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A PROSPECTIVE OBSERVATIONAL STUDY TO ANALYZE THE USE OF ANTIBIOTICS IN ASYMPTOMATIC BACTERIURIA IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Asymptomatic bacteriuria (ASB) is characterized by the presence of bacteria in urine without the symptoms of a urinary tract infection (UTI). It is common among certain populations, including women, the elderly, those with urinary catheters, pregnant women, long-term diabetics, immunocompromised individuals, and those who have recently undergone urinary procedures. **Aim:** This study aims to describe the use of antibiotics in asymptomatic bacteriuria among in-patients in a tertiary care hospital. **Objectives:** The specific objectives of this study include assessing the frequency of adverse events associated with antibiotic treatment for ASB and analyzing the cost-benefit of such treatments. **Methodology:** A prospective observational study was conducted from March to September 2023 at a tertiary care hospital, with Institutional Ethics Committee approval. Data from 120 subjects were collected and analyzed using statistical methods. **Results:**

Among the 120 subjects with positive urine cultures, 59% were male and 41% were female, with the majority aged 60-70 years. The most common organism identified was Escherichia coli (57.5%), followed by Klebsiella species (18.3%), Enterococcus species (9.16%), and other organisms (15%). For ASB-specific cases, 39.2% were treated with antibiotics, while 60.8% were not treated. **Conclusion:** The study emphasizes the importance of rational antibiotic use, cost-effectiveness and the prevention of antibiotic resistance in managing ASB. The findings underscore the necessity for an evidence-based approach to the evaluation and treatment of ASB to enhance patient outcomes and mitigate the risk of adverse effects and antibiotic resistance.

KEYWORDS: Asymptomatic bacteriuria, urinary tract infection, antibiotic stewardship, Escherichia coli, antibiotic resistance, cost-effectiveness, patient outcomes, rational use of antibiotics.

INTRODUCTION

Asymptomatic bacteriuria (ASB) is the presence of bacteria in urine without symptoms of a urinary tract infection (UTI). Furthermore, colonization with one or more organisms in a urine specimen without symptoms or infection is characterized as a patient with asymptomatic bacteriuria.[1] If there are no symptoms, bacteriuria is not an illness. An illustration would be a patient who has had a long-term Foley catheter and is asymptomatic but typically has severe bacteriuria.[2] Symptomatic bacteriuria is linked to a urinary tract infection, typically caused by a single organism. Cystitis and prostatitis are examples of lower urinary tract infections (UTIs); pyelonephritis and pyonephrosis are examples of upper UTIs. ASB is common, particularly in women, the elderly, those with urinary catheters, pregnant women, long-term diabetics, immunocompromised individuals, and those who have recently undergone urinary procedures.[3] Reducing unnecessary antibiotic use for ASB is crucial for antibiotic stewardship and improving patient care.[4,5] ASB is more prevalent in women due to their shorter urethra and in the elderly due to incomplete bladder emptying. The prevalence increases with age, affecting less than 0.5% of infants and toddlers but rising to 15% in people aged 65-80 years and 40-50% in those over 80 in long-term care.[3] Escherichia coli is the most common cause. Patients with ASB are asymptomatic, unlike those with symptomatic bacteriuria or UTIs. Factors increasing ASB likelihood include obstructive uropathy, fecal soiling, indwelling urinary catheters, and frequent urinary tract monitoring. Diagnosis involves urine culture from clean-catch or catheterized specimens. For

women, two consecutive specimens with at least 100,000 CFU/ml are required, while for men, a single specimen suffices.[6] Pyuria and urine dipstick tests have limited usefulness for ASB diagnosis, but microscopic examination is helpful. Pregnant women should be screened for ASB at the end of the first trimester. The Positive Urine Culture Algorithm suggests evaluating urinalysis for contamination, assessing symptoms, and treating based on clinical judgment and guidelines, especially for those without symptoms unless pregnancy or impending urologic procedures are factors.[7]

AIM

To describe the use of antibiotics in asymptomatic bacteriuria among in-patients in a tertiary care hospital.

OBJECTIVES

To describe the use of antibiotic treatment for asymptomatic bacteriuria in adults. Specific objectives include

1. Assessing the frequency of adverse events.
2. Analyzing the cost-benefit of antibiotic usage.

SCOPE

Patients with asymptomatic bacteriuria do not exhibit symptoms; thus, treating these patients does not reduce the incidence of symptomatic urinary tract infections or improve patient outcomes. However, treatment increases the risk of adverse effects from antibiotics and the development of antibiotic-resistant bacteria. This study focuses on the following areas

- **Rational Use of Antibiotics**: Based on "Antibiotic Stewardship," this aspect focuses on using antibiotics in a way that improves patient outcomes.
- **Cost-Effectiveness**: To minimize unnecessary tests and treatments, a cost-effective analysis can benefit patients by reducing overall healthcare costs.
- **Prevention of Antibiotic Resistance**: Aiming to reduce microbial resistance and minimize infections caused by multi-drug-resistant organisms.

METHODOLOGY

A prospective observational study was conducted among patients from March to September 2023 at a tertiary care hospital after obtaining approval from the Institutional Ethics Committee.

Inclusion Criteria

The study included hospitalized adults over 18 years of age who had urinalysis and/or culture taken but showed no symptoms like dysuria, frequency, urgency, suprapubic pain, tenderness, or change in mental status.

Exclusion Criteria

Excluded were pregnant women, outpatients, patients undergoing invasive urological procedures, transplant recipients, patients receiving antibiotics for non-UTI infections at the time of urine collection, neutropenic patients, and immunocompromised hosts.

Sample size

The sample size for this study was calculated using statulator.

Data Collection and Analysis

Data were collected using patient demographic data collection forms, patient case reports, and questionnaires. The collected data included patient demographics, past medical and medication history, diagnosis, laboratory investigations, and urine culture results. The questionnaire were framed using IDSA guidelines comprising of 3 questions-1) Recent history of UTI 2) Episodes of fever in last two days 3) Experience of any UTI symptoms like burning micturition, frequent urination, dysuria, lower abdominal pain, urgency or none of the above.

Data were segregated based on inclusion criteria, and only those meeting these criteria were included. Patients with positive urine cultures were interviewed about their clinical condition and treatment charts reviewed for antibiotic use and treatment progression. Consent was obtained from patients with asymptomatic bacteriuria who were treated with antibiotics, and only those willing to participate were included in the study. Statistical analysis was performed using Microsoft Excel 2015 and Mann Whitney Test. The statistics were insignificant due to the limitations of the study.

RESULTS

Asymptomatic bacteriuria is a common occurrence, but it is usually harmless. Only pregnant women or patients undergoing invasive genitourinary procedures are urged to test and treat asymptomatic bacteriuria. On population screening, healthy women with asymptomatic bacteriuria are more likely to experience symptoms of symptomatic infection, but

antimicrobial therapy for this condition does not reduce the frequency of these symptoms. Antimicrobial therapy can have negative effects, including side-effects and re-infection with bacteria with increasing resistance.

In this study, subjects were selected based on inclusion and exclusion criteria, Data was collected from 120 subjects with positive urine cultures.

Patient Demographics: Of the 120 positive urine cultures, 59% were male and 41% were female. The majority of patients were aged 60-70 years (37.5%), followed by those over 70 years (30%), 45-60 years (23.3%), 30-45 years (8.3%), and 18-30 years (0.8%).

Organisms Identified: The most common organism was Escherichia coli, found in 57.5% of cases, followed by Klebsiella species (18.3%), Enterococcus species (9.16%), and other organisms such as Candida albicans, Acinetobacter, Citrobacter, and Staphylococcus species (15%). Among the Klebsiella species, 95% were Klebsiella pneumoniae and 5% were Klebsiella aerogenes.

Treatment Categories: Patients were divided into three groups based on their treatment: Asymptomatic but treated with antibiotics: 16.6% (n=20), Asymptomatic and not treated with antibiotics: 26% (n=31), Symptomatic and treated with antibiotics: 57.5% (n=69). For ASB-specific cases, 39.2% (n=20) were treated with antibiotics, while 60.8% (n=31) were not treated.

Antibiotic Treatment for ASB Cases: Nitrofurantoin was used in 95% of ASB cases, while Norfloxacin was used in 5%. Treatment duration varied, with the majority being treated for 7 days (45%), followed by 5 days (25%), 9 days (10%), 10 days (10%), 14 days (5%), and 15 days (5%).

DISCUSSION

A total of 872 samples were collected, with 212 excluded. Of the remaining 660 cultures, 120 showed growth (positive) and 540 showed no growth (negative). Of the 120 positive cultures, 69 patients were symptomatic and received antimicrobial therapy within 72 hours of urine culture collection. Of these, 51 were asymptomatic, with 31 not treated with antibiotics and 20 treated with antibiotics.

In our study, mean age of patients was found to be 59.08. The patients between ages of 60-70 nearly 37.5% followed by >70: 30% , 45-60: 23.3% , 30-45: 8.3% and 18-30: 0.8% which was found to be correlated to the study conducted by Lin *et al* [8] in which the prevalence is found to be more in elder age groups.

Out of 120 cases, we found that 59% were male and 41% were female. However according to numerous studies, women are more prone to ASB but due to the exclusion criteria of our study, we conclude that men over 60 years of age are more susceptible to get ASB which parallels with study done by Trestioreanu *et al.*[9] Decreased cell-mediated immunity, increased uroepithelial cell receptivity to bacteria, neurogenic bladder dysfunction, altered bladder defenses from obstructive uropathy, decreased prostatic and vaginal antibacterial factors, urine and vaginal pH, hormones, urine and faecal incontinence are factors that contribute to older adults' increased susceptibility to asymptomatic bacteriuria.

The most common organism was Escherichia coli, found in 57.5% of cases, followed by Klebsiella species (18.3%), Enterococcus species (9.16%), and other organisms such as Candida albicans, Acinetobacter, Citrobacter, and Staphylococcus species (15%). Among the Klebsiella species, 95% were Klebsiella pneumoniae and 5% were Klebsiella aerogenes. The most often isolated organism from patients with asymptomatic bacteriuria is still Escherichia coli (E. coli); men are more likely to have coagulase-negative staphylococci, gram-negative bacilli, and enterococcus species. Numerous different organisms can be identified from patients with genitourinary tract disorders including elderly institutionalized patients. Various adhesions, iron sequestration mechanisms and toxins are among the virulence factors that aid in the colonization of the urinary tract by infecting E. coli in cases of mild UTIs assimilating to the study done by Mims *et al.*[10] and Luo *et al.*[11]

Patients were divided into three groups based on their treatment: Asymptomatic but treated with antibiotics: 16.6%, Asymptomatic and not treated with antibiotics: 26%, Symptomatic and treated with antibiotics: 57.5%. For ASB-specific cases, 39.2% were treated with antibiotics, while 60.8% were not treated. Whether to treat asymptomatic patients who have bacteria in their urine is a frequent conundrum in clinical practice. Antimicrobial resistance in bacteria is a serious problem that calls for the identification of clinical conditions in which antimicrobial therapy is not appropriate before using these medicines rationally. Regarding the management of asymptomatic bacteriuria in diabetic patients, opinions differ. The Infectious Diseases Society of America (IDSA)[12] advises treating and screening adults for

asymptomatic bacteriuria before urological procedures where mucosal bleeding is expected, as well as for women who have catheter-acquired bacteriuria that lasts longer than 48 hours after an indwelling catheter is removed. For other patient groups, no treatment is advised which is comparable to other studies conducted by Zhanel *et al*[13], Nicolle *et al.*[14,15,16] and IDSA guidelines.[12]

Symptomatic Patient Analysis: Among the 69 symptomatic patients, 5 deaths occurred due to multiple comorbidities. 24 patients were treated for conditions other than UTIs, and 40 were treated for UTI-related problems. Among the 40 UTI-related cases, 4 had pyelonephritis, 4 had urosepsis, 22 had urinary symptoms (dysuria, burning micturition, suprapubic pain, tenderness, urination urgency, or frequency), and 10 underwent urological procedures.

Limitations

There are some potential limitations in the study

1. It's possible that we did not fully capture the extent of ASB treatment in hospitalized patients by eliminating concurrent infections.
2. As our 6 months study was limited to 3 months due to approval of hospital ethical committee, the sample size was reduced because of which the statistical analysis was insignificant.
3. It's also important to remember that hospital admission regulations may have changed during the time of data harvest, and new initiatives pertaining to antibiotic stewardship or UTI detection may have been implemented.

CONCLUSION

Our study highlights the significance of Asymptomatic Bacteriuria, emphasizing the need for healthcare professionals and the general public to be aware of its prevalence, implications, and appropriate management strategies. Through comprehensive research, we have gained insights into the diverse clinical implications of asymptomatic bacteriuria, while it might not always necessitate treatment, understanding the factors that influence its significance will aid in making informed medical decisions. Our project underscores the importance of a selective approach to diagnosing and treating asymptomatic bacteriuria by identifying patient groups that benefit from intervention and avoiding unnecessary antibiotic use, we contribute to improved patient care and Antibiotic Stewardship. This project also draws attention to the global concern of antibiotic resistance and how inappropriate antibiotic use for asymptomatic

bacteriuria can exacerbate this issue and therefore further emphasizes the need for individualized patient care.

FUTURE RECOMMENDATION

Treating asymptomatic bacteriuria does not provide any therapeutic benefit from the treatment in contrast leads to increased chances of irrational use of antibiotics following antibiotic resistance and economic burden. So, we recommend that use of antibiotics can be avoided in patients with asymptomatic bacteriuria which facilitates overall patient outcome.

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