



Research Paper

**A RETROSPECTIVE STUDY ON RISKFACTORS, INCIDENCE RATE AND
MANAGEMENT OF URINARY TRACT INFECTIONS IN PAEDIATRICS
DEPARTMENT OF A TERITIARYCARE HOSPITAL**

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Abstract

Urinary tract infection (UTI) is a common bacterial infection in children. It may be difficult to recognise urinary tract infection in children because the presenting symptoms and signs are non-specific, particularly in infants and children younger than 3 years. Even single confirmed UTI is serious due to potential for recurrent UTI, parenchymal damage, hypertension and renal failure. And this study aims in finding the incidence rate, risk factors and clinical management of urinary tract infection in paediatrics in a tertiary care hospital, SVIMS, Tirupati. All children between 1 month to 14 years of age with urinary tract infection were included in the study. Further evaluation was done based on Indian academy of Paediatrics guidelines. Demographic data, incidence rate, risk factors and clinical management of UTI were studied and analysed. Out of 30 cases of urinary tract infection, majority were boys aged between 1 month to 7 years. During the age group 7 to 14 years female children were more prone than male children. Incidence rate was found to be 15.38%. Post-natal hydronephrosis was found to be the highest risk factor i.e., 37% between the age group 2 months to 6 years. *Escherichia coli*, *streptococcus*, *Klebsiella* and *enterococcus* were the causative organisms of urinary tract infection. Out of 30 patients who have undergone culture sensitivity test only 10 patients were culture positive. Antibiotics mostly used were Ceftriaxone of 75mg/kg/day through intravenous route for 10 days followed by Cefixime through oral route for 4 days. The present retrospective study on risk factors, incidence rate and management of urinary tract infections in paediatrics was carried out in a tertiary care hospital. Our study showed that males are more prone to urinary tract infection than females and *Escherichia coli* was the common causative organism found according to the urine culture test. Incidence rate was found to be 15.38% and Ceftriaxone,

Cefixime were commonly prescribed antibiotics given according to the culture sensitivity test. We conclude that usage of antibiotics were rationalized and given according to the empirical therapy of paediatrics.

Key words: incidence, risk factors, pediatrics, urinary tract infection.

INTRODUCTION

Urinary tract infection (UTI) is defined as significant bacteriuria in the presence of a constellation of symptoms such as dysuria (painful urination), increased urinary frequency and urgency, suprapubic discomfort and costovertebral angle tenderness. When it affects the lower urinary tract it is known as a bladder infection (cystitis) and when it affects the upper urinary tract it is known as kidney infection (pyelonephritis)⁰².

Urinary tract infection is a common bacterial infection causing illness in infants and children. It may be difficult to recognise urinary tract infections in children because the presenting symptoms and signs are non-specific, particularly in infants and children younger than 3 years. Collecting urine and interpreting results are not easy in this age group, so it may not always be possible to unequivocally confirm the diagnosis. Current management, which includes imaging, prophylaxis and prolonged follow-up, has placed a heavy burden on NHS primary and secondary care resources. It is costly, based on limited evidence and is unpleasant for children and distressing for their parents or carers. The aim of this guideline is to achieve more consistent clinical practice, based on accurate diagnosis and effective management.

Moreover, the publication of the NICE clinical practice guidelines (CPG) ⁰³ represents a milestone in urinary tract infection. It is based on systemic reviews and represents a major change from the concepts and interventions offered to date, which were mainly based on the document prepared in 1990's American academy of paediatrics⁰⁴. After respiratory tract infections, urinary tract infection is one of the most common bacterial infections in routine paediatric practice. It is estimated that 3-7 out of every 100 children will have urinary tract infection⁰⁵⁻⁰⁸. Moreover; there are wide variations in the interpretation of clinical signs which should guide us to a diagnosis of urinary tract infections, especially in younger children^{09, 10}.

Urinary tract infection (UTI) is a problem that is frequently encountered by paediatric healthcare providers. Over recent decades, the importance of urinary tract infections has been increasingly recognized, in particular the role of as an occult cause of febrile illness in young children. Although urinary tract infections do not occur with as great a frequency in children as in adults, they can be a source of significant morbidity in children. For reasons that are not yet completely understood, a minority of urinary tract infections in children progress to renal scarring, hypertension and renal insufficiency¹¹.

In the past 30–50 years, the natural history of urinary tract infection (UTI) in children has changed as a result of the introduction of antibiotics and improvements in health care. This change has contributed to uncertainty about the most appropriate and effective way to diagnose and treat UTI in children and whether or not investigations and follow-up are justified.

UTI is a common bacterial infection causing illness in children. It may be difficult to recognize UTI in children because the presenting symptoms and/or signs are non-specific, particularly in younger children. Urine collection and interpretation of urine tests in children are not easy and therefore it may not always be possible to unequivocally confirm the diagnosis.

Antibiotics treatment of urinary tract infection starts in most cases without knowing the bacteria responsible for the infection local antibiotic resistance should guide empiric treatment choice; a use of a facility specific antibiogram should be considered before starting the empiric therapy according to the sensitivity. In order to cease the irrational use of antibiotics it is necessary to perform a urine culture test. If this is not done the resident (or) patient may develop resistance at their childhood itself, due to unwanted usage of antibiotics.

Current management involving imaging, prophylaxis and prolonged follow-up has placed a heavy burden on NHS primary and secondary care resources. It is unpleasant for children and families, costly and based on limited evidence. The aim of this guideline is to lead to more consistent clinical practice by considering the importance of accurate diagnosis and the effectiveness of subsequent investigations and treatment (including surgical intervention) and follow-up in altering the outcome.

MATERIALS AND METHODS

All children between 1 month to 14 years of age with urinary tract infection were included in the study. Further evaluation was done based on Indian academy of Paediatrics guidelines. Demographic data, incidence rate, risk factors and clinical management of UTI were studied and analysed.

RESULTS

Incidence rate

Out of 195 patients admitted in paediatric ward, the patients with urinary tract infection were found to be 30. Therefore the incidence rate was found to be 15.38%. These details were depicted in table no. 5.1.

Table 5.1: Incidence rate

| TOTAL CASES | UTI CASES | PERCENTAGE |
|-------------|-----------|------------|
| 195 | 30 | 15.38% |

The age distribution ranged from 0-14 years, from 0-1 year was 10%, 2-6years was 40% and from 7-14 years it was 50%. The details were depicted in table no. 5.2, figure no. 5.2.

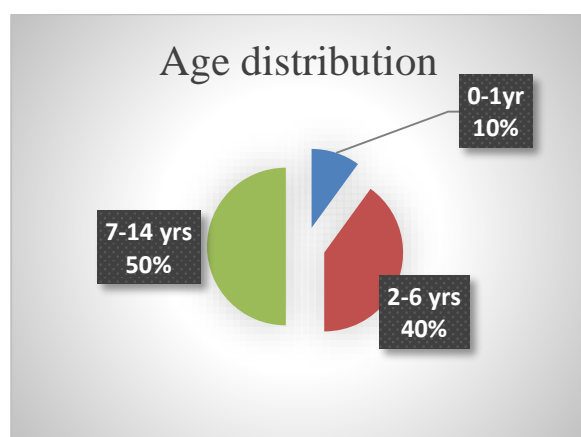


Figure 5.2: Age distribution

Table 5.2: Baseline Observations

| VARIABLES | ATTRIBUTES | N (FREQUENCY) | PERCENTAGE (%) |
|---------------------|--------------------------------------|---------------|----------------|
| Gender | Male | 18 | 60 |
| | Female | 12 | 40 |
| Age | 0-1year | 3 | 10 |
| | 2-6years | 12 | 40 |
| | 7-14years | 15 | 50 |
| Clinical features | Fever | 21 | 46.6 |
| | Burning micturition | 13 | 28.8 |
| | Abdominal pain | 11 | 24.4 |
| Risk factors | Antenatal hydronephrosis | 2 | 25 |
| | Steroid dependent nephrotic syndrome | 1 | 12.5 |
| | Hydronephrosis | 3 | 37.5 |
| | Phimosis | 2 | 25 |
| Causative Organisms | Escherichia coli | 7 | 70 |
| | Staphylococcus aureus | 1 | 10 |
| | Klebsiella | 1 | 10 |
| | Enterococcus | 1 | 10 |

The gender distribution of males and females were 60% and 40% respectively. This showed that males were more prone than females. The details were depicted in table no. 5.2, figure 5.3.

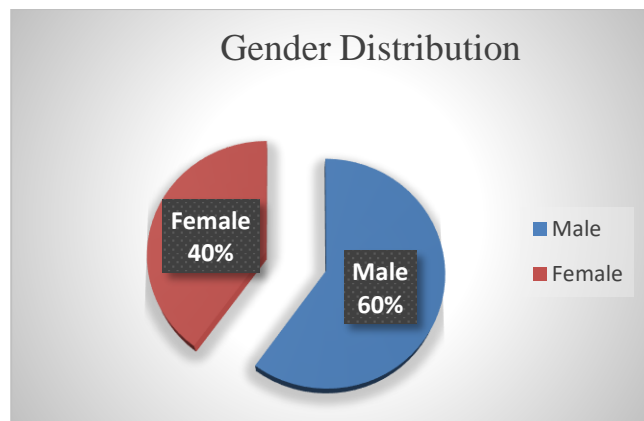


Figure 5.3: Gender Distributions of Male and Female

The clinical features of urinary tract infections in our paediatrics were found to be fever (47%), abdominal pain (24%) and burning micturition (29%). Which showed that fever was most common clinical feature observed. These details were depicted in table no. 5.2 and figure no. 5.4.

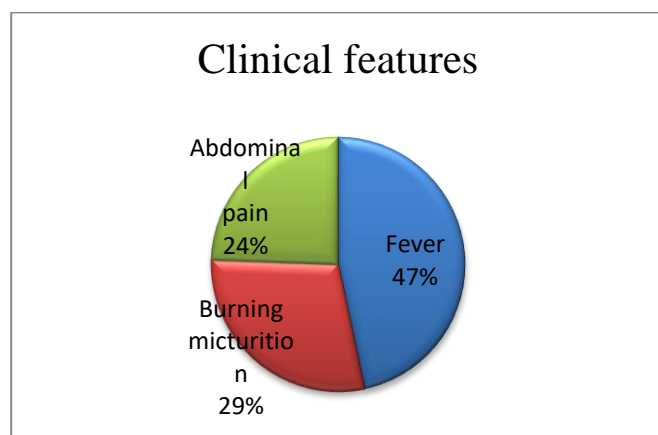


Figure 5.4: Clinical Features of Urinary Tract Infections

The risk factors of urinary tract infections in paediatrics were found to be antenatal hydronephrosis (25%), post natal hydronephrosis (37.5%), steroid dependent nephrotic syndrome (12.5%) and phimosis (25%). These details were depicted in table no. 5.2 and figure no. 5.5.

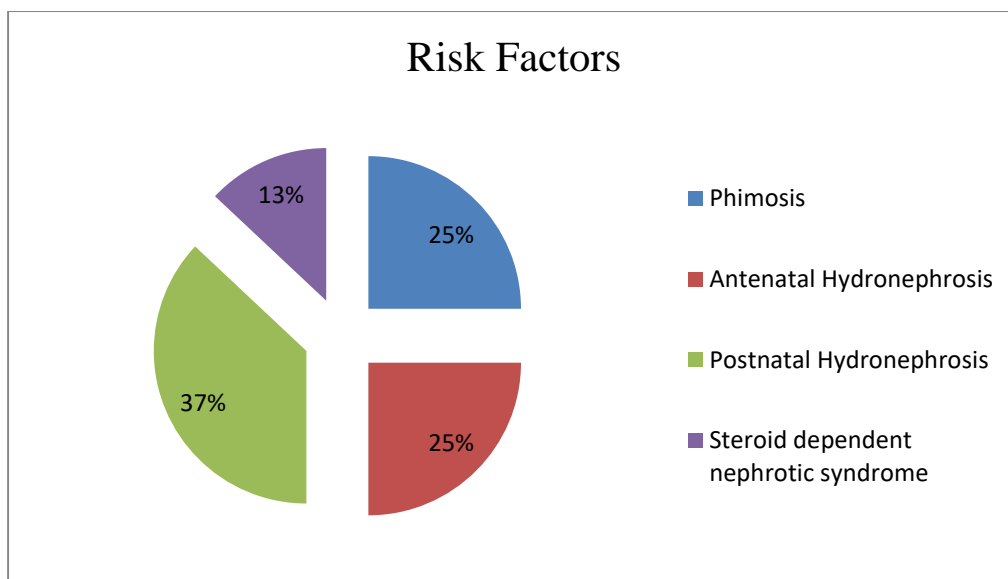


Figure 5.5: Risk factors of Urinary Tract Infections

The main cause of urinary tract infection was found to be microorganisms and the following are the microorganisms most commonly observed they are Escherichia coli (70%), staphylococcus aureus (10%), Klebsiella (10%), Enterococcus (10%). Out of 30 patients only 10 patients are found to be culture positive. These details were depicted in table no. 5.2 and figure no. 5.6.

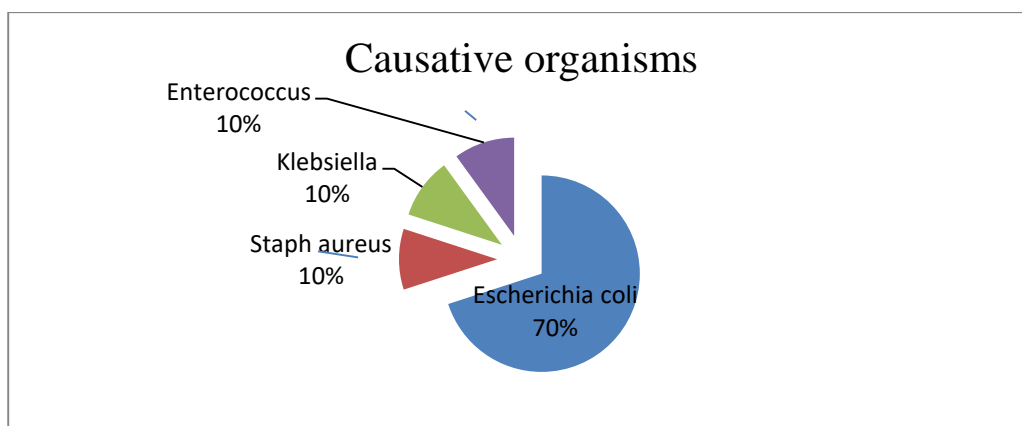


Figure 5.6: Causative organisms

Risk factor distribution based on age

In patients from age group 0-1 the common risk factors found was antenatal hydronephrosis (100%). From age group 2-6years the common risk factors were steroid dependent nephrotic syndrome (33.3%), phimosis (33.3%), postnatal hydronephrosis (33.3%) from age group 7-14years no risk factors were found. These details were depicted in table no. 5.3 and figure no. 5.7.

Table 5.3: Risk factor distribution based on age

| AGE | RISK FACTORS | FREQUENCY | PERCENTAGE |
|-----------|--------------------------------------|-----------|------------|
| 0-1 years | Antenatal hydronephrosis | 2 | 100% |
| 2-6 years | Postnatal hydronephrosis | 1 | 33.3% |
| | phimosis | 1 | 33.3% |
| | Steroid dependent nephrotic syndrome | 1 | 33.3% |

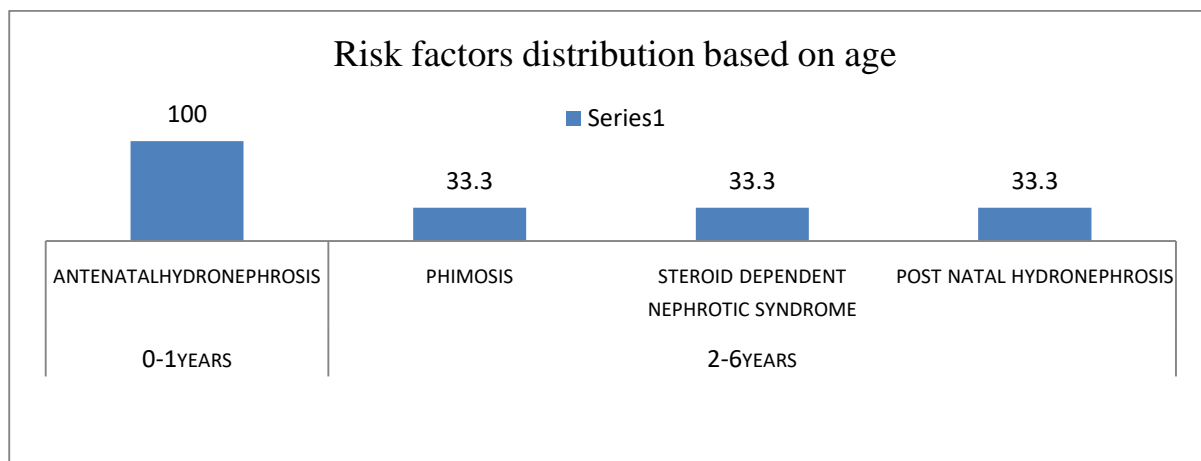


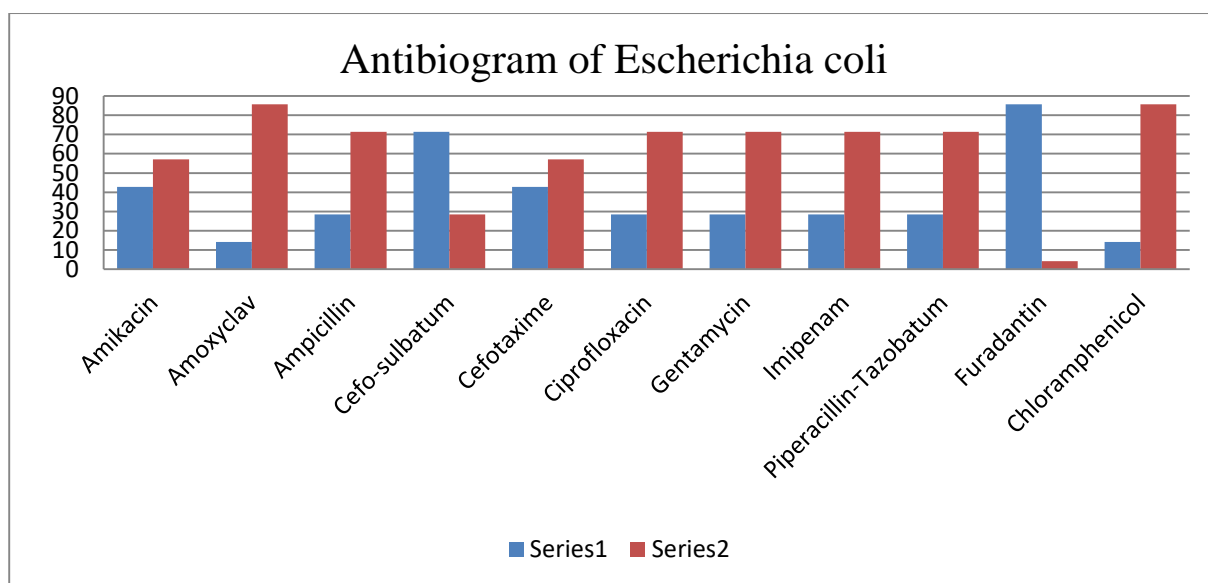
Figure 5.7: Risk factors distribution based on age

Antibiogram of Escherichia coli

In the Antibiogram of Escherichia Coli we found that sensitivity for furadantin was found in most of patients. It was resistant to amoxyclav and chloramphenicol antibiotics. These details were depicted in table no. 5.4 and figure no. 5.8.

Table 5.4: Antibiogram of Escherichia coli

| S.NO | ANTIBIOTICS | SENSITIVITY | RESISTANCE |
|------|-------------------------|-------------|------------|
| 1 | Amikacin | 42.8 | 57.1 |
| 2 | Amoxyclav | 14.2 | 85.7 |
| 3 | Ampicillin | 28.5 | 71.4 |
| 4 | Cefo-sulbactum | 71.4 | 28.5 |
| 5 | Cefotaxime | 42.8 | 57.1 |
| 6 | Ciprofloxacin | 28.5 | 71.4 |
| 7 | Gentamicin | 28.5 | 71.4 |
| 8 | Imipenam | 28.5 | 71.4 |
| 9 | Piperacillin-tazobactum | 28.5 | 71.4 |
| 10 | Furadantin | 85.7 | 4.2 |
| 11 | Chloramphenicol | 14.2 | 85.7 |



Series 1- Sensitivity, Series 2- Resistance

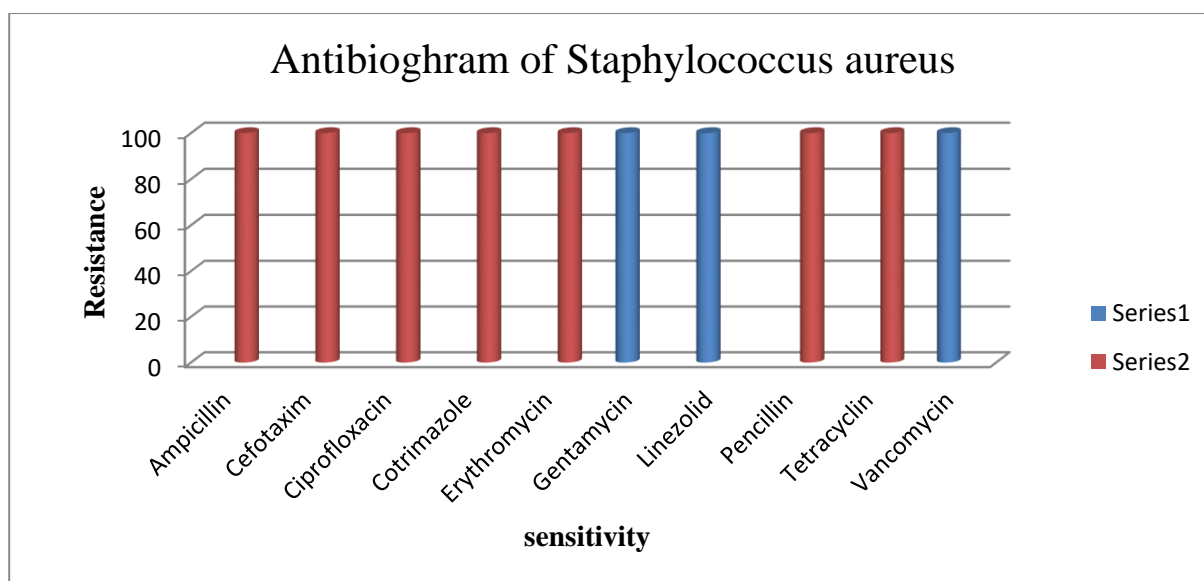
Figure 5.8: Antibiogram of Escherichia coli

Antibiogram of staphylococcus aureus

In the Antibiogram of single patient who was found positive to staphylococcus aureus had shown sensitivity to Gentamicin, linezolid and vancomycin. It was resistant to most of the antibiotics such as Ampicillin, Cefoxitine, Ciprofloxacin; Cotrimoxazole etc., these details were depicted in table no. 5.5 and figure no. 5.8.

Table 5.5: Antibiogram of staphylococcus aureus

| S.NO | ANTIBIOTICS | SENSITIVITY | RESISTANCE |
|------|---------------|-------------|------------|
| 1 | Ampicillin | - | 100 |
| 2 | Cefoxitine | - | 100 |
| 3 | Ciprofloxacin | - | 100 |
| 4 | Cotrimoxazole | - | 100 |
| 5 | Erythromycin | - | 100 |
| 6 | Gentamicin | 100 | - |
| 7 | Linezolid | 100 | - |
| 8 | Penicillin | - | 100 |
| 9 | Tetracycline | - | 100 |
| 10 | Vancomycin | 100 | - |



Series 1- Sensitivity, Series 2- Resistance

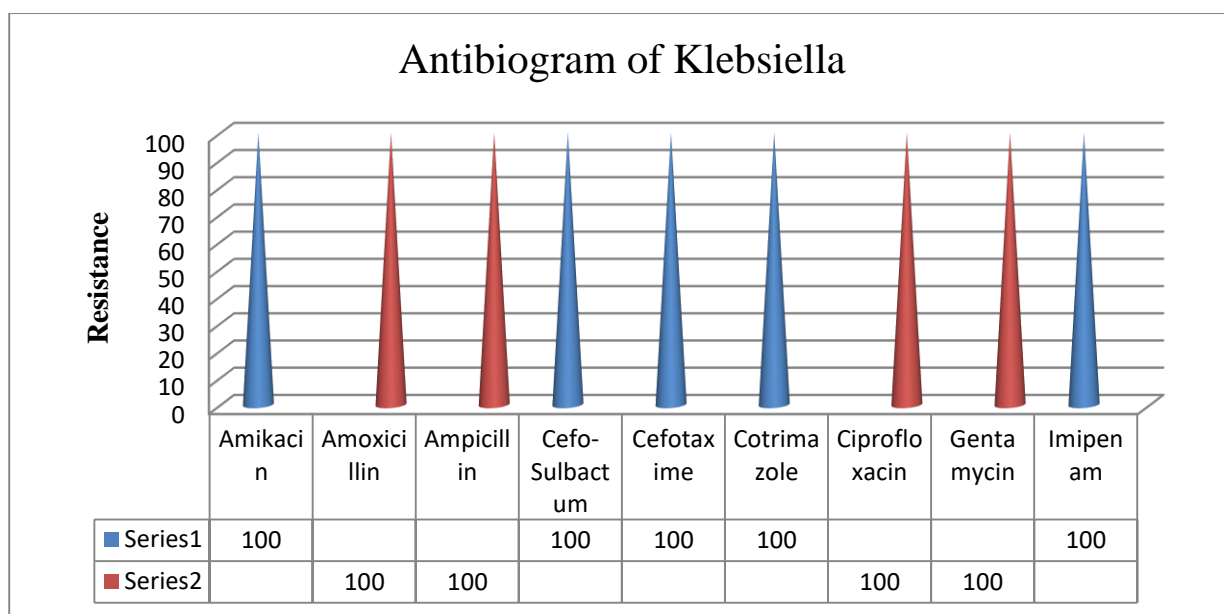
Figure 5.9: Antibiogram of Staphylococcus aureus

Antibiogram of Klebsiella

In the Antibiogram of single patient who was found positive to Klebsiella had shown sensitivity to Amikacin, Ceftio-sulbactam, Cefotaxime, Cotrimoxazole and Imipenam. It was resistant to Amoxicillin, Ampicillin, Ciprofloxacin and Gentamicin. These details were depicted in table no. 5.6 and figure no.5.9.

Table 5.6: Antibiogram of Klebsiella

| S.NO | ANTIBIOTICS | SENSITIVITY | RESISTANCE |
|------|------------------|-------------|------------|
| 1 | Amikacin | 100 | - |
| 2 | Amoxicillin | - | 100 |
| 3 | Ampicillin | - | 100 |
| 4 | Ceftio-sulbactam | 100 | - |
| 5 | Cefotaxime | 100 | - |
| 6 | Cotrimoxazole | 100 | - |
| 7 | Ciprofloxacin | - | 100 |
| 8 | Gentamicin | - | 100 |
| 9 | Imipenam | 100 | - |



Series 1- Sensitivity, Series 2- Resistance

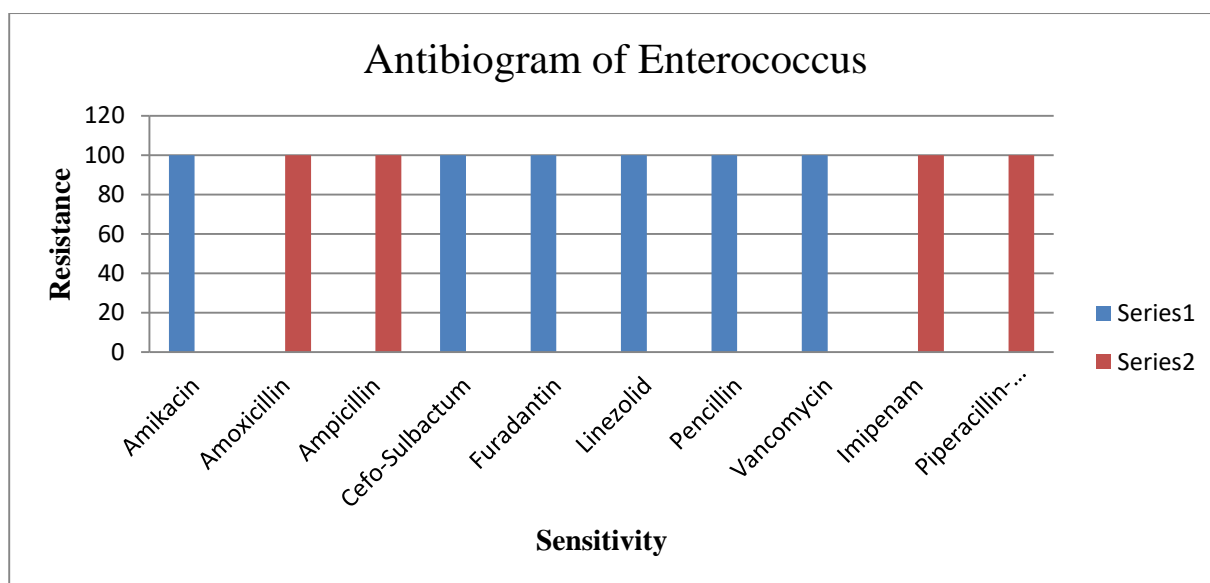
Figure 5.10: Antibiogram of Klebsiella

Antibiogram of Enterococcus

In the antibiogram of single patient who was found positive to Enterococcus had shown sensitivity to antibiotics such as Amikacin, Cefo-sulbactum, Furadantin, Linezolid, Penicillin, and Vancomycin. It was resistant to Amoxicillin, Ampicillin, Imipenam and Piperacillin- Tazobactum. These details were depicted in table no. 5.7 and figure no. 5.10.

Table 5.7: Antibiogram of Enterococcus

| S.NO | ANTIBIOTICS | SENSITIVITY | RESISTANCE |
|------|-------------------------|-------------|------------|
| 1 | Amikacin | 100 | - |
| 2 | Amoxicillin | - | 100 |
| 3 | Ampicillin | - | 100 |
| 4 | Cefo-sulbactum | 100 | - |
| 5 | Furadantin | 100 | - |
| 6 | Linezolid | 100 | - |
| 7 | Penicillin | 100 | - |
| 8 | Vancomycin | 100 | - |
| 9 | Imipenam | - | 100 |
| 10 | Piperacillin-tazobactum | - | 100 |



Series 1- Sensitivity, Series 2- Resistance

Figure 5.11: Antibiogram of Enterococcus

Management outcomes

In this study we found that mainly four micro-organisms were reason to cause urinary tract infection. Out of 30 patients 10 patients were culture positive. Out of which 7 patients were with Escherichia Coli, one patient with Staphylococcus aureus, one patient with Klebsiella, one patient with Enterococcus bacteria. These details were depicted in table no. 5.8 and figure no. 5.11.

Table 5.8: Management outcomes

| S.NO | ORGANISM | NO. OF PATIENTS | RECOVERY |
|------|-----------------------|-----------------|-----------|
| 1 | Escherichia. Coli | 07 | Recovered |
| 2 | Staphylococcus aureus | 01 | Recovered |
| 3 | Klebsiella | 01 | Recovered |
| 4 | Enterococcus | 01 | Recovered |
| 5 | Culture negative | 20 | Recovered |

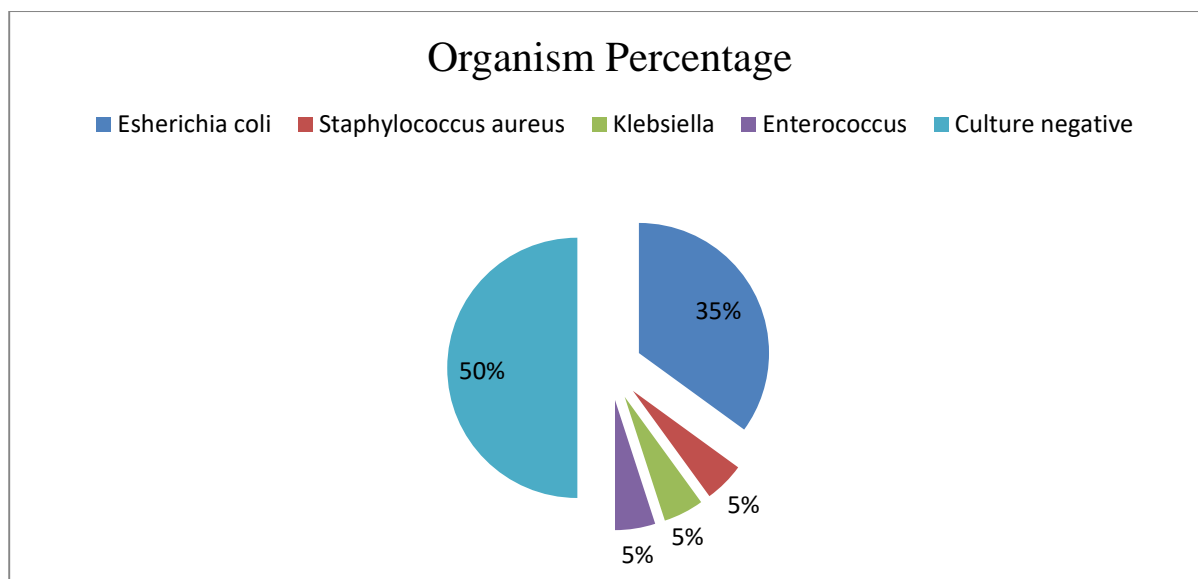


Figure 5.12: Management outcomes- Organism percentages

In this study the empirical antibiotics given to the patients was Ceftriaxone which is a standard empirical antibiotics according to the Indian academy of paediatrics. Out of 30 patients: 20 patients are culture negative and they are treated with these empirical antibiotics. This antibiotic is given as intravenous for 10 days and followed by oral Cefixime for 4 days. The dose of Ceftriaxone administered was 75mg/kg divided in 12-24 hrs.

For patients who were culture positive, the antibiotic which was most sensitive to that particular organism is given as intravenous for 14 days followed by UTI prophylaxis for patients with risk factors like hydronephrosis. All 30 patients recovered as repeat urine routine examination was normal and urine culture was negative done on completion of therapy.

DISCUSSION

According to our study we found that urinary tract infection occurrence is more during the age group 7-14 years and in this age group female children were more prone than male children. So occurrence may be based on age, gender or number of patients admitted to the respective hospital.

On analyzing the clinical profile of the study group fever was the most common presenting symptom with 46.6%, this is followed by burning micturition which was seen in 28.8%. The third common symptom was abdominal pain which constituted 24.4%. This is similar to other study by kavitha j et al which included children from <2 to >12 years conducted in tertiary care Centre. Mallakket al, Islam MN et al and kavitha J et al showed fever as most common presenting complaint in their studies.

On analysing the patients profile antenatal hydronephrosis was seen in age group 0-1 year. From 2-6 years of age group phimosis, postnatal hydronephrosis and steroid dependent nephrotic syndrome were seen. But from age group 7-14 years no such risk factors were found.

Most common causative organism was *Escherichia coli* (70%) followed by *Staphylococcus aureus*, *Klebsiella* and *Enterococcus* constituting 10%,10%,10% respectively This is compared with the study by kavitha J et al.,

Studies by Mantadakis E et.al and lian M E et.al and kavitha E et.al showed *Escherichia coli* as most common organism but with varying proportions. In our study with total of 195 paediatric patients admitted in ward since 2016, we found that 30 patients were suffering with urinary tract infection. The incidence rate was found to be 15.38%

According to our study, antibiotics were used to treat Urinary tract infection. The most common antibiotics used were Amikacin, Furadantin, Cefixime, Cefuroxime, Cephalexin, Augmentin, Azithromycin, Piptaz (Piperacillin + Tazobactam) and Linezolid. Cefixime was the common antibiotic followed by Furadantin with 51.35% and 13.5% respectively. Some patients with symptoms of urinary tract infection show culture negative because they might have been administered with antibiotics prior to the urinalysis.

In our study we found that *Escherichia coli* were more sensitive to Furadantin (85.5%) and Cefosulbactam (71.4%) and resistant to Amoxyclav (88.7%), Chloramphenicol (85.7%) and *Staphylococcus aureus* sensitive to Gentamicin, Linezolid and Vancomycin. *Klebsiella* was sensitive to Amikacin, Cefosulbactam, Cefotaxime, and Cotrimoxazole & Imipenam.

CONCLUSION

From this retrospective study on urinary tract infection in paediatrics we concluded that its incidence rate depends on hospital locality (Tertiary care hospital, Tirupati) which was found to be 15.38% and major risk factors were found to be antenatal hydronephrosis, steroid dependent nephrotic syndrome, postnatal hydronephrosis and phimosis. In hospital mostly children were affected with gram negative bacteria i.e., *Escherichia coli* followed by *Staphylococcus aureus*, *Klebsiella* and *Enterococcus*. Ceftriaxone was most common empirical antibiotic prescribed to the patients at a dose of 75 mg/kg divided in 12 – 24 hours which is given as intravenous for 10 days and followed by oral Cefixime for 4 days. And about 20 patients where underwent culture sensitivity study and organism specific sensitive antibiotics were prescribed, so we conclude that usage of antibiotics were rational.

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