# The prevalence of *Escherichia coli* causing urinary tract infections in Uncircumcised children under the age of five

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## Absrtact

The current study was conducted the relationship between circumcision and urinary tract infection in children under five years. in total, 100 child were included from various hospitals in the city of samarraa, which included (Samarra General Hospital and alkhairi Hospital), for the period between 9/1/2022 and 4/15 /2023

The current study aimed to isolate Escherichia coli bacteria that cause urinary tract infections in children less than five years old and evaluate some risk factors. 100 samples were isolated from children suffering from urinary tract infections of both genders from various hospitals in the city of Samarra, for the period between 9/1/2022 and 4/15. /2023. The results of microscopic examination showed that 55% of the samples were accompanied by bacteriuria and pyuria, 12% with bacteriuria, 22% with pyuria, and 11% without both. Bacterial culture results showed that 67% of the samples showed bacterial growth, and 64.1% of the specimen were diagnosed as *Escherichia coli* and the rest of the percentage was distributed among other bacterial species. The results showed that all male samples that showed bacterial growth were from uncircumcised children. The isolates showed resistance to many antibiotics. and the blood test for males and females showed a decrease in the level of ferritin and a decrease in some blood parameters compared with the normal levels, especially hemoglobin.

**Keywords:** uropathogenic, *Escherishia coli* , UTI, Uncircumcised, CBC

## 1.Inrtoduction

Urinary tract infection (UTI), is the one of the most common infectious diseases in newborns, infants and in the early first five years, which predicts the risk of end-stage renal failure, its mainly caused by uropathogenic *Escherichia coli* (UPEC) [1][2].

The risk factor for urinary tract infection in uncircumcised male children, is higher in the first year of life than in circumcised children [3]. The increase in bacterial colonization around the urethra is greater in uncircumcised males, which leads to urinary tract infection [4]. Uncircumcised infants have a 5 to 10 times greater risk of developing a urinary tract infection during the treatment period [5].

Considering exposure to the infectious agent of the host, the nutritional status of the host is one of the factors involved in the invasion and spread of infection[6]. Hemoglobin concentration is an indicator of chronic nutritional status and the ability of the blood to carry oxygen[7]. Since children are growing rapidly, their nutritional needs are very high[8]. In conditions such as rapid growth, the risk of spreading infection is high and this cycle leads to malnutrition[9]. Anemia is found in approximately 30% of children worldwide [10]. Iron deficiency anemia in children usually develops between the ages of 6 months and 3 years, during which time childhood recurs infection also occurs [11].

The aim of the study is to evaluate the risk factors such as circumcision and iron deficiency anemia in recurrent urinary tract infections in children

## 2.Maternal and Methods

### Sample collection

One hundred urine samples were collected from children suffering from urinary tract infections under five years old from various hospitals in the city of Samarra, which included Samarra General Hospital and alkhairi Hospital, for the period between 9/1/2022 and 4/15. /2023, urine sterile cups were used to collect the sample from the middle of the urine in the early morning for all patient, ready culture media are prepared according to the manufacturer that fixed on their packaging, these media are MacConkey agar, Muller-Hinton agar, Eosin methylene blue (EMB)and Triple sugar iron (Himedia, India), CBC test used newly developed

automated hematology analyser XN (Sysmex, Kobe, Japan) and ferritin test preformed using ELIZA Kit.

## 3.Results and Discusstion

Isolation and Identification

A total of 100 clinical samples were collected from children infected with UTI under five years, 55 from male and 45 from female, and depending on cultural characteristics of growing bacteria 67% samples were yielded positive growth, 42 samples bacterial growth from males and 25 bacterial growth from females.as shown in table 1.

**Table1. Bacterial and non bacterial growth in urine samples.**

| Genders | bacterial growth | | non bacterial growth | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Male | 42 | 62.7 | 13 | 39.4 | 55 | 55 |
| Female | 25 | 37.3 | 20 | 60.6 | 45 | 45 |
| No. | 67 | 67% | 33 | 33% | 100 | 100 |

## Microscopically examination of urine

The presence of $10^5$ or more colony-forming units per milliliter of urine represents bacteriuria, and the presence of 10 or more cells per High power field (H.P.F) is a significant number to distinguish pyuria.

It is clear from Figure 1 that the percentage of samples in which bacteriuria and pyuria appeared was 55% and bacteriuria not accompanied by pyuria was 12% while pyuria not accompanied by bacteriuria was 22% and the sample without pyuria 11% among children.

The reason for the presence of pyuria that is not accompanied by bacterial growth may be due to that the patients taking antibiotics during or before collecting the samples, or the presence of foreign bodies such as kidney stones, as well as infection with microorganisms that require special

conditions for growth, such as anaerobic bacteria and filters, As for patients who did not have pyuria or bacteriuria, the reason may be due to the presence of symptoms and signs resulting from another disease similar to those that indicate a urinary tract infection.

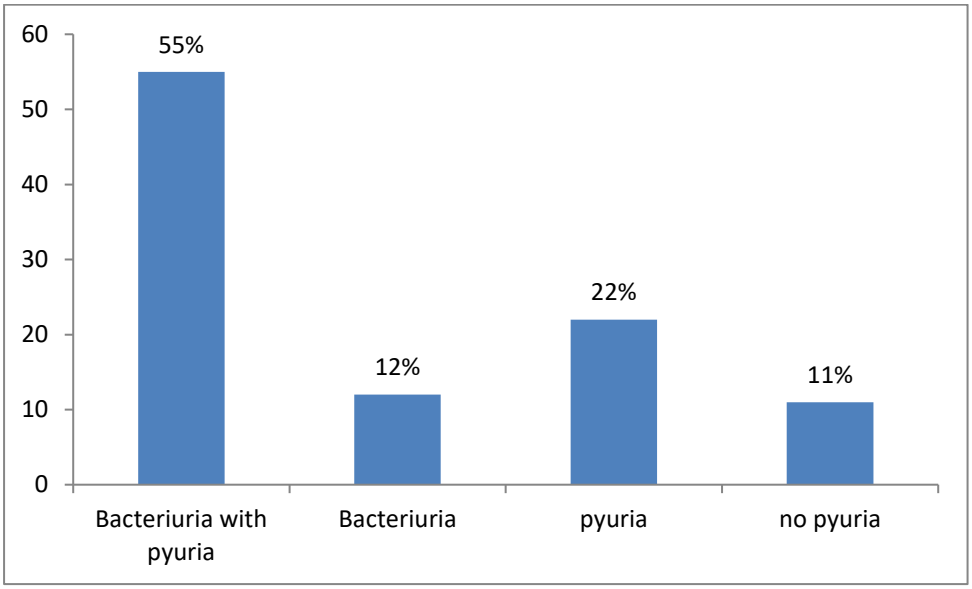


Figure 1: Cases of bacteriuria and pyuria that appeared under Microscopically examination

Urinary tract infections (UTIs) are more common in infants and young children, with a higher incidence in males than females, In infants, uncircumcised males have a significantly higher risk of developing UTIs compared to circumcised males, a frequency of urinary tract infection (UTI) is higher in uncircumcised infants [12]. Although The studies found that circumcision has been associated with a lower incidence of UTIs in boys with Vesicoureteral reflux (VUR), and reduced the risk of UTI recurrence by 87% in boys with high-grade VUR [13].

In 55 samples of males, 10 samples from circumcised males showed no growth of bacteria as shown in table 2, yet the children suffering from UTI, because circumcision reduces the possibility of urinary tract infection in children [14], Studies have found significantly more bacteria in uncircumcised boys compared to circumcised boys [15].

**Table 2. Circumcised and Uncircumcised males groups with UTI infection.**

| male patients | Positive growth | | Negative growth | | Total | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Circumcised | 0 | 0 | 10 | 76.9 | 10 | 18.2 |
| Uncircumcised | 42 | 100 | 3 | 23.1 | 45 | 81.8 |
| Total | 42 | 100 | 13 | 100 | 55 | 100 |

The morphological and biochemical diagnostic results in table 3 were identical to those of *Escherichia coli*, as stated in approved diagnostic sources [16].

**Table 3 Biochemical and morphological properties results of isolated bacteria**

| **Tests** | **Cata** | **Oxi** | **IMVIC** | **TSI** | **Lac** | **Ur** | **EMB** | **mot** |
|---|---|---|---|---|---|---|---|---|
| Results | + | - | ++-- | A/A $Gas^{+}$ $H_2S^{-}$ | + | V | Green metalic sheen | + |

It is noted from figure 2 that the highest percentage of isolation was of *E. coli*, at a rate 64.1%, while the remaining percentage was of other species. *E. coli* is a common cause of urinary tract infections in children and consistent with the previously cited studies [17] It is estimated that *E. coli* accounts for 80 to 90% of UTIs in children[18].

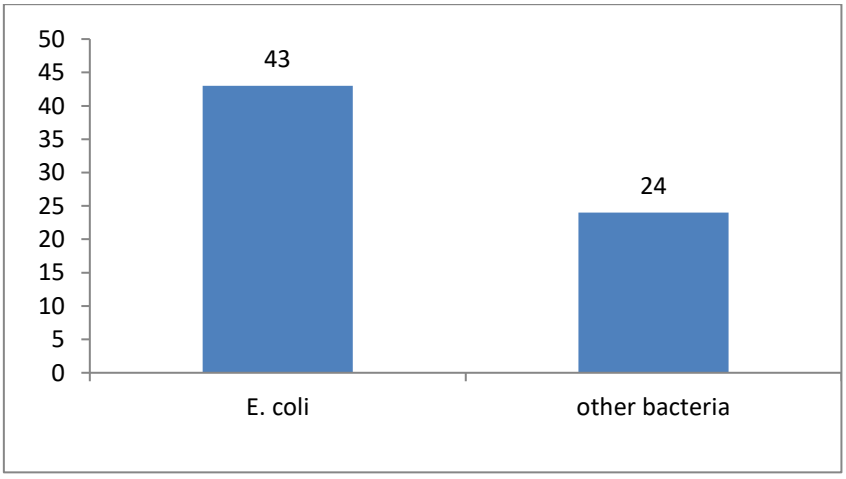


**Figure 2. *E.coli* and other bacteria from bacterial isolation**

It can be seen from figure 3 the highest resistance rate is 100% to ampicillin and 93.40% Augmentin, the results of the current study disagree with the [19] who found that 35% isolates were Augmentin resistant, due to the primary mechanism of the production of β-lactamase enzymes, changes in the target protein, reduced outer membrane permeability and increased expression of drug efflux pumps [20, 21]

The resistance of *E.coli* to cefotoxime was 60%, this do not agree with[22] who found that 98.3% of the isolates were resistant to cefotaxime, The resistance for cefepime was 40.6% , this do not consist with [23] who reported that 28.6% were resistant to cefepime, while [24] found *E.coli* resistance in 85 % of the isolates were resistant to Cefepime. Azithromycin resistance in *E.coli* was 40%, Gomes *et al* [25] indicated that 25.9% of *E. coli* isolates resistant to azithromycin. The results for ciprofloxacin resistance was 20%, this result is not similar to the results of [26] who indicated that 28.03% of *E. coli* isolates were resistant to ciprofloxacin, the reason related to presence of plasmid-mediated quinolone resistance genes and mutations in the quinolone resistance-determining regions. Gentamicin and Tobramycin resistance was 13.40%, Tobramycin resistance is often associated with gentamicin resistance, as both antibiotics target the bacterial ribosome. Therefore, E. coli strains resistant to gentamicin are likely to be resistant to tobramycin as well [27]. This percentage disagree with [28]who recorded 64.0% resistance for Gentamicin. *E.coli* resistance to Imipenem was 0%, the researchers [29] found imipenem resistance was 0% , and it was the most effective antimicrobial agent, Also [30] found all strains of *E.coli* were highly susceptible to imipenem.

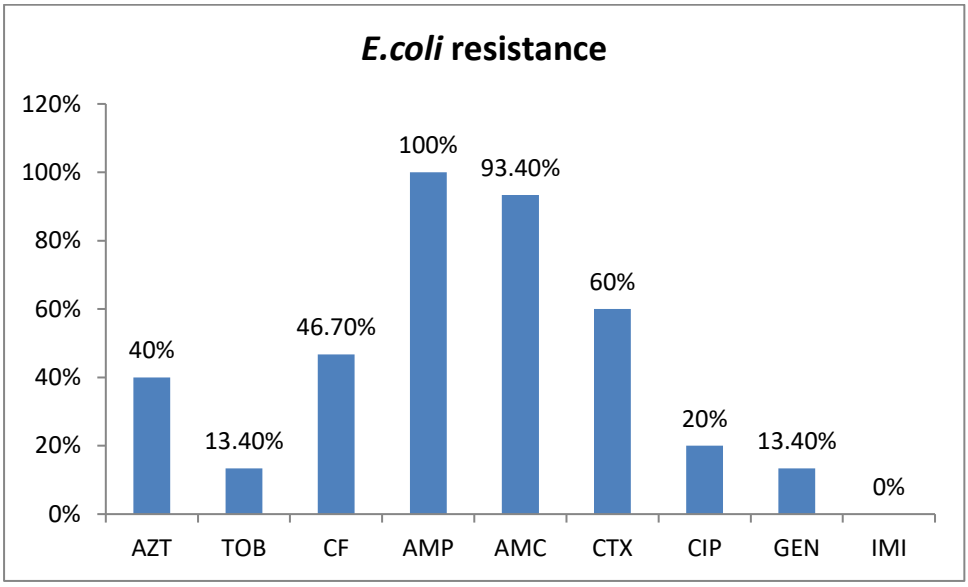


Figure 3 the resistance of *E.coli* against some antibiotics.

Imipenem (IMI) , Gentamicin(GEN), (CIP), Ciprofloxacin, Cefotaxime(CTX), Augmentin (AMC), Ampicillin (AMP), Cefepime (CF), Tobramycin (TOB), Azthromycin (AZT).

## Conclusion

Uncircumcised children are more likely to suffer from urinary tract infections, and Escherichia coli bacteria predominate as the cause of the infection.

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