

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

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## Research article

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# 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. 1 and 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).

Table 1  
Microscopic and biochemical tests for bacteriuria isolates

No. of Isolates	Microscopic characteristics	Biochemical Test				Bacterial isolates
		Catalase	Urease	Oxidase	Indol	
54	+ve Rod	+ve	-ve	-ve	-ve	<i>Listeria</i> sp.
23	-ve Rod	+ve	-ve	+ve	+ve	<i>V. cholera</i>
9	-ve Rod	+ve	-ve	-ve	+ve	<i>E. coli</i>
14	-ve Diplococci	+ve	-ve	+ve	-ve	<i>Neisseria</i> sp.
39	+ve Cocci	+ve	+ve	-ve	-ve	<i>Streptococcus</i> 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. pneumoni*, *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. faecalis* [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 *Streptoococcus* was also high (28.06%),

rare cases caused by it [2]. *Vibrio cholera* (16.55%) and *Neisseria* sp (10.07%) were reported for the first time as UTI agent in Sudan, as first recorded in Taiwan [17]. Less common isolates were *Escherichia coli* (6.47%).

## Conclusion

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

## Methods

### Study design

This UTI study design was carried out, under ethical clearance, as a cross-sectional hospital-based study, 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 asymptomatic 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 cultured 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 stained (Gram reaction) according to 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; AEMC: 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.

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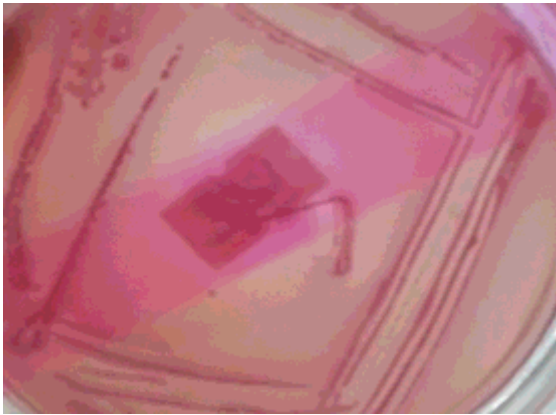
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## Figures



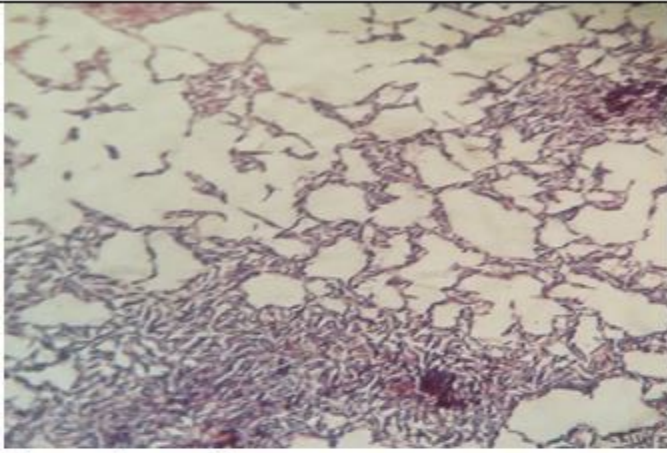
**Figure 1**

E.coli on MacConkey agar media

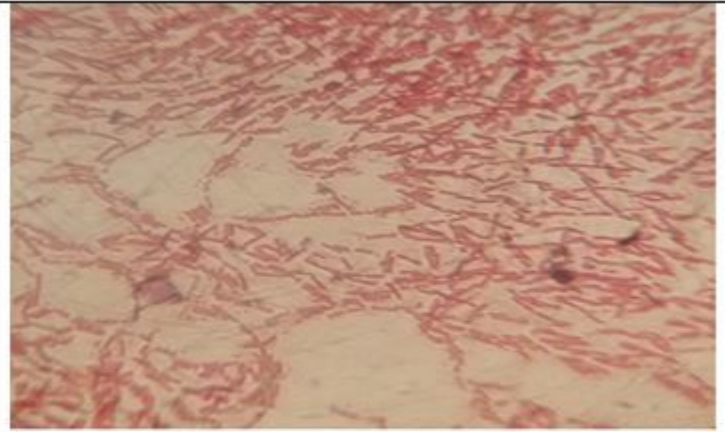


**Figure 2**

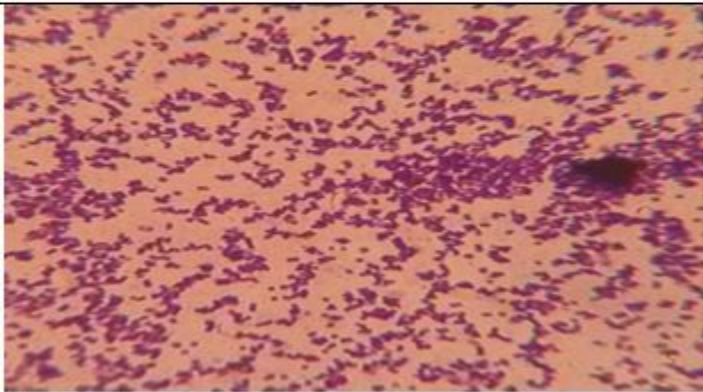
Neisseria on blood agar medium



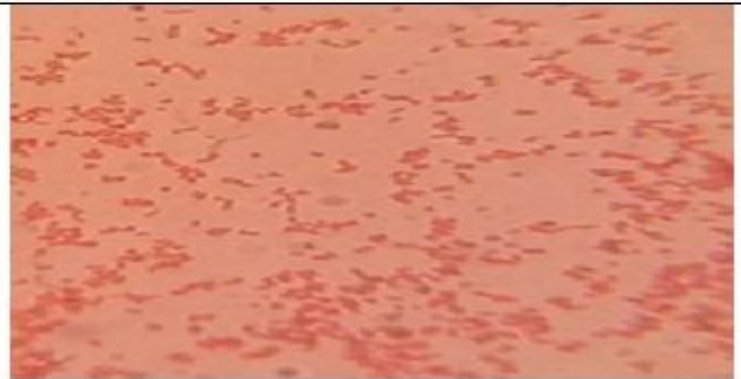
Gram +ve rod



Gram -ve rod



Gram +ve cocci



Gram -ve Diplococci

**Figure 3**

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