
Single	114 (60)	18 15.7	96 (84.2)
Married	76 (40)	7 (9.2)	69 (90.7)
Time in Prison (Yr)			
< 1	26 (13.6)	8 (30.7)	18 (69.2)
1 – 5	152 (80)	15 (9.8)	137 (90.1)
> 10	12 (6.3)	2 (16.6)	10 (83.3)

Table 2. Prevalence of urinary tract infection among inmates at Pankshin correctional center Nigeria

Total urine samples tested	No urine samples positive for UTI (%)	No. GNB Isolated (%)	No. GPC Isolated (%)
190	25 (13.5)	18 (9.4)	7 (3.6)

Gram Negative Bacilli (GNB) Gram Positive Cocci (GPC)

Table 3. Distribution of uropathogens among inmates at Pankshin correctional center Nigeria (n=48)

Bacteria	Frequency (%)
Escherichia coli	9 (18.8)
Klebsiella pneumoniae	10 (20.8)
Proteus sp	6 (12.50
Pseudomonas aeruginosa	4 (8.3)
Gram Positive Cocci	0 (0)
Staphylococcus aureus	16 (33.3)
Streptococcus fecalis	3 (6.3)

Table 4. Antimicrobial susceptibility pattern of isolated Gram negative bacteria.

Antibiotics	*E. coli*	*K. pneumonia*	*P. aeruginosa*	*Proteus sp*
Gentamicin	S	S	S	R
Ciprofloxacin	S	S	R	R
Norfloxacin	S	R	R	R
Amoxil	R	R	R	R
Erythromycin	R	R	R	R
Nalidixic Acid	S	R	R	R
Ampicillin	R	R	R	R
Streptomycin	R	R	R	R
Zithromax	S	S	S	R

Table 5. Antimicrobial susceptibility pattern of isolated Gram positive cocci.

Antibiotics	*S. aures*	*S. fecalis*
Gentamicin	S	R
Tetracycline	R	R
Ampicillin	R	R
Ciprofloxacin	S	R
Ceporex	R	S
Amoxil	R	R
Erythromycin	R	R
Streptomycin	R	R
Norfloxacin	R	R

4. DISCUSSION

Urinary tract infections are recognized globally as the most prevalent bacterial infection in humans and a major public health concern [14]. Prisoners are mostly more susceptible to diseases [5]. In our study, an overall prevalence of 13.2% was observed. This is similar to 9.9% recorded among prison inmates in central jail of Bhopal [3]. However, it contracts with 22.0% recorded among inmates in Afara jail of Umuahia [5]. In this study, Gram negative bacilli constituted 9.4% of the total isolates while Gram positive cocci constituted 3.6%. This finding is in agreement with other reports that Gram negative bacilli are the most found pathogens isolated from patients with urinary tract infection [5, 15]. This also applies to Gram negative bacilli among prison inmates [16]. The most frequent organisms isolated from the inmates were Escherichia coli (33.3%), Klebsiella pneumoniae (20.8%) and Staphylococcus aureus (18.8%). This is consistent with the study conducted by others in Nigeria [3, 5, 17]. Globally, Escherichia coli is seen to cause 70-95% upper and lower urinary tract infection [7]. Inmates incarcerated for less than 1years had the highest prevalence of urinary tract infection in our study. Antibiotic susceptibility pattern of isolated bacteria showed high sensitivity of Gram negative bacilli to Gentamicin and Zithromax. Similar findings had been previously reported [22, 23]. Maximum resistance was shown to Amoxil. The most useful antibiotics against Gram positive cocci were Ciprofloxacin and Gentamicin. Resistance shown to Tetracycline and Ampicillin could be due to over-use and above of these antibiotics. In conclusion, the prevalence of urinary tract infection in Pankshin Correctional Center was 13.2%. Escherichia coli was the most implicated bacteria causing urinary tract infection and female prison inmates were mostly infected. Gentamicin and Ciprofloxacin were the most useful antibiotics for the treatment of urinary tract infection.

5. REFERENCES

[1] Ndukwe, C. and Nwazor, C. I. (2014). Nigerian prison service and the challenges of social welfare administration; a study of Abakiliki prison. Journal of Policy and Development Studies 9: 20-27.

[2] Kumar, S. D., Kumar, S. A., Pattankar, J. V., Reddy, S. B. and Dhar, M. (2013). Health status of the prisoners in a Central Jail of South India. India Journal of Psychololgical Medicine 35: 373-377.

[3] Essien, U. C., Ede, F. R., Idoko, E. J., Vem, T. S., Damen, J. G. and Sheyin, Z. (2017). Bacteriology of urinary tract infection among inmates of Jos main prison plateau state, Nigeria. European Journal of Pharmacy and Medical Research 4: 179-182.

[4] Amit, D., Tripathi, K. and Nema, S. (2016). Prevalence of intestinal parasites and urinary pathogens among prison inmates in central jail of Bhopal (MP). Indian Journal of Microbiology Research 3: 47-52.

[5] Arnold, J. J., Hehn, L. E. and Klein, D. A. (2016). Common questions about recurrent urinary tract infections in women. Family Physicians 93: 560-569.

[6] Payam, B., Elham, B., Hodjjat, V. and Roghiyyen, A. A. (2010). Survey on urinary tract infections associated with the three most common uropathogenic bacteria. Medica (Buchar) 5: 111-115.

[7] Tosin, T. O., Akinwumi, A. A., Adeyemi, O. and Oluseyi, A. A. (2018). Urinary tract infections and antibiotics sensitivity pattern of uropathogens in a tertiary hospital in south West Nigeria. Sahel Medical Journal 18-22.

[8] Schaffer, A. J. and Nicolle, L. E. (2016). Clinical practice. Urinary tract infections in older men. New England Journal of Medicine 374: 562-571.

[9]   Nema, S., Tripath, I. and Dhanvijay, A. K. (2013). Bacteriological profile and antibiogram of community and hospital acquired urinary tract infections in Medical College hospital of central India. International Journal of Medicine and Applied Science 2: 380-391.

[10]   Forbes, B. A., Sahm, D. F. and Weissfield, A. S. (2002). Infections of the urinary tract. Bailey and Scotts Diagnostic Microbiology. 11th ed, Mosby: vol 60, pp 927-938.

[11]   National Committee for Clinical Laboratory Standards (NCCLS). (2010). Performance standards for antimicrobial susceptibility testing 20th Informational Supplement. M100- S20. Clinical and Laboratory Standards Institute. Pennsylvania, USA.

[12]   Tigist, G., Belayneh, R., Aseer, M. (2016). Prevalence, diversity and antimicrobial resistance of bacterial isolated from the UTI patients of Arba Minch Province, Southern Ethiopia. Translational Biomedicine 7: 3.

[13]   [bata, T. I. (2006). Prevalence and antibiogram of UTIs among prison inmates in Nigeria. The Internet Journal of Microbiology 3: 2.

[14]   Alo, M. N., Ugah, U. I., Saidu, A. Y. and Alhassan, H. M. (2015). Microbial status of prison inmates in Abakaliki Prison, Ebonyi State Southern Nigeria. Global Journal of Medical Research and Studies 2: 7-11.

[15]   Mody, L., Juthani, M. M. (2014). Urinary tract infection in older women; a clinical review. Journal of American Medical Association311: 844-854.

[16]   August, S. L. and DeRosa, M. J. (2012). Evaluation of the prevalence of urinary tract infection in rural Panamanian women. Public Library of Science ONE e7752.

[17]   Alzohariry, M. and Khadri, H. (2011). Frequency and antibiotic susceptibility pattern of uropathogens isolated from community and hospital acquired infections in Saudi Arabia - a prospective case study. British Journal of Medical Research 1920: 45.

[18]   Ezeagwula Divine, Nwachukwu Ndubuisi, Nwaugo Victor, Ulasi Amara. Urinary Tract Infection Among Prison Inmates in Afara Jail Umuahia. International Journal of Clinical Urology. Vol. 4, No. 1, 2020, pp. 25-29. doi: 10.11648/j.ijcu.20200401.16

[19]   Mann R, Mediati DG, Duggin IG, Harry EJ, Bottomley AL. Metabolic adaptations of Uropathogenic E. coli in the urinary tract. Front Cell Infect Microbiol. 2017;7:241–1.

[20]   Klumpp D, Rycyk M, Chen M, Thumbikat P, Sengupta S, Schaeffer A. Uropathogenic Escherichia coli induces extrinsic and intrinsic cascades to initiate Urothelial apoptosis. Infect Immun. 2006;74:5106–13