Urinary Tract Infection Caused by Bacteria in Pregnant women from Kassala State, Sudan

Suhndh Ahmed Musa (suhndh87@gmail.com)
University of Khartoum

Research article

Keywords: Urinary tract infection, Pregnancy, Bacteria, Kassala, Sudan

DOI: https://doi.org/10.21203/rs.3.rs-48038/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License
Abstract

Background Urinary tract infection is a common disease prevailing in pregnancy: microorganisms, mostly bacteria, cause it.

Result The prevalence of urinary tract infection was very high (70.9%). The most common isolate were *Listeria* spp. (38.85%) and *Streptococcus* spp. (28.06%), less common isolates were *Vibrio cholera*, *Neisseria* sp. and *E. coli* with percentages (16.55%,10.07% and 6.47%), respectively.

Conclusion Five bacteria species associated with urinary tract infection in pregnant women recorded in this study. *Vibrio cholera* and *Neisseria* sp. It was first time recorded in Sudan.

Background

Urinary tract infection (UTI) pathogens invades and multiply any urinary tract tissues from the kidney to the urethra [1]. UTI infection includes viruses, fungi, bacteria and mycoplasma [2]. Various microorganisms can be involved in UTI, which has a notable role in increasing the number of stillbirth deliveries [3]. Its related problems are the cause of nearly 150 million annual deaths per year worldwide. The disease can be develop in 40% - 50% of women and 5% of men [4].

The most common UTI isolates of bacteria in Khartoum were *Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Enterococcus faecalis, Staphylococcus aureus, Pseudomonas* spp. and *Staphylococcus* [5, 6]. From Khartoum North, *E. coli* and *S. aureus* reported as the most common [7]. Females are more prone to UTI than males due to their moist genitalia and physiological changes in the urinary tract during pregnancy [8], pregnancy and sexual activities [9]. Pregnant women are at higher risk than non-pregnant [8]. Some complicated risk increase with the presence of UTI like preterm birth, preterm labor, preeclampsia, ammonites, pregnancy induced hypertension and anemia [10], pyelonephritis during pregnancy is most frequent health issues as result of UTI [11].

Results

Isolation of bacteria from urine samples

Bacteriuria colonies were selected as different isolates according to their cultural characteristics on the isolation plates. The strains were maintained at 4°C on nutrient agar medium.

Cultural characteristics of bacteriuria isolates

One hundred thirty-nine bacterial isolates belonging to five genera were obtained. These were fifty-four isolates of *Listeria*, thirty-nine isolates of *Streptococcus* and fourteen isolates of *Neisseria* were isolated using a blood agar medium. Twenty-three isolates of *vibrio cholera* and nine isolates of *Echeria coli* were selectively isolated on Mac-Conkey agar media. (Fig. 1and 2).
Microscopic characteristics and Biochemical tests

In this study, the Gram-positive rods isolates were (38.85%) and the Gram negative rod isolates were (23.02%). The Gram-negative Diplococci were (10.07%) and the Gram-negative Cocci were (28.06%) as shown in Fig. 3.

Biochemical tests were carried out to confirm the presence of the species of bacteriuria from the selected groups. The catalase test gave 100% positive results. Urease test gave 28.06% positive and 71.94% negative reactions. In the oxidase test 26.62% were positive and 73.38% were negative. The indole test recorded 23.02% positive and 76.98% negative results (Table 1).

| No. of Isolates | Microscopic characteristics | Biochemical Test | Bacterial isolates |
|-----------------|----------------------------|------------------|--------------------|
|                 |                            | Catalase | Urease | Oxidase | Indol |                      |
| 54              | +ve Rod                     | +ve      | -ve    | -ve     | -ve   | Listeria sp.          |
| 23              | -ve Rod                     | +ve      | -ve    | +ve     | +ve   | V. cholera            |
| 9               | -ve Rod                     | +ve      | -ve    | -ve     | +ve   | E. coli               |
| 14              | -ve Diplococci              | +ve      | -ve    | +ve     | -ve   | Neisseria sp.         |
| 39              | +ve Cocci                   | +ve      | +ve    | -ve     | -ve   | Streptococcus sp.     |

Discussion

UTI is the most common disease caused by bacteria species in pregnant mothers which can lead to complicated disease and important complications in neonatal. Five bacterial species were found in pregnant women in Alsaudi and AMEC hospitals in Kassala. These were Escherichia coli, Streptococcus sp., Listeria sp., Neisseria sp. and Vibrio cholera. In Khartoum state hospitals, Ahmed et al. isolated E. coli, Klebsiella pneumoniae and Proteus mirabilis [5], Hamdan et al. isolated K. pneumonia, P. aeruginosa, Escherichia. Coli, S. aureus and group B streptococcus isolated bacteria [7], Badri and Mohamed isolated E. coli, K. pneumonia, P. aeruginosa and E. feacalis [6] and Saeed et al. isolated Enterococcus faecalis, Escherichia coli, Staphylococcus aureus, Klebsiella pneumoniae, Proteus mirabilis, Staphylococcus saprophyticus and Pseudomonas spp., as the urinary pathogens [12]. The overpopulation of this border city might cause the difference in bacteria isolated. This study revealed that the UTI in pregnant women in Kassala caused by bacteria is 70.9%. In Khartoum the prevalence of UTI was 14.0% [7] and 35% [12]. In Nigeria 61.5% and 56% recorded by [13, 9] respectively, while Assefa et al. [14] reported 11% in Ethiopia. The present study found that Listeria isolates were the most common (38.85%). In Khartoum E. coli was reported as the most common UTI causative agent [5, 7, 12]. Also Escherichia coli is most common isolates in the other countries (9, 13, 15,16). The prevalence of Streptococcus was also high (28.06%),
rare cases causes by it [2]. Vibrio cholera (16.55%) and Neisseria sp (10.07%) were reported for the first time as UTI agent in Sudan, as the registered in Taiwan [17].less common isolates was Escherichia coli (6.47%).

**Conclusion**

The study recorded that the UTI in pregnant women in Kassala is very high, it caused by five bacteria species associated with urinary tract infection. The highest scores were Listeria sp. and Streptococcus sp., Vibrio cholera and Neisseria sp. it first recorded in Sudan.

**Methods**

**Study design**

This UTI study design was carried out, under ethical clearance, as cross sectional hospital based, at Kassala New Hospital (Alsaudi) and Abdurrahman Elmobark Medical Center (AEMC), Kassala, Sudan.

**Sample collection and culturing of bacteria**

A total of 196 pregnant women with clinical symptoms and a-symptoms of UTI referred to Alsaudi and AEMC were investigated. The women's age varied from 15 to 40 years. Clean-Catch midstream urine method was used [18, 19]. Urine samples were Culturing in MacConkey Agar Medium and Blood Agar Medium.

**Characterization and identification of bacteriuria**

According to Cheesbrough and Bergey's Manual for Determinative Bacteriology [20, 21], identification and characterization of bacteriuria were carried out.

**Microscopic examination**

The bacterial cells were staining (gram reaction) according Collins et al. [22].

**Biochemical tests**

Urease, Oxidase, Indole and Catalase biochemical tests used for bacteriuria identification in this study were conducted according to [23, 24].

**Abbreviations**

UTI
Urinary Tract Infection; Alsaudi:Kassala New Hospital; AMEC:Abdurrahman Elmobark Medical Center

**Declarations**

Ethical approval and consent to participate
The study was approved by Ethical Clearance Committee Federal Ministry of Health, Kassala, Sudan. The consents of the patients were obtained verbally towards agreeing to publish the outcome of the research study. Most of the patients are illiterate, therefore, the Ethical Clearance Committee Federal Ministry of Health, Kassala, Sudan agree to take a verbal consent. In case of patients under 16 years old, the consent were obtained from their parents, verbally.

Consent for publication
Not applicable.

Availability of data and material
The dataset supporting the conclusions of this article is included within the article (and its additional file).

Competing interests
The authors declare that they have no competing interests.

Funding
Not applicable.

Authors’ contributions
SAMA performed the experimental work and wrote the manuscript.

Acknowledgments
The author would like to acknowledge the team of Kassala New Hospital and Abdul Rahman Al-Elmobark Medical Center.

References
1. Najar MS, Saldanha CL, Banday K. A. Approach to urinary tract infections. Indian journal of nephrology. 2009;19(4):129.
2. Tita AT, Andrews WW. Diagnosis and management of clinical chorioamnionitis. SClinics in perinatology. 2010;37(2):339–54.
3. Mittal P, Wing DA. Urinary tract infections in pregnancy. Clinics in perinatology. 2005;32(3):749–64.
4. Totsika M, Moriel DG, Idris A, Rogers BA, Wurpel DJ, Phan MD. et al. Uropathogenic Escherichia coli mediated urinary tract infection. Curr Drug Targets. 2012;13(11):1386–99.
5. Ahmed AA, Osman H, Mansour AM, Musa HA, Ahmed AB, Karrar Z, Hassan HS. Antimicrobial agent resistance in bacterial isolates from patients with diarrhea and urinary tract infection in the Sudan. The American journal of tropical medicine hygiene. 2000;63(5):259–63.
6. Badri A, Mohamed S. Clinical Epidemiology and Antibiogram of UTI Patients Attended Different Hospital in Khartoum, Sudan. Clin Microbiol. 2017;6(301):2.

7. Hamdan HZ, Ziad AHM, Ali SK, Adam I. Epidemiology of urinary tract infections and antibiotics sensitivity among pregnant women at Khartoum North Hospital. Annals of clinical microbiology and antimicrobials. (2011);10(1), 2.

8. Kamienski M. Treatments for symptomatic urinary tract infections during pregnancy. International Journal of Evidence-Based Healthcare. 2012;10(4):415–6.

9. Nwachukwu E, Onyebuchi O, Michael O. Prevalence of urinary tract infections in pregnant women in Onitsha, Nigeria. J Bacteriol Mycol Open Access. 2018;6(5):284–5.

10. Mazor-Dray E, Levy A, Schlaeffer F, Sheiner E. Maternal urinary tract infection: is it independently associated with adverse pregnancy outcome? The Journal of maternal-fetal neonatal medicine. 2009;22(2):124–8.

11. Krcmery S, Hromec J, Demesova D. Treatment of lower urinary tract infection in pregnancy. International journal of antimicrobial agents. 2001;17(4):279–82.

12. Saeed A, Hamid SA, Bayoumi M, Shanam S, Alouffi S, Alharbi SA, … and Abd H. Elevated antibiotic resistance of Sudanese urinary tract infection bacteria. EXCLI journal. 2017;16:1073.

13. Ezeigbo R, Nnadozie R, Asuoha-Chuks N, Ojiako U, Awurum N, Ugochukwu M. Incidence of Urinary Tract Infection (UTI) Among Pregnant Women Attending Antenatal Clinics at Some Selected Hospitals in Aba, Southeastern Nigeria. International Journal of Current Microbiology and Applied Sciences. 2016;5(1):193–9.

14. Assefa A, Asrat D, Woldeamanuel Y, Abdella A, Melesse T. Bacterial profile and drug susceptibility pattern of urinary tract infection in pregnant women at Tikur Anbessa Specialized Hospital Addis Ababa, Ethiopia. Ethiopian medical journal. 2008;46(3):227–35.

15. Kaduma J, Seni J, Chuma C, Kirita R, Mujuni F, Mushu MF, … and Mshana SE Urinary Tract Infections and Preeclampsia among Pregnant Women Attending Two Hospitals in Mwanza City, Tanzania: A 1:1 Matched Case-Control Study. BioMed research international. (2019).

16. Lee AC, Mullany LC, Koffi AK, Rafaqullah I, Khanaan R, Folger LV, … and Uddin J. Urinary tract infections in pregnancy in a rural population of Bangladesh: population-based prevalence, risk factors, etiology, and antibiotic resistance. BMC Pregnancy Childbirth. 2020;20(1):1.

17. Chen YT, Tang HJ, Chao CM. Urinary tract infection due to NonO1 Vibrio cholera. Journal of microbiology, immunology, and infection = Wei mian yu gan ran za zhi. (2016);49(2), 305.

18. Karlowsky JA, Hoban DJ, DeCorby MR, Laing NM, Zhanel GG. Fluoroquinolone-resistant urinary isolates of Escherichia coli from outpatients are frequently multidrug resistant: results from the North American Urinary Tract Infection Collaborative Alliance-Quinolone Resistance study. Antimicrobial agents chemotherapy. 2006;50(6):2251–4.

19. Solberg OD, Ajiboye RM, Riley LW. Origin of class 1 and 2 integrons and gene cassettes in a population-based sample of uropathogenic Escherichia coli. Journal of clinical microbiology. 2006;44(4):1347–51.
20. Cheesbrough M. Medical Laboratory Manual for Tropical Countries. 1 ed. Cambridge: University Press; 1991.

21. Buchanan RE, Gibbons NE. Bergey's Manual of Determinative Bacteriology. Beijing: Science Press; 1984.

22. Collins CH, Lynes PM, Grange JM. Microbiological Methods (7th Edn.) Butterwort. (1995).

23. MacFaddin JF Biochemical Tests for Identification of Medical Bacteria, Williams and Wilkins. Philadelphia, PA. (2000); 113.

24. Taylor WI, Achanzar D. Catalase test as an aid to the identification of Enterobacteriaceae. Appl Environ Microbiol. 1972;24(1):58–61.

**Figures**

![Figure 1](image1)

**Figure 1**

E.coli on MacConkey agar media

![Figure 2](image2)

**Figure 2**

Neisseria on blood agar medium
Figure 3

Rod shape on mac Conkey agar media cocci shape on blood agar medium