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INCIDENCE, CAUSATIVE BACTERIA AND ANTI-MICROBIAL SUSCEPTIBILITY OF PEDIATRIC URINARY TRACT INFECTION; A RETROSPECTIVE STUDY IN MOGADISHU, SOMALIA

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ABSTRACT

Background- Urinary Tract Infections in children stand out as one of the most common bacterial infections in pediatrics associated with many complications and morbidities. However, data about these infections among children in Somalia is limited. Therefore, this study aimed to determine the incidence, etiology, and antimicrobial susceptibility patterns of the uropathogenic affecting children between 2 months and 15 years of age in a selected hospital. **Objective-** To determine the incidence, etiology, and antimicrobial susceptibility patterns of the uropathogenic affecting children between 2 months and 15 years of age in a selected hospital in Somalia. **Methods-** A retrospective study was conducted from January 2022 to December 2023 among children aged 2 months to 15 years old in the department of pediatrics, Somali Sudanese Hospital, Mogadishu, Somalia who had clinical signs and symptoms of urinary tract infections. One thousand one hundred ninety one (1191) children suspected to have UTIs based on clinical symptoms had their urine samples examined and cultured onto blood agar and MacConkey agar plates. The growth of a single organism and more than 10^5 colony-forming units per milliliter (Cfu/mL) indicated a positive culture. The Kirby-Bauer disk diffusion method was used for the antibiotic susceptibility test. The positive uropathogen culture incidence rates per 100 children were calculated in stratified age (2 months – 3 years, 4 years – 7 years, and 8 – 15 years). Simple frequency was used to determine proportion and chi-square was used to determine if there were significant differences between different categories; p values < 0.05 were considered significant. **Results –** Twenty-one thousand eight hundred fifty three （21,853 ）children visited the pediatric department during the study period among which 1191(5.45%) fulfilled the eligibility criteria. Out of 1191 children, 57.2% were female, the majorities (37.0%) of the children were aged 8 – 15 years and 83.5% of the children were from the Outpatient Department. Urine culture was positive for 273/1191(22.9%) of the clinically suspected children, the majority of whom (61.5%) were female. The incidence rates were 21.43 per 100 children, 21.82 per 100 children, and 25.17 per 100 children for groups 2 months – 3 years, 4 years – 7 years, and 8 years – 15 years respectively. Five species of bacteria were cultured in the children's urine (E. coli, Klebsiella species, Enterobacter species, Proteus species, and Staphylococcus saprophyticus); the most predominant uropathogen was E.coli at a rate of 50.5%, followed by Klebsiella species (23.1%). The most sensitive antibiotics to the uropathogen isolated were vancomycin (97.8%), followed by amikacin (89%) and nitrofurantoin (82.4%). The least sensitive antibiotics were ampicillin (27.5%) and Trimethoprim-sulfamethoxazole (20.7%). **Conclusions-** The findings reflect low incidence of urinary tract infections among children less than 15 years of age in this group of children in Mogadishu Somalia. E. coli is the most predominant uropathogen in children of this age. Vancomycin, amikacin, and nitrofurantoin are the most sensitive antibiotics to the uropathogen in this group of children under 15 years of age. **Recommendations-** basing on these findings, empirical antibiotic selection is guided by local antibiotic sensitivity data and prevalence of bacterial species based on local data instead of solely relying on global standards of therapy.

KEYWORD:- Child, Urinary tract infection, Urine culture, Antimicrobial susceptibility.

INTRODUCTION

Urinary tract infections (UTIs) are prevalent bacterial infections in children worldwide, with girls showing a higher occurrence compared to boys after infancy. Pre-pubertal girls have a UTI incidence of about 3%, whereas boys have a lower rate of around 1%.

Interestingly, infants under one-year-old have a higher UTI incidence among boys (3.7%) than girls(2%).[1–3] Identifying the difference between pyelonephritis (upper urinary tract infection) and cystitis (lower urinary tract infection) based solely on clinical symptoms and signs can be difficult, especially in infants and young children.[4–6]

The clinical signs of UTIs can vary depending on the child's age and may not be specific, particularly in younger children, posing challenges for diagnosis. Infants may exhibit nonspecific symptoms like fever, irritability, vomiting, or poor growth, which could delay diagnosis due to overlapping symptoms with other common conditions. It's crucial to maintain a high level of suspicion, especially in febrile neonates/young infants and those with risk factors such as prematurity, low birth weight, prolonged rupture of membranes, and congenital urinary tract anomalies. Conversely, older children typically show more recognizable symptoms like painful urination, frequent urination, or flank pain.[1]

Anatomical and functional factors are significant contributors to UTIs in pediatric patients. Incomplete bladder emptying, often seen in young children who haven't achieved full bladder control, can lead to urinary stasis and bacterial overgrowth. Anatomical abnormalities like vesicoureteral reflux (VUR), ureter pelvic junction obstruction, and posterior urethral valves can heighten UTI risk by aiding pathogens' ascent from the bladder to the upper urinary tract. Additionally, issues such as constipation, urinary retention, and dysfunctional voiding habits can also play a role in UTI development and recurrence in pediatric patients.[4,7]Age-related differences influence the clinical presentations of UTIs in urinary tract anatomy and function.

Managing UTIs in pediatric patients demands a thorough approach encompassing diagnostic evaluation, antimicrobial therapy, supportive care, and preventive measures. Prompt diagnosis and timely administration of appropriate antimicrobial treatment are essential to prevent UTI complications and minimize recurrence. Whenever feasible, conducting urine culture and sensitivity testing is advised to identify the causative organism and customize antibiotic selection based on local resistance patterns. In febrile infants and young children, empirical antibiotic therapy may be initiated initially, with adjustments made later based on urine culture results and clinical progress.[8,9] In managing UTIs in pediatric patients, antimicrobial treatment alone might not suffice, particularly for those with underlying risk factors or anatomical conditions predisposing them to recurrent infections.

There is an information vacuum regarding the incidence, etiology, and antimicrobial susceptibility patterns of pediatric urinary tract infections in Mogadishu, Somalia. It is most likely difficult for healthcare professionals to create efficient treatment plans and focused interventions due to the lack of local epidemiological data. Effective treatment for pediatric UTIs depends on identifying the precise bacteria causing the infection. Antibiotic effectiveness varies based on the causative organism, and UTIs can be caused by a variety of bacterial pathogens. The high rate of antimicrobial resistance in the area exacerbates this problem.

Antimicrobial resistance is a major problem globally. But it is especially noticeable in low-resource environments like Mogadishu. Antibiotic misuse and overuse lead to resistant bacterial strains that cannot be treated with conventional therapies. This means that in the case of UTIs, commonly prescribed antibiotics might no longer be effective against the bacteria causing the infections, requiring the use of alternative treatments that could be more expensive and difficult to obtain. The issue is made worse by the shortage of local epidemiological data on the antimicrobial susceptibility patterns of bacteria that cause UTIs in Mogadishu. This study therefore aimed to study and determine the incidence of urinary tract infections, identify the causative bacterial pathogens, and evaluate their susceptibility to commonly used antibiotics. The goal is to offer insights for evidence-backed interventions and policy suggestions to enhance the diagnosis and treatment of UTIs in children.

MATERIALS AND METHODS

This section focuses on the methods and materials employed in the current research; the section highlights the study research design, study population, sample size estimation, eligibility criteria undertaken, study procedure and data collection, data analysis, ethical issues related to the study.

Research design

For this study, a retrospective design was selected to investigate the incidence, causative bacteria, and antimicrobial susceptibility of urine tract infections (UTIs) in pediatric patients in Mogadishu, Somalia. A retrospective approach involves analyzing existing data from medical records, which allows for a comprehensive review of many cases over a specific period. Additionally using existing medical records is a cost-effective and time-efficient method, avoiding the need for new patient recruitment and data collection.[10] A retrospective study was appropriate for this research as it allowed for the inclusion of a diverse patient population, enhancing the generalizability of the findings. The data obtained will be crucial in developing targeted treatment protocols and antimicrobial stewardship strategies, ultimately improving patient outcomes in the pediatric population of Mogadishu.

Study population

Pediatric patients aged 2 months to 15 years who sought medical care for urinary tract infections (UTIs) at the Somali Sudanese Hospital between January 1st, 2022, and December 31st, 2023 are included in the study population for "Incidence, causative bacteria, and antimicrobial susceptibility of Urinary Tract Infection in pediatric patients; A retrospective approach in Mogadishu, Somalia." This group includes children who were diagnosed for UTIs during the designated study period and who were residents of Mogadishu, Somalia.

Sample size estimation

A two-year retrospective study was conducted at Somali Sudanese Hospital Between January 1st, 2022, and December 31st, 2023. During this period, the pediatric department attended to pediatric patients aged 2 months to 15 years who presented with urinary tract infections (UTIs). The department recorded a total of 21,853 visits from pediatric patients. Out of these, 1191 patients met the stringent eligibility criteria established for our study, ensuring that a comprehensive dataset of relevant cases was available for analysis.

Eligibility criteria

Inclusion criteria included - patient age of 2 months to 15 years, Active patient from January 2022 to December 2023, Clinical signs and symptoms such as dysuria, abdominal pain, vomiting, irritability, and flank pain, suspected of urinary tract infection whose urine had been cultured through the study period.

Exclusion Criteria - Patients with incomplete medical records or missing data necessary for analysis, Patients with non-infectious urinary inflammation.

Study procedure

This study included individuals aged from 2 months to 15 years, who visited to the pediatric department at Somali Sudanese Hospital from January 1, 2022, to December 31, 2023. Data on urinalysis and urine culture of pediatric patients suspected to have UTIs, based on medical history, symptoms, and physical examination, were retrospectively retrieved from the hospital's computerized system. The study examined patients' demographic characteristics (age and sex), clinical sign and symptoms (Dysuria, Abdominal pain, and vomiting, irritability, and flank pain) urinalysis, and urine culture findings, as well as antibiotic susceptibility patterns. The proper instructions for gathering a midstream urine sample were typically provided to legal guardians. When the perineum had been cleaned with regular saline cotton swabs, children older than two years old who could follow parental instructions directly transferred a clean catch or mid-stream urine sample into a sterile urine bottle while being observed. For children less than two years or those unable to follow instructions were used catheterization. The sample was then sent right away to the microbiology unit for examination. Urine dipstick test (leukocyte esterase and nitrite) was used for the initial screening of all children participating in the study.

Urine Culture: For a semi-quantitative method, calibrated loops (0.002ml) were used to inoculate urine samples onto blood agar and MacConkey agar plates (Oxide, Ltd., Basingstoke, Hampshire, England). Overnight at 37°C, the inoculated plates were incubated. The growth of a single organism and the presence of more than 10^5 colony-forming units per milliliter (Cfu/mL) were indicators of a positive culture, which decreased the possibility of contamination. Gram staining and colony morphology were used to describe pure isolates of bacterial pathogens. Using standard protocols, all positive urine cultures exhibiting significant bacteriuria were identified, and the identification was further validated by examining their biochemical reaction patterns. The culture also had a noticeable presence in the relevant media.[11] The Kirby-Bauer disk diffusion method was used for the antibiotic susceptibility test. A pure culture was put into a tube with 5 ml of nutrient broth to create a uniform suspension and gently mixed. The inoculum's density was then standardized by comparing the suspension's turbidity to the 0.5 McFarland standards. A sterile cotton swab was dipped into the suspension and then gently rotated against the surface of the tube to remove any excess. Using the swab, the bacterial suspension was then equally spread over the Mueller-Hinton agar (Oxoid) surface. The inoculated plates were left to dry at room temperature for three to five minutes. Oxoid provided the following antibiotics for the disc diffusion test: ampicillin (10μg), cefoxitin (30μg), amikacin (30μg), vancomycin (30μg), erythromycin (15μg), ciprofloxacin (5μg), nitrofurantoin (300μg), ceftriaxone (30μg), cefotaxime (30μg), gentamicin (10μg), cotrimoxazole (1.25/23.75μg), ampicillin (10μg), cefoxitin (30μg), amikacin (30μg), and ampicillin (10μg).Using a caliper, the zone of growth inhibition was measured after 18 to 24 hours of incubation at 37°C, to the nearest whole millimeter. The zone diameters were interpreted in compliance with the guidelines provided by the Clinical and Laboratory Standards Institute (CLSI).[12]

Data analysis

A data scoring sheet was created by entering patient data including demographics data, clinical signs and symptoms, bacterial isolates, and antimicrobial susceptibility into Excel, to ensure accuracy and consistency. The dataset was analyzed using Statistical Package for the Social Sciences (SPSS) software, specifically version 26, utilizing Simple frequencies to determine proportions, presenting grouped data as counts and corresponding percentages. Categorical data underwent analysis using the Pearson chi-square test with Statistical significance defined as a p-value less than 0.05.

Ethical considerations

The researcher ensured that ethical standards were followed at all stages of the current study. All procedures of the present study were carried out in accordance with the principles for human investigations (i.e., Helsinki Declaration) and also with the ethical guidelines of the Institutional research ethics. Formal ethics approval was sought from the Southern Medical University Institutional Review Board (IRB) and permission to conduct the study sought from the hospital. Participant's information was handled with utmost confidentiality and informed consent was sought from children aged > 8 years of age; and assent sought from parents/guardians of children less than 8 years of age.

RESULTS

Socio-demographics of the participants

The study was conducted between January 2022 and December 2023 and the study included 1191 children (patients). The socio-demographics of the children who were involved in the study were as follows; 57.2% were female, majority (37.0%) of the children were aged 8 – 15 years and 83.5% of the children were from the Outpatient Department as elaborated in Table 1 below.

Table 1: Socio-demographics of the participants.

Variable	Frequency	Percentage
Gender		
Female	681	57.2
Male	510	42.8
Age		
2 months – 3 years	420	35.3
4 years – 7 years	330	27.7
8 years – 15 years	441	37.0
Department		
In patient	30	11
Out patient	228	83.5
Intensive Care Unit	15	5.5

Incidence of urinary tract infections among participants

A total of 1191 participants fulfilled our inclusion criteria and urine cultures were performed. Out of the urine samples cultured, 273 were found to have bacterial growth in the urine cultures, indicating a positive result representing 22.9% of the population sampled. Majority of the positive cases (61.5%) were female. The incidence in the group of children aged 2 months – 3 years was 21.43 per 100 children, the incidence in the group of children aged 4 years – 7 years was 21.82 per 100 children and the incidence in the group of children aged 8 years – 15 years was 25.17 per 100 children. The table below shows distribution of positive cases among the genders of children.

Table 2: Urine culture result and gender distribution among positive cases

Variables	Frequency	Percentages
Urine culture		
Positive	273	22.9
Negative	918	77.1
Gender		
Female	168	61.5
Male	105	38.5

Spectrum of symptoms among the study participants

The commonest symptom exhibited by the children was fever (75.3%), followed by dysuria (difficult urination) (29.9%) and abdominal pain (25.7%). The least reported symptoms were vomiting (25.2%), irritability (5.8%), and flank pain (4.8%) as elaborated in the table 3 below.

Table 3: Symptoms exhibited by the study participants.

Symptom	N	Percentage
Fever	897	75.3
Dysuria	357	29.9
Abdominal pain	306	25.7
Vomiting	300	25.2
Irritability	69	5.8
Flank pain	57	4.8

Laboratory analysis of the urine samples

Dipstick (leukocyte esterase and nitrate) and microscopic (pyuria) test results from the urinalysis performed as part of the study are as follows: for the leukocyte esterase test, 885 (74.3%) results were negative, and 306 (25.7%) were positive; for the nitrate test, 984 (82.6%) were negative and 69(17.4%) were positive. Pyuria was measured by white blood cell count per high power field (HPF). These results were recorded as negative (if <5WBC/hpf) - 244(61.5%) of the urine samples were negative. A positive test was recorded if >5WBC/hpf - 153(38.5%) results were positive. These results are as shown in Table 4 below

Table 4: Laboratory test results of the urine samples

Variables	Frequency	Percentage
White blood cells (per HPF)		
Less than 5 cells	732	61.5
More than 5 cells	459	38.5
Nitrates		
Negative	984	82.6
Positive	207	17.4
Leukocyte esterase		
Negative	885	74.3
Positive	306	25.7

Common bacterial pathogens in urine cultures

E. coli was the most common uropathogen in the current study accounting for 50.5%. Of these, 34.8% of cases occurred in children aged 2 months to 3 years, 32.6% in those aged 4 to 7 years, and 32.6% in the 8 to 15 age group. Klebsiella spp was the second most common uropathogen accounting for 23.1% of the total cases. Of these, 28.6% of the cases occurred in children aged 2 months to 3 years, 4.8% in those aged 4 to 7 years, and 66.6% in those aged 8 years to 15 years. There was a significant difference in the occurrence of Klebsiella spp. among these age groups (p value - 0.000). Enterobacter spp occurred in 7.7 % of the total UTI cases in the present study; 14.3 % of these occurred in children aged 2 months to 3 years and 85.7% in children aged 4 to 7 years. There was a significant difference in the occurrence of Enterobacter spp. among these age groups (p value - 0.000). More of these results on distribution of the bacterial isolates among the different age groups are shown in the table below;

Table 5: Distribution of the bacterial isolates among the different age groups.

Uropathogen	Age group			P value	Total (n:273)
	2months -3 years (n:90)	4-7 years (n:72)	8-15 years (n:111)		
E-coli	48 (34.8%)	45(32.6%)	45(32.6%)	0.335	138(50.5%)
Klebsiella spp	18 (28.6%)	3 (4.8)	42 (66.6%)	0.000	63(23.1%)
Proteus spp	21(63.6%)	6 (18.2%)	6 (18.2%)	0.002	33(12.1%)
Enterobacter spp	3 (14.3%)	18 (85.7%)	0	0.000	21(7.7%)
Staphylococcus saprophytic	0	0	18(100%)	0.000	18(6.6%)

Anti-microbial susceptibility patterns

Table 6 presents the sensitivity of the bacterial isolates from the urinary tract to given antibiotics. E-coli isolates were more sensitive to vancomycin (97.8%) of the cases, followed by amikacin (95.7%) of the cases and nitrofurantoin (89.1%) of the cases. While Klebsiella spp were most sensitive to vancomycin (100%) of the cases, followed by amikacin (95.2%) of the cases and nitrofurantoin and amoxicillin-clavulanate (76.2%) of the cases. For the Proteus spp, the isolates were most sensitive to vancomycin (90.9%) of the cases, followed by nitrofurantoin (81.8%) of the cases and amikacin and amoxicillin-clavulanate (72.7%) of the cases. The Enterobacter spp. Isolates were most sensitive to vancomycin (100%) of the cases followed by nitrofurantoin, amoxicillin-clavulanate, ciprofloxacin, ceftriaxone and amikacin in 71.4% of the cases. Staphylococcus saprophytic was more sensitive to vancomycin (100%) followed by ceftriaxone and amoxicillin-clavulanate (83.3%) of the cases. In general, most bacterial isolates were sensitive to vancomycin (97.8%), followed by amikacin (89%) and nitrofurantoin (82.4%). Most recurrences were from Klebsiella spp (55.6%) and zero recurrences from Staphylococcus saprophytic. as shown in Table 6 below.

Table 6: Antibiotic sensitivity patterns of common bacterial isolates in the urinary tract.

Antibiotic	E.coli (n = 138)	Klebsiella spp. (n = 63)	Proteus spp. (n = 33)	Enterobacter spp. (n = 21)	Staphylococcus saprophytic (n = 18)	Overall sensitive	Overall Resistance
Ampicillin	8.7%	42.9%	54.5%	42.9%	50%	27.5%	72.5%
Amoxicillin-clavulanate	73.9%	76.2%	72.7%	71.4%	83.3%	74.7%	25.3%
Trimethoprim-sulfamethoxazole	23.9%	19.0%	18.2%	14.3%	16.7%	20.7%	79.3%
Nitrofurantoin	89.1%	76.2%	81.8%	71.4%	66.7%	82.4%	17.6%
Gentamicin	78.2%	0.00	54.5%	57.1%	66.7%	73.6%	26.4%
Ceftriaxone	52.2%	57.1%	54.5%	71.4%	83.3%	57.1%	42.9%
Vancomycin	97.8%	100%	90.9%	100%	100%	97.8%	2.2%
Ciprofloxacin	54.3%	52.4%	63.6%	71.4%	50%	56%	44%
Cefotaxime	32.6%	19%	45.5%	57.1%	33.3%	33%	67%
Amikacin	95.7%	95.2%	72.7%	71.4%	66.7%	89%	11%
Erythromycin	56.5%	57.1%	63.6%	42.9%	16.7%	53.8%	46.2%

DISCUSSION

This study presented the incidence and antibiotic sensitivity patterns of bacteria isolated in the urine of children with urinary tract infections in a Somali Sudanese Hospital between 2022 and 2023. The study involved 1191 patients between age of 2 months and 15 years. The current study reported positive urine culture for 22.9% (n = 273) of the children. These findings are consistent with those in a previous similar study conducted in Southern Ethiopia which reported a positive urine culture in 27.5% of the children,[13] another study from India[14] revealed a prevalence of 26.7% and another study[15] which also revealed a closer prevalence (28.3%) as that reported in the current study. Lower rates have been reported in quite a number of other studies. A survey conducted in a referral hospital in Mogadishu revealed a prevalence of 17.6%, another study conducted in North West Ethiopia that revealed a prevalence of 16.7% and another study in Tanzania which revealed prevalence of 16.8%.[16–18] The difference in the reported prevalence in different studies might be attributed to differences in study designs, economic and health conditions of the area of included patients.

The study reports an incidence of 21.43 per 100 children for children aged up to 3 years. Contrary to this finding, a study conducted to assess minimum incidence of first urinary tract infections in children reported a cumulative incidence of 4.3% in children up to 2 years.[19] This difference can be attributed to a difference in sample size of the studies and the type of participants i.e. the latter study was conducted on only first time UTIs. Among children of up to 6 years, a study conducted to determine the incidence rates of UTIs among children less than 6 years of age reported an incidence of 8.4%. This is contrary to the findings reported by the current study. Such a difference could be attributed to the difference in the type of participants and the study design.[20]

The current study also demonstrated that E. coli was the most predominant bacterial pathogen isolated in the urine of children with UTIs. This could be due to the fact that E coli live harmlessly in the gut and easily access entry to the gut during defecation. The findings in this study are similar to findings from previous studies which revealed that E coli was the most common bacterial isolate in the urine of children with UTIs.[21,22] E coli are gram negative bacteria that have been implicated as a causative agent of UTIs in 80-90% of UTIs in children.[4] To the contrast however a 9 year local experience study on pediatric urinary tract infections[23] reported that Pseudomonas aeruginosa was the most common uropathogen isolated in the urine of pediatric children with UTIs. This finding is different from the findings of the current study and could be attributed to the duration of the study i.e. the study was conducted for a period of 9 years.

Additionally, the current study revealed that incidence of E.coli was highest in children aged 2 months - 3 years (34.8%) while the incidence of the second most common uropathogen, Klebsiella spp was highest in children aged 8-15 years (66.7%). This is quite different from findings of a previous study that reported higher incidence of E.coli among infants and higher incidence of Klebsiella spp among neonates.[24] This shows as demonstrated by a study conducted in Najimieh hospital in Tehran among children with community acquired urinary tract infections by[25] that age is an important determinant in the etiology of UTIs.

The current study also revealed Klebsiella spp as the second most common uropathogen. This could be attributed to the high virulence properties of Klebsiella spp that enable it to stay in the urinary tract that is its K capsule and its ability to produce urease. The findings of the current study are consistent with findings from previous studies; one study conducted in Bahrain,[26] another study conducted in Saudi Arabia assessing community acquired urinary tract infections in children [27] and another study conducted in Saudi Arabia assessing E coli versus non E coli urinary tract infections in children.[28] All these studies revealed Klebsiella spp as the second most common uropathogen in Urinary tract infections. E coli and Klebsiella spp are serious global pathogens that are associated with a number of infections, serious morbidity and health care related costs.[16]

Regarding antimicrobial susceptibility, the current study revealed that E.coli isolates were most susceptible to antibiotics vancomycin, amikacin and nitrofurantoin. This finding could lead to an assumption that these antibiotics have not been overly abused by the community in Somalia and so isolates of the most common uropathogen are still highly susceptible to them. The findings of E coli susceptibility in the current study are consistent with findings from a previous study that reported that E.coli bacterial isolates were most sensitive to meropenem, ertapenem, amikacin and nitrofurantoin[29] and another study in Saudi Arabia that reported similar findings- E.coli being more susceptible to amikacin, nitrofurantoin, imipinem and meropenem.[30] In another study conducted in a French Medical Institute for children, it was established that the isolated uropathogens in children suffering from Urinary Tract Infections were most sensitive to pristinamycin, ticarcillin, ertapenem, imipenem, amikacin, tazobactam, fosfomycin, vancomycin, and nitrofurantoin.[31] Our general observation from previous studies[29,30] was that amikacin and nitrofurantoin were among the most sensitive antibiotics to E.coli, just like our study suggests. To the contrary though, findings from a previous similar study reported that E.coli in their study were most susceptible to ceftriaxone and cefotaxime.[32] The least sensitive antibiotics for E.coli in the current study were ampicillin and Trimethoprim-Sulfamethoxazole. These findings are consistent with those of a previous similar study.[29]

Overall, the most sensitive antibiotics in the current study were vancomycin, amikacin and nitrofurantoin. These findings could as well drive an assumption that these antibiotics have not been overly abused by the pediatric community suffering from Urinary Tract infections in Somalia. The findings on the overall sensitivity of the antibiotics in this study appear consistent with the findings of a previous similar study that reported nitrofurantoin, amikacin, vancomycin, gentamicin among the most highly sensitive antibiotics in urinary tract infections.[33] To the contrast though, another study reports that against UTIs in children, antibiotics ceftriaxone, ciprofloxacin and gentamicin were the most sensitive.[34] This can be attributed to different sample sizes and study sites of the studies as each site can have its own anti-microbial susceptibility patterns. This is one of the reasons as to why it is important to have local anti-microbial susceptibility data and do not depend wholly on global and national anti-microbial susceptibility data to support empirical treatment.

The most resistant antibiotics were trimethoprim-sulfamethoxazole (79.3%), ampicillin (72.5%) and cefotaxime (67%). These findings are similar to findings of a study carried out among children under 5 with urinary tract infections in a primary health care facility in North-Western Tanzania which reported that the most resistant antibiotics were trimethoprim-sulfamethoxazole, ampicillin and penicillin.[35] The study in context reports no Multi-drug resistant spp. This is a good indicator especially that the study involves children.

Limitations of the study

The study has a few limitations; firstly, is the study population. The study involved patients that from a single hospital in a localized region. This could affect the generalizability of the data. Secondly, there is a lack of data regarding previous antimicrobial use. Despite these limitations; our study significantly contributes to the understanding of anti-microbial susceptibility patterns among children in Somalia. The findings from the study will serve as valuable reference and guidance in clinical decision making while managing children with Urinary Tract infections. We recommend further studies on larger scales and involving more diverse populations in Somalia to capture more comprehensive data on the subject.

CONCLUSION AND RECOMMENDATIONS

The current study revealed low incidence of urinary tract infections among children less than 15 years of age, E.coli as the most predominant uropathogen in children of this age and vancomycin, amikacin and nitrofurantoin as the most sensitive antibiotics to the uropathogens in children less than 15 years of age.

The study goes further to recommend that basing on these findings, empirical antibiotic selection be guided by local antibiotic sensitivity data and prevalence of bacterial spp based on local data instead of solely relying on global standards of therapy. By implementing these, our study aims to ensure proper patient management especially in children with UTIs, better treatment outcomes and reduced levels of resistance from inappropriate antibiotics usage.

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