Section: Microbiology

Original Research Article

A BACTERIOLOGICAL STUDY OF URINE SAMPLES RECEIVED IN A TERTIARY CARE HOSPITAL OF AGRA

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ABSTRACT

Background: Urinary tract infections (UTIs) are among the most common bacterial infections in humans, causing morbidity and hospital visits in the general population. Information on the culture positivity rate and local bacterial aetiology is an essential tool in identifying and implementing the updated recommendations for ideal empirical therapy. This study aims to estimate the prevalence of bacterial culture positivity among the urine samples suspected of UTIs and submitted for urine culture and sensitivity and to identify the pattern of bacteria isolated from the positive cultures.

Materials and Methods: This is a retrospective (Record-based) Cross-sectional study comprising a sample size (N) of 4201. Inclusion criteria included all urine samples received in the central laboratory for culture and sensitivity within a specific duration of past one year.

Results: The prevalence of bacterial culture positivity among the urine samples submitted for urine culture and sensitivity was observed to be 10.4%. The most common bacteria were found to be E. coli (41.06%), followed by Klebsiella oxytoca (22.02%) and Klebsiella pneumoniae (18.35%).

Conclusion: Prevalence of urinary tract infection considerably varies depending on various factors such as geographical location, laboratory techniques, sample size, inclusion or exclusion criteria's, climatic conditions and socioeconomic groups. Most prevalent bacteria causing UTIs are E. coli followed by Klebsiella spp.

Keywords: Urinary tract infection, Urine Culture, Uropathogen, E. coli, Klebsiella spp.

INTRODUCTION

Urinary tract infections (UTIs) are among the most commonly found bacterial infections in humans.[1] UTI is one of the most important causes of morbidity in the general population, and is the second most important cause of hospital visits.[2] Generally, empirical antibiotics are prescribed for UTIs before the urine culture and sensitivity results are available.[3] Recently, bacterial resistance to various antibiotics has been emerging significantly, limiting therapeutic choice.[4,5] Bacteria causing UTIs may vary in their sensitivity to antimicrobials depending on factors such as place and time.[6] Information on the culture positivity rate and local bacterial aetiology is an essential tool in identifying and implementing the updated recommendations for ideal empirical therapy.

Therefore, this study is taken up to

1. Estimate the prevalence of bacterial culture positivity among the urine samples suspected of UTIs and submitted for urine culture and sensitivity in central laboratory of F.H. Medical College and Hospital, Etmadpur, Agra.
2. Identify the pattern of bacteria isolated from the positive cultures among the urine samples suspected of UTIs and submitted for urine culture and sensitivity in central laboratory of F.H. Medical College and Hospital, Etmadpur, Agra.

MATERIALS AND METHODS

Type of Study: Retrospective (Record-based) Cross-sectional
Place of study: F.H. Medical College and Hospital, Etmadpur, Agra.
Inclusion Criteria: All the urine samples received in the central laboratory for culture and sensitivity for the past one year (01/05/2024 to 30/04/2025) in F.H. Medical College and Hospital, Etmadpur, Agra.
Tools for data collection: Medical records
Data management: Microsoft Excel was used for data entry, management, and analysis.
Ethical issues

- Prior approval was obtained from the Institutional Ethical Committee of F.H. Medical College and Hospital, Agra.
- Informed written consent to retrieve data from urine culture and sensitivity records was obtained from the Head of Department, Department of Microbiology, F.H. Medical College and Hospital, Etmadpur, Agra.

RESULTS

The prevalence of bacterial culture positivity among the urine samples submitted for urine culture and sensitivity: Out of the total samples (N=4201), received during one-year period (01/05/2024 to 30/04/2025), the prevalence of bacterial culture positivity among the urine samples submitted for urine culture and sensitivity was observed to be 10.4% as shown in Figure 1 below.

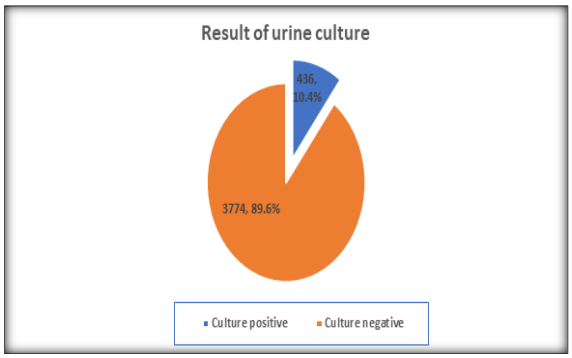

Figure 1: Showing the prevalence of bacterial culture positivity among the urine samples submitted for urine culture and sensitivity

The pattern of bacteria isolated from the cultures: As shown in Figure 2 below, among the bacterial isolates of the urine cultures, the most common bacteria were found to be *E. coli* (41.06%), followed by *Klebsiella oxytoca* (22.02%) and *Klebsiella pneumoniae* (18.35%).

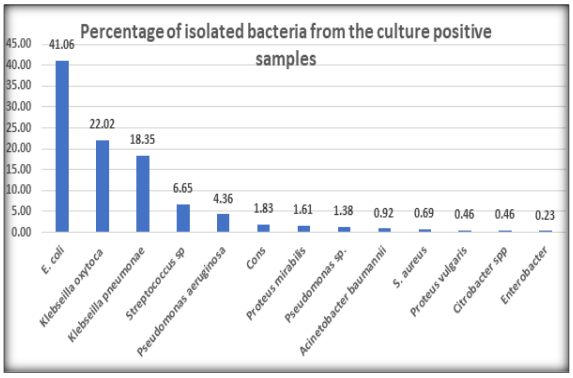

Figure 2: Showing the pattern of bacteria isolated from the culture positive samples

DISCUSSION

The prevalence of bacterial culture positivity among the urine samples submitted for urine culture and sensitivity
Current study observed that the urine culture positivity rate was (10.4%), similar positivity rate of 10.1% was reported by Mohapatra S. et al. (2022).[7] In a study of a tertiary care hospital in Central India by Mehta et al. (2024), 48% of the urine samples analysed were found to have significant bacteriuria, which is much higher than that of our study.[1] Gahlot R et al. (2024) in a tertiary care hospital-based research in Central India noted that the culture positivity rate was 27.1%.[8] In a super-speciality hospital-based study by Ahirwar N et al., the culture positivity rate among 266 urine samples received over a period of seven months was observed to be 22.93%.[9] Kumar A et al. (2023) noted the urine culture positivity to be 25.7% which is more than that of our study.[10] Another study conducted in the Northern part of India by Bhargava K. et al. (2022) observed a high bacterial positive culture rate of 77.96% among the urine samples analysed.[3] A tertiary care hospital-based study of North India by Chooramani G et al. (2020) observed a bacterial positivity rate to be 16.9% among the urine samples received for culture and sensitivity,[4] whereas Kumar A et al. (2017) observed a culture positivity rate of 25.13% at a tertiary care hospital of Jharkhand.[6] Singh V P et al. (2017) conducted a study in a tertiary care hospital of western Uttar Pradesh, India, wherein they observed the prevalence of urine culture positivity to be 33.3 % in the analysis of 2250 urine samples.[11]
The above variations from our study may be attributed to different geographical location of studies, different time periods of the conduction of studies, varying laboratory techniques used for urine culture, varying sample sizes (number of samples analysed), different selection (inclusion and exclusion) criteria of the urine samples, fluctuating infection control practices, predominant bacterial flora, varying climatic conditions, socioeconomic and educational discrepancies.

Table 1: Comparison of prevalence of bacterial culture positivity in various studies

Study	Year	Sample size	Culture positivity rate
Current study	**2025**	**4201**	**10.4%**
Gahlot R. et al.[8]	2024	2893	27.1%
Mehta et al.[1]	2024	642	48%
Kumar A et al.[10]	2023	892	25.7%
Ahirwar et al[9].	2023	266	22.93%
Mohapatra S. et al.[7]	2022	2549	10.1%
Bhargava K. et al[3]	2022	427	77.96%
Chooramani G. et al[4]	2020	10171	16.9%
Singh V P et al[11]	2017	2250	33.3%
Kumar A. et al[6]	2017	1723	25.13%

The pattern of bacteria isolated from the cultures:

In our study, we observed that the majority of the bacterial isolates were found to be *Escherichia coli* (41.06%), *Klebsiella oxytoca* (22.02%), and *Klebsiella pneumoniae* (18.35%). In a study conducted in a tertiary care hospital in Central India by Mehta et al. (2024), the majority (84%) of the isolated uropathogens were *Escherichia coli* (57.2%) and *Klebsiella pneumoniae* (26.3%).[1] In one research conducted by Gahlot R et al. (2024) in a tertiary care hospital of Central India, it was detected that the most often encountered bacteria were *Escherichia coli* (41.9%), followed by *Enterococcus* species (23.9%), and *Klebsiella pneumoniae* (10.3%).[8] In a super-speciality hospital-based study by Ahirwar N et al. (2023) in North India, it was noted that *Escherichia coli* (37.70%), *Klebsiella pneumoniae* (26.22%), and *Pseudomonas aeruginosa* (11.47%) were the most common uropathogens.[9] Kumar A et al. (2023) in a tertiary care hospital-based study of Western U.P., India, noticed that the most frequent bacteria among the urine samples were *Escherichia coli* (36.6%) followed by *Klebsiella* species (16.5%),[10] which is similar to our study's findings. Another study conducted in North India by Bhargava K et al. (2022) observed that the most common pathogen identified was *Escherichia coli* (55%), followed by *Proteus* sp. (6.9%), *Klebsiella pneumoniae* (6.6%), and *Pseudomonas aeruginosa* (6.3%).[3] A tertiary care hospital-based study of North India by Chooramani G et al. (2020) observed that the most common bacterial isolates among the urine samples were *Escherichia coli* (53.4%), *Enterococcus* spp. (20.7%) and *Klebsiella* spp. (10.3%).[4] In a study conducted by Kumar A et al. (2017) at a tertiary care hospital in Jharkhand, the most frequent bacteria detected were *Escherichia coli* (37.41%), followed by *Klebsiella* species (32.79%) and *Pseudomonas* species (25.86%).[6] According to yet another study by Singh V P et al. (2017), among 2250 urine samples analysed for the identification of bacterial isolates in a tertiary care hospital of western Uttar Pradesh, India, *E.coli* was the most common bacterial isolate (33.3%), followed by *Staphylococcus aureus* (20%), *Klebsiella* spp. (13.3%).[11]

The above variations from our study may be attributed to different factors already mentioned before while describing the probable reasons for variations in prevalences.

Table 2: Comparison of pattern of the isolated bacteria (*E.coli* & *Klebsiella* spp.) in various studies

Study	Year	Sample size	*E. coli*	*Klebsiella* spp.
Current study	**2025**	**4201**	**41.06%**	**40.37%**
Gahlot R. et al.[8]	2024	2893	41.9%	10.3%
Mehta et al.[1]	2024	642	57.2%	26.3%
Kumar A. et al.[10]	2023	892	36.6%	16.5%
Ahirwar et al[9].	2023	266	37.70%	26.22%
Mohapatra S. et al.[7]	2022	2549	68.3%	17.6%
Bhargava K. et al[3]	2022	427	55%	6.6%
Chooramani G. et al[4]	2020	10171	53.4%	10.3%
Singh V P et al[11]	2017	2250	33.33%	13.3%
Kumar A. et al[6]	2017	1723	37.41%	32.79%

CONCLUSION

The current study underlines the following two important findings in regards to urinary tract infections:

1. Prevalence of urinary tract infection may vary depending on various factors such as geographical location, laboratory techniques, sample size, inclusion or exclusion criteria's, climatic conditions and socioeconomic groups.
2. Most prevalent bacteria causing UTIs were found to be *E. coli* followed by *Klebsiella* spp., for which locally tailored guidelines need to be established and complied upon for minimizing the risk of emergence of drug resistant bacteria.

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