

Urinary Tract Infection Among Inmates in Afokang Prison, Calabar, Cross River State, Nigeria

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ABSTRACT.

BACKGROUND: Prisoners in developing countries like Nigeria live in extremely poor conditions with greater burden of infection compared to other members of the society. Urinary tract infection is influenced by a lot of epidemiological factors such as overcrowding, poor sanitation, poor nutrition and socio-cultural practices etc. However, the prevalence of urinary tract infections is yet to be fully explored in prisons. Therefore, the present study aimed at determining the prevalence rate of urinary tract infections (UTIs) among male and female inmates in Afokang prison, Calabar, Nigeria.

METHODS: Socio-demographic characteristics of the inmates were obtained using structured questionnaires. A total of 120 mid-stream urine samples were randomly collected across the male and female cells and examined using Standard Bacteriological Techniques.

RESULTS: Out of 120 samples examined at 10^5 CFU/mL, the study recorded 93.3% bacteriuria across all experimented inmates. 92 (76.7%) indicated significant bacteria growth from male and 28(23.3%) from female inmates urine samples respectively. Isolated and identified bacteria species were; were *S. aureus*, *E.coli*, *Klebsiella spp*, *Proteus spp*, *S. epidermidis*, *Pseudomonas spp*, *Bacillus spp*, *Citrobacter spp* and *Streptococcus spp* with corresponding percentage occurrences of 33.6%, 30.5%, 15.6%, 7.0%, 6.3%, 2.3%, 2.3%, 1.6% and 0.8% respectively. Evaluation of UTIs based on incarceration period reveals that 38 % of UTI was recorded for inmates with < 1 year and 40 % for those between 1-5 years of incarceration.

CONCLUSION: This study provide the prison authority with the health information in regards to UTIs status of the inmates calling for urgent education inform of creating of awareness on the preventive measures needed to curb the spread of this infection among the inmates and provide a more healthy environment during their stay in the prison.

Key words: Urinary tract infection, prison inmates, urine, *S. aureus*, *E. coli*.

I. INTRODUCTION

Urinary tract infections (UTIs) are the most frequently encountered bacterial infections in clinical practice. It is yet to be fully explored in prisons. Prison which is now known as correctional facility in Nigeria is a place in which a lot of diseases are concentrated. The prison lacks adequate health facilities resulting in greater burden of illness to the society [1].

Restrictions from normal life style in the prison environment as well as inadequate private space cause the inmates to suffer from much greater burden of illnesses than other members of the society [2].

They harbor diseases that is determined by both the environment from which they come from and prison in which they live. The prevalence of UTIs in prisons are influenced by several epidemiological factors, such as poor

sanitation, poor personal and community hygiene, ignorance, and other socio-cultural practices [3,4,5].

The different types of UTIs are named after the affected part such as cystitis (bladder infection), pyelonephritis (kidney infection), urethritis (urethral infection) and vaginitis (acute vaginal infection) [6]. Different species of microorganism can be responsible for UTI, but vast majority of it is caused by *E. coli*, a common member of *Enterobacteriaceae* family which accounts for 75-90% of all UTIs [7].

The present study set out to evaluate the prevalence of UTIs among Afokang Prison Inmates with the aim of controlling and preventing the spread of this infection.

II. Materials and Methods

A. Study Area

A cross-sectional study was conducted among prison inmates in Afokang Prisons located in Calabar South, Cross River State, Nigeria between January 2020 to February 2021. Afokang prison was established in 1987. It is made up of 14 cells designated as A, B, C, D, E CC, female wing (cell 1 and 2) and the Administrative block. It was originally built to accommodate 450 inmates but presently, there are more than 658 inmates.

B. Study Participants

A total of 120 inmates participated comprising of both male and female with ages ranging from 15-60 years.

C. Sample Collection

The socio-demographic characteristics of the inmates were obtained using structured questionnaires. Study subjects were instructed on how to collect clean catch mid-stream urine into sterile containers after carefully cleaning the genitalia, especially around the opening of the urethra. Samples were collected at the prison medical unit and were quickly transported in an ice pack to microbiology laboratory of Cross River University of Technology, Calabar for analysis. Only one sample was obtained from each inmate and samples were processed within one hour of collection.

D. Sample Processing

Urinalysis: The physical appearance (color, odor and turbidity) of each urine sample was determined. Combi-9 dipstick was used to carry out macroscopic examination in order to determine the pH and check for the presence of glucose, bilirubin, urobilinogen, protein, ketone, nitrite, ascorbic acid and blood in the urine, while microscopic examination was done to check for crystals, pus cells, debris, stains of blood and parasites in the urine.

E. Bacterial Cell Count, Isolation and Characterization of Bacterial Species.

Bacterial cell count in the urine samples were determined by pour plating method using already prepared semi-solid Cysteine-lactose-electrolyte-deficient (CLED) and MacConkey agar (L: S-BIOTECH, San Diego, USA). Ten-fold serial dilutions was done by transferring 1ml of urine sample into 9ml of sterile physiological saline and mixed properly.

A 1ml aliquot of 10^{-5} dilution of each urine sample was poured into a sterile Petri dish and 20ml of already prepared molten CLED and MacConkey agar at about 44°C was added and the Petri dish was swirled for homogenization. The plates were allowed to set before incubation at 37°C for

24 h in a humidified incubator. After incubation, emergent colonies were counted and recorded. Discrete colonies were isolated after three successive sub-culturing and re-isolations and characterized by standard bacteriological techniques according to Cheesbrough, (2006) [8].

F. Data Analysis

The data collected were analyzed using Statistical Package for the Social Sciences (SPSS) version 20 for descriptive statistic. Statistical test of significance was performed using T-test and the level of significance was determined between the various groups with confidence intervals at 90% and P-value <0.05.

G. Ethical Clearance:

Ethical consideration was sought and obtained from the Chief controller of prison service and Head of Medical unit of Afokang main prison Calabar. Inmates were given a brief health education after which consenting inmates participated.

III. Results

A total of one hundred and twenty (120) urine samples were sent to Microbiology laboratory, Cross River University of Technology for Urinalysis and culture within one year of study. 92(76.7%) were from male while 28(23.3%) were from female (Table 1).

Urinalysis results showed that 100 (83.3%) out of 120 samples appeared pale-yellow while other 20 (16.7%) varied between amber to yellow in colour. One-third of the urine samples were observed to have unusual odor with pH varying from 5-9. All samples showed normal level of glucose, urobilinogen and ketone. 30(25.0%) had considerable level of bilirubin and 15 (12.5%) showed indiscriminate presence of proteins, nitrate and blood.

Out of 120 urine sample examined 112 (93.3%) indicated significant growth of different species of uropathogenic bacterial at 10^{-5} CFU/ml. 43% of the isolated bacteria were Gram positive while 57% were Gram negative (Table 2) Frequency of bacterial occurrence (Figure 1) reveals that *S. aureus* was the predominant isolate 43 (33.6%) followed by *E. coli* 39(30.5%), *Klebsiella* spp 20(15.6%) and the least was *Streptococcus* spp 1(0.8%).

Based on age distribution analysis (Table 3), there were more UTIs within the age range of 20-39 and 30-39 with infection rate of 48 (42.8%) and 28 (25.0%) and the least infected group were age > 50 years.

Infection based on educational level before incarceration (Fig 2) shows that secondary level were the most infected group 72(64.3%) followed by primary 24(21.4%) and 16(14.3%) for the tertiary level (Table 4).

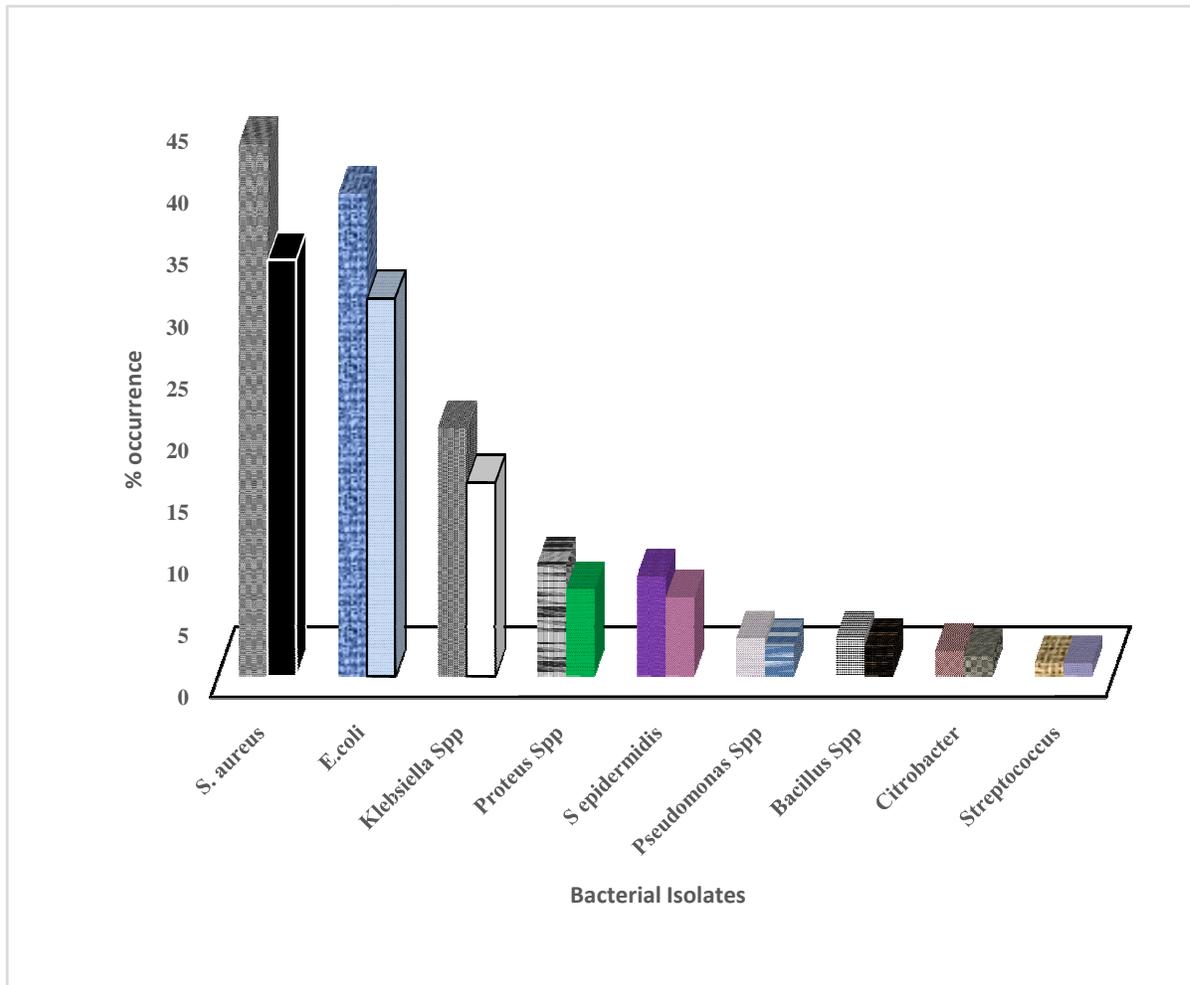


Figure 1: Species of bacterial isolated and their corresponding frequency and percentage occurrence.

Table 1: Socio-demographic characteristic of Inmates at Afokang Prison

Variable	No. Examine (%)	No. UTI Positive (%)
Gender		
Male	92 (76.7)	84 (91.3)
Female	28 (23.3)	28 (100)

Table 2: Distribution of Uropathogens obtain from Afokang inmates according to gram Reaction (n= 128)

Bacteria Species	Frequency (n)	Percentage (%)
Gram Positive		
<i>S. aureus</i>	43	33.6
<i>S. epidermidis</i>	8	6.3
<i>Bacillus Spp</i>	3	2.3
<i>Streptococcus</i>	1	0.8
Gram Negative		
<i>E. coli</i>	39	30.5
<i>Klebsiella Spp</i>	20	15.6
<i>Proteus</i>	9	7.0
<i>Pseudomonas Spp</i>	3	2.3
<i>Citrobacter Spp</i>	2	1.6

Table 3: Prevalence of UTI Distribution

Age group (y)	No. examine (%)	No. of UTI positive (%)
15-19	20 (16.7)	16 (14.3)
20-29	48 (40.0)	48 (42.8)
30-39	28 (23.3)	28 (25.0)
40-49	-	-
50-59	16 (13.3)	13 (11.6)
60+	8 (6.7)	7(6.3)

Table 4: Level of UTIs infection based on Educational Background

Education	No. Examine (%)	No.of UTI positive (%)
Completed Primary Sch.	28 (23.3)	24 (21.4)
Completed Sec. Sch.	76(63.3)	72 (64.3)
Tertiary	16 (13.3)	16 (14.3)

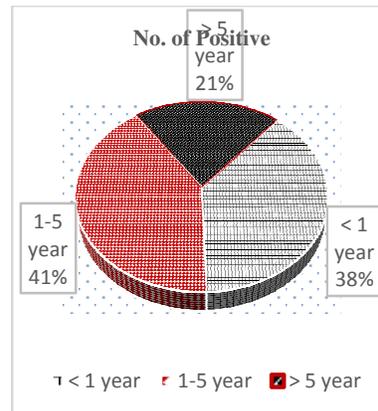


Figure 2: The number of UTI infected inmates based on Incarceration period

VI. -Discussion

The prevalence of urinary tract infections recorded in this study was 93.3%; 84(91.3) and 28(100) for male and female inmates respectively. This is higher than 55.14% obtained in Abakiliki prison, South-Eastern Nigeria [1], 22.0% from Afara Jail, Umuahia[5], 21.4% from Jos main prison [2] and 9.91% from Central jail of Bhopal [3]. High prevalence rate of UTI among female inmates may be linked to the shorter urethra in female which is easily transversed by microorganisms [9], and proximity of their urethra to the gastrointestinal outlet. This encourages easy entrance and colonization of this area by enteric flora. However, research has shown that urinary tract infection is more frequent in females than males during adolescence and adulthood [10].The index result also observed that 20-29 age groups had the highest prevalence rate of UTIs. This may be linked to sexually active state of this group of people. Gram negative bacteria had the highest prevalence rate of 57% compare to their Gram positive 43% counterpart.

This finding is in line with the report of Prakash *et al.*, (2013) [11] who documented Gram negative bacteria as the commonest isolated pathogens from patients with UTI. *S. aureus* (33.6%) was the most prevalent uropathogen among prison inmates followed by *E.coli* (30.5%), *K.pneumoniae* (15.6%) and *Proteus spp* (7.0%). This is consistent with the study conducted by Essien *et al.*, (2017) [2] in Jos main prison, Ekwealoret *et al.*, (2016) [12] from South East Nigeria, and Pondei *et al.*, (2012) [13] in Southern Nigeria. The role of *S.aureus* in regards to urinary tract infection and community associated infection has been demonstrated by several researchers.

Several studies signify *S.aureus* as a prime competitor of *E. coli* during the course of most infection [14]. Results from this study indicate that inmates within 1-5 years of incarceration had a higher % of 40% compared to 38 %

recorded for people with < 1 year of incarceration. This may be because prolonged stay in such an environment means longer period of exposure to infectious agents.

Several factors have been posited to contribute to some of these observations. This includes; Overcrowding of the prison facility, poor nutrition, deteriorated state of the prison environment, poor sanitation, inadequate water supply, poor medical facilities, unhealthy habits, lack of information on the preventive measures against infection. The aforementioned factors play pivotal roles in health status of humans including inmates. The absence of concern on the state of the inmates further increases the chances of rapid spread of infectious diseases, high mortality rate within inmates. This study draw the attention of the Prison Controller, Federal Government and Non-Governmental organizations, dealing on health issues to organize periodic health sensitization program for inmates, refurbish their health clinic with the needed healthcare facilities that is able to arrest emergency situation and set up regular health monitoring team for checking of inmates health.

VII. Conclusion

Inmates consist of individual from different tribe, ethnic groups and location living together under a crowded and poor sanitary condition. The index study reveals a high prevalence rate of UTIS across the male and female cells. We therefore draw the attention of the prison authorities and the Federal Government on the urgent need to improve on the sanitary measures of the inmates, rehabilitate the prison health clinic, immediate renovation and decongestion of prisons cells for more ventilation and in-cell education of the inmates. Provision of portable water and social welfare of the group of people should not be neglect.

VIII. Declaration

A. Ethical Approval and Consent to Participate

Ethical consideration was sought and obtained from the Chief controller of prison service and head of medical unit of Afokang main prison Calabar. Inmates were given a brief health education after which consenting inmates participated.

B. Consent for Publication

No details, images or videos relating to any individual were used in this research. Therefore, there is no need for "consent for publication".

C. Availability of Data and Materials

All relevant raw data and information given in this manuscript should be freely available to any scientist wishing to use them for non-commercial purposes. It does not breach the participant confidentiality whatsoever.

D. Competing Interests

The authors declares that they have no competing interests.

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F. Authors' Contributions

The authors have made substantial contributions to the conception, design, analysis, field work, drafting and editing of the work. The authors have also agreed to be personally accountable for the work.

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