Prevalence of intestinal parasites and urinary pathogens among prison inmates in central jail of Bhopal (MP)

Deol Amit[1], Tripathi Kiran[2,*], Nema Shashwati[3]

[1]Final MBBS Student, [2]Professor, [3]Associate Professor, Dept. of Microbiology,
L.N.Medical College and Research Centre, Bhopal (M.P.) India

***Corresponding author**
E-mail: kirantripathi71@gmail.com

Abstract

Introduction: Jail lacks adequate health facilities resulting in greater burden of illness than other members of society due to the factors like poor sanitation, poor personal hygiene and ignorance. Prevalence of Intestinal parasitic infections and urinary tract infections have been studied extensively in community in various set up and different age groups, but yet to be explored in prison inmates whose health problems are often neglected.

Methodology: A Cross sectional study was conducted at central Jail of Bhopal for a period of 2 months among 114 prison inmates. Proforma containing structured questionnaire was also filled. 114 stool samples and 111 urine samples were obtained. Stool samples examined using saline, iodine wet mount. Urine samples processed for aerobic bacterial culture, isolates identified by standard microbiology techniques. Antimicrobial susceptibility testing was performed by Kirby Bauer disc diffusion method as per CLSI guidelines.

Results: Intestinal parasites found among 7.9% prison inmates. Protozoan parasites contributed 7.0% and intestinal helminth 0.9%. Significant growth of uropathogens obtained in 9.91% urine samples. 6.31% were gram negative bacilli (GNB) and 3.60% gram positive cocci (GPC). GNB isolates were more sensitive for imipenem followed by amikacin. GPC showed maximum sensitivity for vancomycin and linezolid.

Conclusions Our study showed low prevalence rate of both intestinal and urinary tract infections among prison inmates of central jail Bhopal. This may be attributed to maintenance of adequate sanitary conditions in jail premises.

Keywords: Gram negative bacilli, Gram positive cocci, Intestinal parasites, Prison inmates, Urinary pathogens

Access this article online	
Quick Response Code:	**Website:** www.innovativepublication.com
	DOI: 10.5958/2394-5478.2016.00013.3

Introduction

"Prison" means any jail and place used permanently or temporarily under the general or special order of the state for the confinement of prisoners. Prison and jail environment are being recognized as place in which society's diseases are concentrated. It is seen either as punishment or mode of rehabilitation. The normal life of inmates is restricted, freedom of movement is curtailed and private space is limited. Prison serves as mirrors of society.[1]

In the walls of jail, due to lack of adequate health facilities, the prisoners suffer from much greater burden of illness than other members of the society. They harbor disease that is determined both by environment from which they come and prison in which they live. The prevalence of the intestinal parasites are influenced by several epidemiological factors, such as poor sanitation, poor personal and community hygiene, ignorance, climatic condition and other socio-cultural practices such as the use of night soil for fertilizer.[2]

Prevalence of parasitic infections and urinary tract infections have been studied extensively in community in various set up and in different age groups, but it is yet to be explored in prison inmates whose health problems are often neglected. Understanding health conditions in prisons would help us to improve the public health system. Therefore the aim of the study was to determine the prevalence of intestinal parasitic infections and urinary tract infections with the antimicrobial susceptibility pattern of the urinary pathogens among the prison inmates of Bhopal Central jail.

Materials and Methods

Study type: Cross sectional study
Study site: Central jail, Bhopal and Microbiology laboratory, LNMC & J. K. Hospital Bhopal
Study duration: 10th July 2014 to 10th September 2014
Number of subjects: 114 subjects
Sample: Urine and Stool.
Inclusion criteria: prison inmates living more than 6 month in Bhopal jail
Exclusion criteria: prison inmates less than 6 months in Bhopal jail
Choice of subjects: prison inmates of Bhopal Central Jail

Permission for the study was obtained from Director General of health services and approval was obtained from institutional ethics committee (Ref: LNMC/Dean/2014/1660j). The participants were informed clearly about the objective of the study in their local language. Structured questionnaire were filled with the help of prisoners after obtaining their written informed consent.

Detailed Protocol for stool sample:

Specimen Collection: A small screw capped plastic bottle with scoop was provided. The container was properly labeled with name, age, sex, sample number and date respectively before giving to the participants for collection of stool sample. The stool samples were collected and brought to the laboratory for processing.

Specimen Processing [3]

Macroscopic examinations: Each stool specimen was macroscopically examined for presence of mucus, blood or for presence of any parasite.

Microscopic examinations: The recognition of intestinal parasites was observed by using a binocular microscope under 10X and confirmed by observing under 40X.

Saline wet mount: Approximately 2 mg of stool sample was picked up using a wooden stick and mixed with a drop of 0.9% normal saline on a glass slide with applicator stick. The preparation was covered with a cover slip and observed under the microscope for blood leucocytes, RBC's eggs, larvae and motile trophozoites.

Iodine wet mount: Approximately 2 mg of stool sample was picked up using a wooden stick and mixed with a drop of dilute Lugol's iodine. It was covered with a cover slip and observed under the microscope mainly for the demonstration of protozoal cysts.

Detailed protocol for urine sample:

Specimen collection: All the participants were well instructed on how to collect sample aseptically prior to sample collection to avoid contaminations from urethra. Sterile screw capped universal container was labeled before collection. Clean catch midstream urine was collected from each participant and transported to the microbiology laboratory. In each container boric acid (0.2mg) was added to prevent the growth of bacteria in urine samples.

Microscopic examination: Three ml. of well mixed urine sample was centrifuged at 3000 rpm for 10 min. The supernatant was discarded and the deposit was examined microscopically using 40X objective[4] for pus cell RBCs, epithelial cells and any other abnormal findings.

Culture

The bacterial counts in the urine samples were determined by semi-quantitative method using 4 mm internal diameter standard loop. The samples were inoculated on MacConkey and Blood agar plates. After overnight incubation at 37^0C, culture plates yielding bacterial counts of > 10^5 CFU/ml for gram negative bacilli and 10^3-10^5CFU/ml for gram positive cocci were considered as significant [5, 6]

Identification:

After 18 to 24 hours of incubation, isolated organism was identified by standard methods. [7]

Antimicrobial susceptibility testing:

Antimicrobial susceptibility was performed by the Kirby-Bauer disc diffusion method[8] as described by Clinical Laboratory Standard Institute (CLSI) guidelines.[9]

The drugs selected were based upon their action on particular organisms. After 18-24 hours of incubation, the diameter of the inhibitory zone was measured by using a millimeter scale. The zone size around each antimicrobial disc was interpreted as sensitive, intermediate or resistant according to (CLSI) criteria.[9]

The following antibiotics were tested : Ampicillin (10 µg), cefuroxime (30 µg), ceftriaxone (30 µg), cefotaxime (30 µg), ceftazidime (30 µg), cefepime (30 µg), cefoxitin (30 µg), aztreonam (30µg), ampicillin-sulbactam ((10/10µg), amoxicillin-clavulinic acid (20/10µg), piperacillin-tazobactam (100/10µg), amikacin (30µg), gentamicin (10µg), nalidixic acid (30µg), norfloxacin (10µg), nitrofurantion (300µg), trimethoprim-sulfamethoxazole (1.25/23.75µg), imipenem (10µg), meropenem (10µg), penicillin (10 units), vancomycin (30 µg) & linezolid (30 µg).

For staphylococcus species, E test was per performed to detect MIC of vancomycin.

Detection of Methicillin resistance in Staphylococcus species

Methicillin resistance was detected by using cefoxitin (30µg) disc by disc diffusion method.

Staphylococcus aureus and *Coagulase negative staphylococcus spp* (CONS) showing zone diameter of ≤ 21mm and ≤24 mm respectively [9] were considered as methicillin resistant.

Quality control:

The control strains used were *E.coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853, and *Staphylococcus aureus* ATCC 25923.

Results

Intestinal parasitic infection

Total study population was 114, Out of which 111 urine sample and 114 stool sample was obtained. The overall prevalence of intestinal parasitic infection was 7.9% among prison inmates [Table1]. 7.0% of infections were due to protozoan parasites, while intestinal helminths were detected only in 0.9% in prison inmates. *Entamoeba histolytica* was the commonest pathogenic protozoa found in 5.3% prison inmates followed by *Giardia intestinalis* 1.7%, *Taenia spp* (0.9%) [Table 2].

Urinary tract infections

Of the 111 urine specimens processed, 11 (9.91%) gave significant growth of pathogens. 6.31% isolates were gram negative bacteria while 3.6% were gram positive cocci [Table 3]. *E. coli* was the predominant isolates (2.70 %) followed by *K. pneumoniae* (1.80%), *S.aureus* (1.80%), CONS (1.80%). Other bacterial isolates were *P. vulgaris* (0.9 %) and *P. aeruginosa* (0.9%) [Table 4].

As shown in the Table 5, antimicrobial susceptibility pattern of gram negative bacilli revealed maximum sensitivity pattern for imipenem (85.71 %) and amikacin (85.71 %) and least sensitivity was observed for ampicillin (14.28%), amoxicillin-clavulinic acid (14.28%), cefuroxime (14.28%), ceftriaxone (14.28%), nalidixic acid (14.28%). Table 6 depicts antimicrobial susceptibility pattern of isolated gram positive cocci. All gram positive cocci were found sensitive for vancomycin, linezolid and amikacin.75% of isolates were sensitive for trimethoprim-sulfamethoxazole, gentamicin, nitrofurantoin, norfloxacin.

Table 1: Prevalence of parasitic infection among prison inmates

Total stool samples tested	No. of samples positive for parasites n (%)	No. of samples negative for parasites n (%)
114	09(7.89)	105(92.11)

Table 2: Distribution of intestinal parasites among prison inmates

Total no. of parasites n (%)	*Entameoba histolytica* n (%)	*Giardia intestinalis* n (%)	*Taenia sps.* n (%)
9(7.9)	6(5.30)	2(1.70)	1(0.9)

Table 3: Prevalence of urinary tract infection among prison inmates

Total urine samples tested	No. of samples positive for UTI n (%)	No. of gram positive cocci isolated n (%)	No. of gram negative bacilli isolated n (%)	Total no. of samples negative for UTI n (%)
111	11 (9.91%)	4 (3.60%)	7 (6.31%)	100 (90.09%)

Table 4: Distribution of urinary pathogens among prison inmates

Total no. of bacteria isolated n (%)	*E.coli* n (%)	*K. pneumoniae* n (%)	*S. aureus* n (%)	CONS n (%)	*P.aeruginosa* n (%)	*P. vulgaris* n (%)
11(9.91%)	3(2.70)	2(1.80)	2(1.80)	2(1.80)	1(0.9)	1(0.9)

Table 5: Antimicrobial susceptibility pattern of isolated gram negative bacilli

Antibiotics	*E.coli* (n=3)	*K.pneumoniae* (n=2)	*P.vulgaris* (n=1)	*P.aeruginosa* (n=1)	Total (%)
Ampicillin	1	0	0	NR	1(14.28)
Amoxicillin-clavulinic acid	0	0	1	NR	1(14.28)
Ampicillin- sulbactam	1	0	1	NR	2(28.57)
Cefotaxime	1	0	1	NR	2(28.57)
Cefuroxime	0	0	1	NR	1(14.28)
Ceftriaxone	0	0	1	NR	1(14.28)
Ceftazidime	1	0	1	1	3(42.86)
Cefepime	1	0	1	1	3(42.86)
Trimethoprim-sulfamethoxazole	1	0	1	NR	2(28.57)
Gentamicin	1	2	1	1	5(71.43)
Amikacin	2	2	1	1	6(85.71)
Nitrofurantoin	2	0	0	NR	2(28.57)
Nalidixic acid	1	0	0	NR	1(14.28)
Norfloxacin	1	0	0	1	2(28.57)
Piperacillin- tazobactam	1	0	1	1	3(42.86)
Imipenem	2	2	1	1	6(85.71)
Meropenem	1	0	0	1	2(28.57)
Aztreonam	1	0	1	1	3(42.86)
Cefoxitin	2	1	0	NR	3(42.86)

NR= not recommended by CLSI; hence not tested

Table 6: Antimicrobial susceptibility pattern of isolated gram positive cocci

Antibiotics	*S. aureus* (n=2)	*CONS* (n=2)	Total (%)
Penicillin	0	0	0(0.0)
Ampicillin	0	0	0(0.0)
Amoxicillin-clavulinic acid	0	0	0(0.0)
Trimethoprim-sulfamethoxazole	1	2	3(75.0)
Gentamicin	1	2	3(75.0)
Amikacin	2	2	4(100.0)
Nitrofurantoin	2	1	3(75.0)
Norfloxacin	1	2	3(75.0)
Vancomycin	2	2	4(100.0)
Linezolid	2	2	4(100.0)

Discussion

The prison inmates are susceptible to diseases in general and intestinal parasitic infections due to poor health care, overcrowding high risk behaviors, low level immunity because of stress and inadequate or poor nutritional quality, and overall low living standard compared to the general population. The present study was conducted to determine the prevalence of intestinal parasites among the prison inmates.

The distribution of intestinal parasites are influenced by several factors such as quality of the potable water, level of sanitary condition and the personal hygiene of the prison population. In our study, the prevalence of intestinal parasites among prison inmates was found to be 7.89% [Table1]. Gupta et al [10] found high prevalence of intestinal parasites (42.8%) among prison inmates of Yerwada jail, Pune, Maharashtra. Prevalence rate of 20.67% was reported in a similar study conducted by Kumar et al[1] at Gulbarga, Karnataka. Central jail of Bhopal is the first ISO certified jail of the country. It is spread over 151.22 acres with all types of medical and health facilities. This might be the reason for low prevalence of parasitic infection in the present study.

As shown in the Table 2, the prevalence of protozoan infection in our study was higher (7.0%) as compared to helminth infection (0.9%). In a similar study conducted by Okolie [11] in 2009 reported higher prevalence rate of protozoan infection (44.6%) than helminth infection (32.40%). Distribution of intestinal parasites in prison inmates showed that *Entamoeba histolytica* was the predominant protozoan parasite (5.26%) and *Taenia* spp was only 0.87% whereas in a study conducted by Colman et al [12] among prison inmates revealed that *Entamoeba coli* (9.95%) was predominant parasite and *Taenia* spp was found least (1.01%). The decrease in prevalence of *Taenia* infection may be due to unavailability of non-vegetarian food.

Urinary tract infection may vary from asymptomatic presence of bacteria in urine to severe infection of the kidney with sepsis. It is a major cause of morbidity in both the hospital and community settings, the situation is further complicated if the bacteria causing UTI develops drug resistance. Out of 111 urine samples received during study period, uropathogens were isolated from 11(9.91%) samples as shown in Table 3. This study was in contrast to the study conducted by Kumar et al [1] where lower number of growth positivity and urinary calculus (0.67%) was recorded. In this study, the gram negative bacilli constituted (6.31%) of the total bacterial isolates while gram positive cocci constituted (3.60%) [Table 3]. To the best of our knowledge no studies were conducted regarding urinary pathogen among prison inmates so far. The study conducted in community by Prakash et al [13] revealed gram negative bacilli to be (90.32%) and gram positive cocci was constituted (9.68%) which was much higher than our findings. The higher prevalence of gram negative bacilli among prison in mates and community is attributed to the fact that gram negative bacilli related to enterobacteriaceae are the primary agents causing urinary tract infection and has many factors responsible for their attachment to the uroepithelium. In addition, they are able to colonize in the urogenital mucosa with adhesins, pili, fimbriae, and P-I blood group phenotype receptor. [14]

In the present study *E.coli* (2.70%) was the most common isolated uropathogen among prison inmates. *K. pneumoniae* (1.80%), *S.aureus* (1.80%) and CONS (1.80%) are the second commonest uropathogens causing UTI in the prisoners [Table 4]. These findings were consistent with the study conducted by Prakash et al, [13] where *E.coli* (42.58%) was found more prevalent followed by *K.pneumoniae* (18.7%), *P.aeruginosa* (12.90%), *S.aureus* (9.68%), *Proteus spp* (9.03%) and *Enterobacter spp* (7.10%). In another study conducted by Khameneh et al [15] , in a combined population of community as well as in hospital setting showed *E.coli*

(78.5%) as the commonest isolate followed by *Klebsiella*, *Proteus* and *Staphylococcus*.

Antimicrobial susceptibility pattern of isolated gram negative bacteria are shown in Table 5. Among the various antibiotics used against gram negative isolates imipenem (85.71%) and amikacin (85.71%) were found to be most effective followed by gentamicin (71.43%). These findings are comparable with the previous study conducted by Nema et al [16] where gram negative uropathogens showed (94.44%) susceptibility to imipenem, 80.24% susceptibility to amikacin followed by gentamicin (64.19%). Similar findings were also reported by Saleh et al.[17] In a study conducted by Alzohairy et al, [18] highest susceptibility was reported to imipenem, amikacin, ciprofloxacin and gentamicin. In our study, high degree of resistance was observed to β lactam group of antibiotics like ampicillin, 2nd and 3rd generation cephalosporins and aztroenam which was comparable to the study conducted by Murugan et al.[19] Low level of susceptibility to trimethoprim-sulfamethoxazole (28.57%) norfloxacin (28.57%) and nalidixic acid (14.28%) was observed. Similar finding in gram negative uropathogens was also reported by Nema et al [16] with low sensitivity to oral antimicrobial agents like trimethoprim sulfamethoxazole (39.72%), norfloxacin (34.56%) and nalidixic acid (19.85%). Vakilwala et al [20] also reported lower susceptibility to trimethoprim sulfamethoxazole (26.66%). These findings in gram negative isolates of uropathogens indicate that these drugs no longer be useful in the treatment of UTI.

All the isolates of Gram positive cocci were found to be sensitive to vancomycin, linezolid and amikacin [Table 6]. Nema et al [16] also found similar pattern of susceptibility to gram positive uropathogens to vancomycin (100%), linezolid (100%) and amikacin (84.78%). It was observed that there was only one isolate of *S. aureus* resistant to methicilin. In a study conducted by Murugan K et al [19] at Tamilnadu significant vancomycin resistance (20%) was reported among *Staphylococcus spp* which was contrast to our study. The least sensitivity was observed to trimethoprim-sulfamethoxazole, gentamicin, nitrofuran-toin & norfloxacin.

Conclusions

IPIs and UTIs are an important public health problem in tropical countries. The prison population consists of most vulnerable groups who are underprivileged members of society. These victims are often people with poor health and chronic untreated conditions. Although low prevalence rate of both intestinal parasites and UTI were found in our study, similar periodical studies are necessary to know their health status. This will help the prison authorities to plan intervention strategies for improving health of prison inmates.

Acknowledgement

We are thankful to Indian Council of Medical Research (ICMR) for accepting this topic for Short Term Studentship ICMR Project.

Conflict of Interest: None
Source of Support: Nil

References

1. Kumar SD, Kumar SA , Pattankar JV, Reddy SB, Dhar M**.** Health Status of the Prisoners in a Central Jail of South India. *Indian Journal of Psychological Medicine* 2013; (35):373-77.
2. Eneanya CI, Njom VS. Geohelminth contamination of some common fruits and vegetable in Enugu , South east Nigeria. *The Niger. J. Parasitol.* 2003; 24:123–28.
3. Parija SC. Textbook of Medical Parasitology. 3rd ed. Common Laboratory methods in parasitology , stool examination; p.362.
4. Cruickshank R. Medical Microbiology vol 2, 12th Edition pp 587, Churchill Livingstone, London, 1975.
5. Collee JG, Duguid JP, Fraser AG, Marmion BP, Simmons A. Laboratory strategy in diagnosis of infective syndromes. In Mackie and McCartney Practical Medical Microbiology. 14th edition (Churchill Livingstone produced by Longman Singapore Publisher Ltd.)1996:88.
6. Microorganisms encountered in the urinary tract. In Bailey & Scott's diagnostic microbiology (9th edition). Baron EJ, Finegold SM, Eds (Mosby publishers, St.Louis, Missouri) 1994; 256.
7. Win WC, Allen SD, Janda WM, Koneman EW, Procop GW, Schreckenberger PC,Wood G, editors. Color atlas & text book of diagnostic microbiology 6th ed. Philadelphia: Lippincott Williams and Wilkins; 2006.
8. Bauer AW, Kirby WMM, Sherris JC, Jurck M. Antibiotic susceptibility testing by a standardized single disc diffusion methods. *Am J Clin Pathol* 1996; 45:493-6.
9. Clinical and Laboratory Standard Institute. Performance Standards for Antimicrobial Susceptibility Testing; Twenty Second Informational Supplement.M100-S22; (32) 3.
10. Gupta RK, Singh GPI, Gupta RR, Health status of inmates of a prison, *Indian J Commun Med* 2001; (26):86-9.
11. Okolie NJC. Intestinal parasites distribution among inmates of Owerri prison. *The Internet J.Parasitic Dis* 2009;4(1):5580/1se7.
12. Colman S, Mangoro ZM and Isa L. Incidence of intestinal and urinary parasites among prison inmates.*Academia Journal Microbiology Research* 2013; 1(1):011-15.
13. Prakash D & Saxena RS. Distribution and Antimicrobial Susceptibility Pattern of Bacterial Pathogens Causing Urinary Tract Infection in Urban Community of Meerut City, India. *ISRN Microbiology2013*; Article ID 749629, 1- 13 pages.
14. Das RN, Chandrashekhar TS, Joshi HS, Gurung M, Shrestha N, and Shivananda PG. "Frequency and susceptibility profile of pathogens causing urinary tract infections at a tertiary care hospital in western Nepal," *Singapore Medical Journal* 2006; 47(4):281–85.
15. Khameneh ZR, Afshar AT. Antimicrobial susceptibility pattern of urinary tract pathogens. *Saudi J Kidney Dis Transpl* 2009; 20(2):251-53.
16. Nema S, Tripathi K. Dhanvijay AK, Bacteriological profile and antibiogram of Community and Hospital acquired urinary tract infections in Medical college

hospital of Central India. *International journal of medical and applied sciences* 2013; 2(4):380-91.
17. Saleh AA, Ahmed SS, Ahmed M, Sattar ANI, Miah MRA. Changing trends in uropathogens and their antimicrobial sensitivity pattern. *Bangladesh J Med Microbiol* 2009; 3(1):9-12.
18. Alzohariry M, Khadri H, frequency and antibiotic susceptibility pattern of uropathogens isolated from community and hospital acquired infections in Saudi Arabia- A prospective case study. *British Journal of Medicine & Medical Research* 2011; 1(2):45-56.
19. Murugan K, Savitha T, Vasanthi S. Retrospective study of antibiotic resistance among uropathogens from rural teaching hospital, Tamilnadu, India. *Asian Pac J Trop Dis* 2012; 2(5): 375-80.
20. Vakilwala M, Trivedi R. Prevalence of antimicrobial resistance in uropathogens and determining empirical therapy for urinary tract infections. *International Journal of Pharma and Bio Sciences* 2012; 3(2):436-440.

How to cite this article: Amit D, Kiran T, Shashwati N. Prevalence of intestinal parasites and urinary pathogens among prison inmates in central jail of Bhopal (MP). Indian J Microbiol Res 2016;3(1):47-52.