IOSR Journal Of Pharmacy
(e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219
Www.Iosrphr.Org Volume 3, Issue 9(October 2013), Pp 53-59

Symptomatic Urinary Tract Infections Among Children Between Ages 1-5 Years In A Children's Specialist Hospital, Ilorin, Kwara State, Nigeria.

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ABSTRACT : *This study investigated the incidence of symptomatic bacteriuria among male and female children aged between 1-5 years at chidren's specialist hospital,Ilorin Metropolis, Ilorin, Kwara State. The aim of this study was to isolate the organisms responsible for symptomatic bacteriuria and determine the antibiotic susceptibility pattern of the isolates. The bacterial agents were isolated from a total of 200 early morning mid-stream urine samples collected between November 2005 and January 2006. Eight bacterial species were isolated out of which Escherichia coli was the most predominant with a frequency of 21.57% while Pseudomonas aeruginosa and Proteus mirabilis had the lowest frequency of 2.27% each. Their susceptibility patterns to seven antibiotics: Augumentin, Sparfloxacin, Erythromycin, Gentamicin, Chloramphenicol, Ceftazindine and Tetracycline was determined. Incidence of symptomatic bacteriuria among the children was found to be 44% with female preponderance over male. Female had a higher incidence of symptomatic bacteriuria(60.2%). Children aged 1 year had the highest incidence (26.1%) while those aged 2 years had the lowest (13.6%). The bacterial isolates showed varying degree of antibiotic resistance sensitivity pattern (between 50 and 80%) with Staphylococcus aureus and Staphylococcus epidermidis showing resistance to four antibiotics. All the isolates showed varying degrees of multidrug resistance with S.aureus, S.epidermidis and P.aeruginosa showing complete drug resistance. It is important to undertake regular monitoring of uroparhogens and their antibiotic susceptibility patterns and to find sufficient ways to control the abuse of antibiotics in the community.*

KEY WORDS: *Children, Drug resistance, Escherichia coli, Symptomatic bacteriuria.*

I. INTRODUCTION

The presence of a significant count (usually $\geq 10^5$ or 10^6 organisms/ml of bacteria in the urine of a person without symptoms is usually referred to as asymptomatic bacteriuria[1,2]. Asymptomatic bacteriuria may precede symptomatic urinary tract infection, characterised by dysuria, pain and fever. This accounts for over 6 million outpatients each year[3]. Children with asymptomatic bacteriuria may have underlying urinary tract abnormalities. More than 30% of infants and children with asymptomatic bacteriuria have vesicoureteral reflux and about 37% have renal scarring or other abnomalities(the lower prevalence generally reflecting more stringent definitions of abnormality), whereas such abnomalities are not common in the general population of children[4,5]. The risk of acquiring bacteriuria varies with age and sex. Asymptomatic bacteriuria in infants is more common in males(estimated prevalence of 2.0-2.9% against 0.0-1.0% in females) but it is considerably more common in girls after age 1(0.7-2.7% in girls against 0.0-0.4% in boys)[6].

A Urinary Tract Infection (UTI) in infants and children can be referred to as the detection of significant bacteria in the urine with associated specific and non-specific signs and symptoms. Current evidence shows that lower colony counts may be of paramount importance in young children, especially those not yet toilet trained[7]. Children with a neurogenic bladder, have the most frequent medical complication, which is urinary tract infections[8]. In children with symptomatic UTI with or without reflux, oral therapy may be initiated with amoxicillin,ampicillin,sulfisoxazole acetyl, a combination drug containing trimethoprim and sulfamethoxazole, nitrofuratoin or cephalosporins.Multidrug resistance (MDR) can be referred to as the ability of a living cell to show resistance to a wide variety of structurally and functionally unrelated compound[9]. Even though, urinary tract infection is a common bacterial infection encountered in children, there are few studies showing resistance of uropathogens to drugs among the pediatric population[10]. Therefore, the aim of this present study was to determine the incidence of symptomatic bacteriuria in children between ages 1-5 years, find out if there is a difference in incidence of symptomatic bacteriuria in male and female children, isolate the organisms responsible for symptomatic bacteriuria and determine the antibiotic susceptibility pattern of the isolates.

II. MATERIALS AND METHODS

This study was carried in the pediatric department of the Children's Specialist hospital, Ilorin,Kwara State. A total of 200 early morning mid-stream urine samples of children (117 boys and 83 girls) between the ages of 1-5 years were collected from November 2005 to January 2006.A sterile wide mouth bottle was given to the parents' of the patients to collect early morning mid-stream urine samples. The samples were transported to the laboratory, where they were centrifuged at 3000rev/min for 5mins and observed for the presence of pus cells, red blood cells, epithelial cells,casts and crystals. Microscopic analysis of the urine was done primarily to detect the presence of high numbers of white blood cells as a sign of infection in the urinary tract[2,11]. A standard loop(0.01) technique[2,11] was used to place 0.01ml of urine on MacConkey and blood agar media. All plates were incubated at 37^oC for 18-24 hrs. Then the plates were examined to quantify the organisms present. The colony count was evaluated and organisms were identified by using standard laboratory methods[12]. Significant Colonies from the plates were selected on the basis of colonial morphology and subcultured onto sterile solidified Nutrient and MacConkey agar using the streaking technique. The plates were incubated at 37^oC for 24hrs and then examined for purity.The organisms that were isolated were further subjected to biochemical tests to identify them into species. Such biochemical tests include citrate utilization test using simmon's citrate agar slope, indole test, oxidase test, urease test, motility test, coagulase test, catalase test and sugar fermentation test, optochin and bactracin for Stretococci.

III. ANTIBIOTIC SUSCEPTIBILITY TEST

Antibiotic susceptibility patterns to commonly prescribed antibiotics were performed on uropathogens isolated from children. Data were analysed separately for all age groups used in this study. The antibiotic susceptibility-testing pattern was determined using disc-diffusion method[13]. The antibiotics and their disc contents were described by Chessbrough and are shown as follows: Augumentin(30µg), Sparfloxacin(30µg), Erythromycin(15µg), Gentamicin(10µg), Chloramphenicol(30µg), Ceftazidime(30µg) and Tetracycline(30µg). Isolates were recorded as sensitive when the zone of inhibition was wider than, equal to or not more than 3mm and resistant when isolates had no zone of inhibition or less than 3mm.

IV. RESULT.

A total of 200 urine samples were collected from the patients(children) that visited the specialist hospital. Out of 200 samples that were collected, 88(44%) were infected. The age distribution of the subjects and incidence of infection in them are shown in Table 1. The highest number of infected cases was found in children aged 1 year(26.1%) and the lowest(13.6%) among children aged 2 years. Considering the sex of the children, the number of males were predominant (Table 2). Nevertheless,bacterial pathogens were isolated from 53 female children and 35 male children. These represented 60.23% and 39.77% of the total number of cases respectively,corresponding to a female to male ratio of 1.5 : 1.

Table 1: Age Distribution and incidence of urinary tract infections in children.

Age	Number of children,a(%)	Number with UTI,b	Incidence (b/a x100%)	Infected children as % of total cases (b/88 x 100)%
1	37(18.5)	23	62.16	26.14
2	42(21.0)	12	28.57	13.64
3	33(16.5)	16	44.48	18.18
4	34(17.0)	15	44.12	17.04
5	54(27.0)	22	40.74	25.00
Total	200(100)	88		

Table 2: Sex Distribution of Infected Children

Sex	Infected	Non-infected	Total	% Infected
Male	35	82	117	39.77
Female	53	30	83	60.23
Total	88	112	200	

4.1 BACTERIAL ISOLATES

A total of eight (8) bacterial species were encountered in the samples. They were tentatively identified as *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Enterobacter aerogenes*, *Streptococcus pyogenes*, *Pseudomonas aeruginosa* and *Proteus mirabilis*. The frequency of occurrence of the isolates is shown on Table 3. *Escherichia coli* was the most freqeuntly encountered (31.15%) evidently *Pseudomonas aeruginosa* and *Proteus mirabilis* were the least encountered (3.28%). In terms of sex distribution, the organisms isolated were more frequently encountered among females (Figure 2).However, *Escherichia coli* was more frequently encountered in children of ages 1 and 2 years, while *Klebsiella pneumoniae*, was more frequently encountered in children of ages 3 and 5 years(Table 5).

Table 3: Bacteria isolated from urine samples of infected chidren between ages 1-5 years.

Isolate code no.	Bacterial Isolates	No.of Infected Children(%)
B1	*Esherichia coli*	19 (31.15%)
B2	*Klebsiella pneumoniae*	18 (29.51%)
B3	*Staphylococcus epidermidis*	7(11.48%)
B4	*Staphylococcus aureus*	6 (9.84%)
B5	*Enterobacter aerogenes*	4 (6.56%)
B6	*Streptococcus pyogenes*	3 (4.92%)
B7	*Pseudomonas aeruginosa*	2 (3.28%)
B8	*Proteus mirabilis*	2 (3.28%)

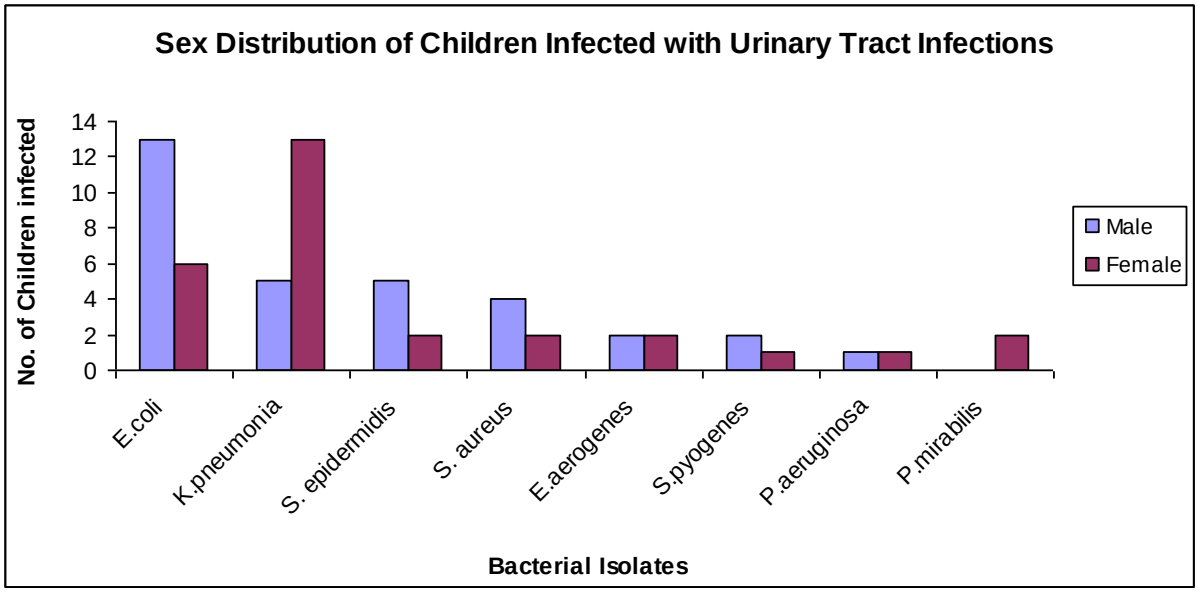

Figure 2: Sex Distribution of children Infected with Urinary Tract Infections.

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Table 4: Distribution of bacterial Isolates among Infected children of various Ages.

Bacterial Isolates	Age Groups in Years				
	1	2	3	4	5
Esherichia coli	6	6	2	2	3
Klebsiella pneumoniae	3	1	7	2	5
Staphylococcus epidermidis	1	2	0	1	0
Staphylococcus aureus	3	0	2	1	0
Enterobacter aerogenes	1	0	1	2	0
Streptococcus pyogenes	1	0	1	0	1
Pseudomonas aeruginosa	0	1	1	0	0
Proteus mirabilis	0	1	0	0	1

4.2 ANTIBIOTIC SENSITIVITY

The antibiotic susceptibility pattern of the bacterial species is shown on Figure 3. Antibiotic resistance was more observed in *Staphylococcus epidermidis* and *Staphylococcus aureus*, which showed resistance to three of the antibiotics. Four of the bacterial species showed resistance to Erythromycin (*Escherichia coli, Klebsiella pneumoniae, Staphylococcus epidermidis, Staphylococcus aureus).* In addition, *Escherichia coli, Staphylococcus aureus, Streptococcus pyogenes, and Proteus mirabilis* resisted tetracycline while *S.epidermidis,S aureus,and Pseudomonas aeruginosa* resisted Augumentin. Resistance to Cefazidime was noted in three bacterial species(*S.epidermidis, S. pyogenes and P.aeruginosa*),while six bacterial species were susceptible to Sparfloxacin (*E.coli, K.pneumoniae, S.aureus, S.pyogenes, Proteus mirabilis and Enterobacter aerogenes*) and two bacterial species showed resistance to Sparfloxacin (*S. epidermidis, and P.aeruginosa*).

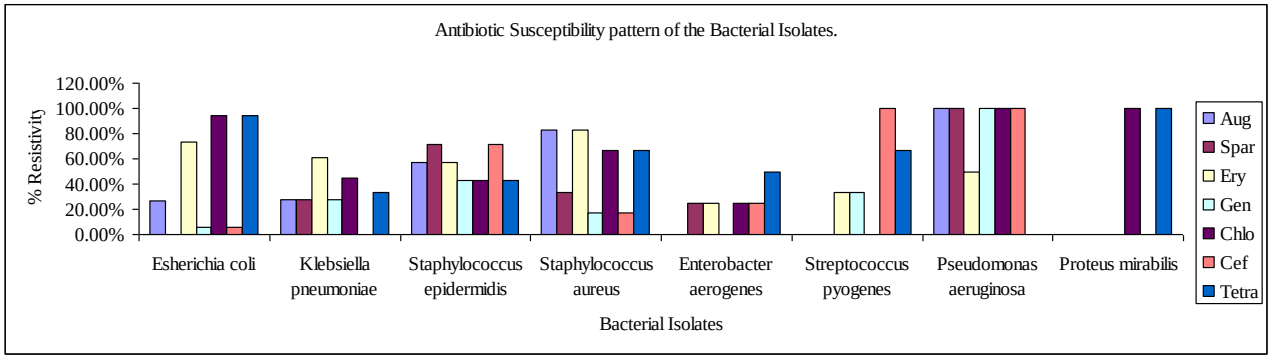

Figure 3: Antibiotic susceptibility patterns of the Bacterial Isolates.

4.3 MULTIDRUG RESISTANCE

Multi-drug resistance was observed in all the isolates. Although, the incidence varied among the different bacterial species (Figure 4). All(100%) the *Staphylococcus aureus, Staphyloccus epidermidis and Pseudomonas aeruginosa* isolates showed multidrug resistance,nevertheless *Klebsiella pneumoniae* and *Proteus mirabilis*, showed the least, incidence of 50% while the other species exhibited between 75 and 80%.

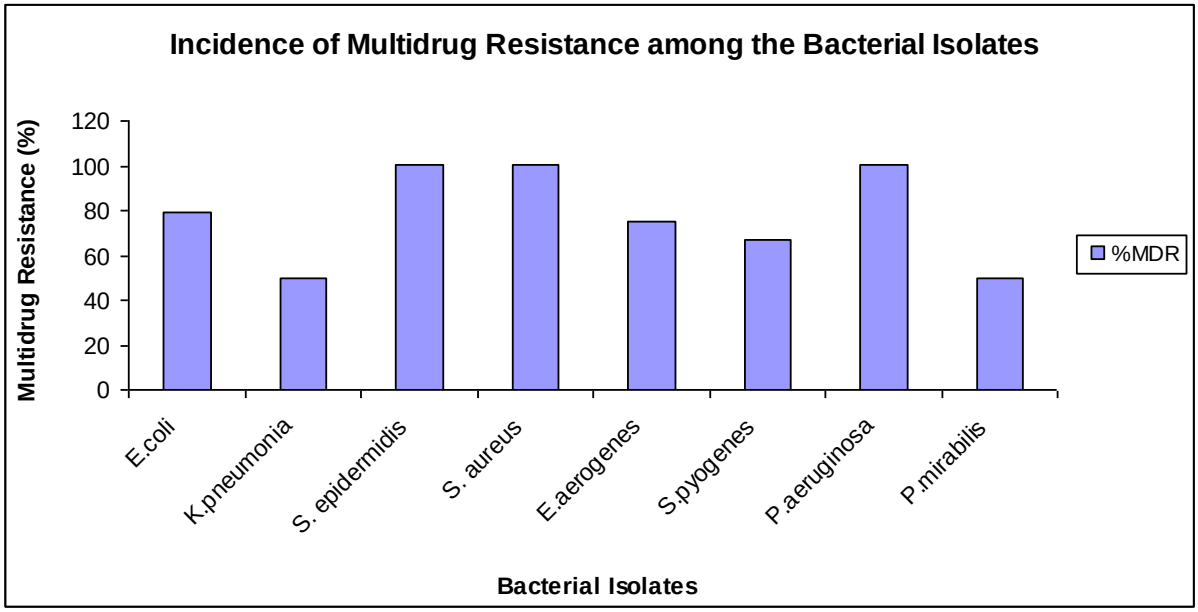

Figure 4: Incidence of Multidrug-Resistance among the bacterial Isalates.

V. DISCUSSION.

Urinary Tract Infection in children is a significant source of the occurence of a disease. Further investigation and continuous urinary monitoring is required in order to avoid complications. UTI is still misdiagnosed and managed incompetently, although treatment is simple. During the first two years of life,UTI is a significant cause of morbidity and mortality[14]. Results obtained from this study shows that 44% of the children examined had UTI. Estimates of the true incidence of UTI depend on rates of diagnosis and investigation[15].Children aged 1 year had an incidence of 62% were found to be infected and accounted for 26.1% of total cases of infection. Children aged 5 years, which accounted for 27% of subjects had an incidence of 40.74% and accounted for 25% of UTI cases. The lowest incidence of UTI(28.57%) was among children aged 2 years which made up 21% of the subjects and contributed 13.6% of the total UTI cases. Although male subjects constituted 58.5%, there was a higher incidence of UTI among the females (63.86%). The females accounted for 60.2% of all UTI cases encounted as against 39.8% from males. These agrees with previous studies which shows a higher incidence of UTI among females[2,16]. The females are more susceptible to UTI because they have a shorter urethra than males[10]. In this study, eight bacterial species were isolated from the urine samples. This suggests that a favourable condition existed for the bacteria to thrive. The species isolated include those that are usually associated with urinary tract infections,such as *E.coli, Klebsiella pneumonuae, Pseudomonas aeruginosa*[17]. *Escherichia coli* were isolated from 21.59% of cases,from all age groups. All the same, it was more encounted in children aged 1 and 2 years. *E.*coli is a major cause of UTIs among children[18]. It accounts for about 85-90% of all urinary tract infections in the age group. *K.pneumoniae* accounts for 20.45% of all cases and from all age groups. It was encountered among children that are aged 5 years. The distribution of the bacterial isolates suggest that *E.coli* and *K.pneumoniae* are more likely to be primary agents of UTI. Enteric bacteria are the organisms usually associated with urinary tract infections. This is because they easily gain access to the urethral opening due to proximity to the anus[19].

Stapylococcus aureus, was isolated from 6.82% of all cases. It was mostly encountered among the males. S. aureus an opportunistic pathogen is a part of the normal human flora. It is also present on the skin, axilla, external ear, nose and nasopharynx, lower ileum and large intestine[20].Staphylococcus epidermidis accounts for 7.95% of all total cases. It was isolated majorly from children that are aged 5 years. It is not as virulent as S.aureus and are responsible for fewer infections. S.epidermidis is the commonest coagulase-negative species associated with human infections[21].Proteus mirabilis, was isolated from 2.77% of all cases, and from age groups 2 and 5 years. It was majorly encountered among the females. Pseudomonas aeruginosa accounts for 2.27% of total cases and was encountered in age groups 2 and 3 years. These results are similiar with other recent publications[22,23]. The antibiotic sensitivity profile showed that many of the isolates were resistant to some of the antibiotics. This can be because some of these antibiotics have been abused. Strains of bacterial isolate whose levels of susceptibility are above 50% are known to be resistant while those that are below 50% are known to be sensitive.

From this study, Escherichia coli and Klebsiella pneumoniae had a resistance of 5.3% and 27.8% respectively to Gentamicin. This suggests that they are highly susceptible to this antibiotic and can be used to treat urinary tract infections. Gentamicin, though inexpensive is only availabe in an injectable form and therefore difficult to administer by non-medical personnel and more difficult to abuse[24]. Staphylococcus epidermidis was found to be resistant to Gentamicin and Chloramphenicol at levels below 50%. This suggests that it is susceptible to these antibiotics.Staphylococcus aureus was resistant to Erythromycin and susceptible to Gentamicin. S. aureus was found to be resistant to Tetracycline at levels above 50%. This finding agrees with that of other workers[16].Enterobacter aerogenes was resistant to Sparfloxacin at levels below 50%. This also suggests that Sparfloxacin is sensitive to urinary tract infections caused by this pathogen.Pseudomonas aeruginosa and Proteus mirabilis have been found to be highly resistant to chloramphenicol but sensitive to Erythromycin. This also suggests that Erythromycin can be used to treat urinary tract infections. Results of the antibiotic susceptibility due to multidrug resistance showed that 78.9%(15 of 19) of the E. Coli isolates were resistant to three or more antibiotics and are thus considered multidrug resistant. Among the multidrug resistant isolates,26.3% were resistant to augumentin,73.7% were resistant to erythromycin and 5.3% were resistant to gentamicin and ceftazidime. Klebsiella pneumoniae and Proteus mirabilis was found to have a multidrug resistance of 50% while Pseudomonas aeruginosa is completely multidrug resistant(100%). Concurrent resistance to antibiotics of different structural classes has risen in a multitude of bacterial species and may complicate the therapeutic management of infections, including those of the urinary tract[9].

VI. CONCLUSION

UTIs are a common bacterial illness in infants and children[25]. Eight bacterial species have been isolated in this study, with *Esherichia coli* and *Klebsiella pneumoniae* standing out as major causes of urinary tract infections(UTI) in children. A pattern of multidrug resistance is seen among the isolates, which portend grave danger for the management of UTI in chidren. It is therefore important that more effort should be focused on preventing UTI in chidren. Also the abuse of antibiotics should be greatly discouraged.

REFERENCES

[1] Smith M.B.H. Screening for urinary infection in asymptomatic infants and children In: Canadian Task Force on Periodic Health Examination. Canadian Guide to Clinical Preventive Health Care. (Ottava: Health Canada, 1994) 220-30

[2] Jha,B.K,Singh, Y.I. Prevalence of asymptomatic bacteriuria in school going children. *Journal of Medical Microbiology, 5(17)*, 2007, 81-84.

[3] National Centre For Health Statistics. Detailed diagnoses and procedures for patients discharged from short-stay hospitals: United States.1985. Vital and health Statistics.Government Printing Office.87-1751.

[4] Kunin C.M. Detection, Prevention and management of Urinary Tract Infections (4th edition. Lea and Febiger ,Philadelphia,1987)..

[5] Jones B.W, Headstream J.W. Vesicoreflux in Children.*Journal of Urology*. *80*, 1958, 1067-1069.

[6] American Academy of Pediatrics. Recommendation for pediatric preventive health care.

[7] Poole, C. Diagnosis and Management of urinary tract infection in children. Nursing standard. 2002, 47-55

[8] Matsumoto,T., Takahasshik,K., Manabe, N., Iwatsulo,E. And Kawakami,Y. Urinary tract infection in neurogenic bladder. *International Journal of Antimicrobial Agents. 17(4)*, 2001, 293-297.

[9] Sahm,D.F., Thornsberry,C., and Mayfield,D.C. Multidrug-resistant urinary tract isolates of Escherichia coli:Prevalence and patients demographics in the United States in 2000. Antimicrobial Agents Chemotheraphy. 2001,45:1402-6.

[10] Fanos,Y and Khoory,B.J. Antimicrobial survey of urinary tract isolates from a pediatric department. *Journal of Chemotherapy. 11*, 1999, 255-9.

[11] Collee J.G,Fraser A.G,Marimon B.P,Simmons,A. Mackie and McCartney Practical Medical Microbiology. 14th edition. Churchhill Livingstone, 1996:86-88.

[12] Cheesbrough,M. Medical Laboratory Manual For Tropical Countries. 2, 1984, 146-156.

[13] Bauer,A.W.W.,Kirby,M.M.,Sherris,J.C. and Truck,M. Antibiotic Susceptibility Testing by a Standard Single disc method. *American Journal of Clinical Pathology. 45*, 1996, 493-496.

[14] Parviz,A.,Abolfazi,M.,Hassan,J.H.and Sodabeh,K.(2010). Urinary Tract Infections in Children. 2(1):9-14.

[15] Marild,S. and Jodal,U. Incidence rates of first-time symptomatic urinary tract infections in children under six years of age. Pediatrics. 87(5), 1998, 549-52.

[16] Decousser,J.W.,Pfitser,P.,Xueref,X.,RakotoAlson,O. and Rouff,J.F. Acquired antibiotic resistance in Madagascar, First Evaluation. Med. Trop. Mars. 59(3), 1999, 259-65.

[17] Naylon,G.R.E. A 16 month analysis of urinary tract infection in children. *Journal of Medical Microbiology*. *17*, 1984, (31).

[18] Bhat,R.G., Katy,T.A. and Place,F.C. Pediatric urinary tract infections. Emergency Medicine Clinics of North America. 29(3), 2011, 637-653.

[19] Goossens,H. and Sprenger,M.J.W. Community acquired infections and bacterial resistance. *Journal of Medicine. 317*, 1998, 118-121.

[20] Mackowiak,P.A. The normal microbial flora. *New England Journal of Medicine 307*, 1982, 83-85.

[21] Marples,R.R and Richadson,J.E. Characters of Coagulase-negative staphylococci collected for a collaborative phage-typing study. American Family Physician. 10, 1981, 175.

[22] Arslan S, Caksen H, Rastgeldi L, Uner A, Oner AF, Odabas D. Use of urinary gram stain for the detection of urinary tract infection in childhood. *Yale Journal of Biology and Medicine* 2002;75:73-8.

[23] Al-Momani,T. Microbiological study of urinary tract infection at Princess Haya Hospital in South of Jordan.*Middle East Journal of Family Medicine*.4(2), 2006.

[24] Omojasola,P.F. and Omojasola,T.P. Urinary Tract Infection Among Adult Subjects in Ilorin Metropolis. *NISEB Journal* 1(3), 2001, 205-209.

[25] Honkinen,O.,Jahnukainen,T.,Mertsola,J.,Eskola,J and Ruuskanen,O. Bacteremic urinary tract infection in children. *Journal of Pediaatric Infectious Disease. 19(7),* 2000, 630-634.