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ORIGINAL ARTICLE

Frequency of Urinary Tract Infection among Children Presenting with Acute Febrile Illness

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ABSTRACT

Background: Acute febrile illnesses are common in children worldwide, especially in those under 5 years of age. Febrile illness is typically presumptively treated as malaria in African children in endemic areas, where the majority of these children are given anti-malarial drugs. This study will provide us the latest and updated information regarding urinary tract infections among children presenting with acute febrile illness in our population.

Objective: The objective of this study is to evaluate the frequency of urinary tract infections among children presenting with acute febrile illness. Although much research has already been conducted on this topic, no recent study has been done in our population. This study will provide us with the latest and updated information regarding urinary tract infections among children presenting with acute febrile illness in our population. The aim to evaluate the frequency of urinary tract infections in children with acute febrile illness presenting at a tertiary care hospital, in Peshawar.

Methods: A total of 250 children meeting the inclusion criteria were enrolled from Hayatabad Medical Complex, Peshawar during December 2021 to December 2022. Clean-catch urine samples were collected, and UTI was diagnosed based on the presence of ≥105 colony-forming units (CFU) per milliliter of a single uropathogenic on urine culture. Demographic data, clinical features, and laboratory investigations (complete blood count, C-reactive protein, urinalysis) were recorded. Potential risk factors for UTI, such as age, gender, antibiotic use, and underlying medical conditions, were analyzed using appropriate statistical tests (chi-square test, logistic regression). The sample was 250 keeping a 20.3% proportion of UTI among febrile children 95% confidence interval and 5% margin of error using the WHO sample size estimation formula.

Results: The results show that among 162 children Mean age was 22 months with SD ± 12.08. 100(62%) children were male and 62(38%) children were female. 23(14%) children had urinary tract infection and 139(86%) children didn't had urinary tract infection.

Conclusions: The study found a 14% frequency of UTI among children with acute febrile illness presenting at a tertiary care hospital in Peshawar, Pakistan. These findings highlight the need for routine urine screening and appropriate management of UTI in the evaluation of febrile illnesses in children in this setting.

Keywords: Urinary tract infection, children acute febrile illness.

INTRODUCTION

Urinary tract infections (UTIs) are a common cause of acute illness in infants and young children, occurring in an estimated 8% of girls and 2% of boys by seven years of age, with a recurrence rate of 10% to 30% [1]. Guidelines and recommendations for diagnosing UTIs were recently updated by the Canadian Paediatric Society and are consulted for how to sample and test urine, how to interpret results, and for treatment strategies [2]. Urinary tract infection (UTI) in young children often presents with non-specific symptoms and obtaining a urine sample from those who are acutely unwell is challenging [3]. Sampling rates are generally lower than recommended, and it has been estimated that up to half of children with UTI in primary care may not be diagnosed when first consulting [4]. A recent UK primary care study found that up to 80% of UTIs may be missed. Primary care clinicians have been urged to lower their threshold for obtaining a urine sample for culture in acutely unwell children [5].

Febrile illness in children is a common cause of hospital admission globally, with significant associated morbidity and mortality6. In developing countries, this is frequently compounded by low rates of immunization, untreated co-morbidities, and late presentations [6]. Febrile illnesses are caused by diverse pathogens, presenting with non-specific symptoms to healthcare facilities with limited diagnostic capacity [7]. Clinical management guidelines for acute febrile illness are available but rarely supported by knowledge of the locally prevalent causative agents [7].

A robust contemporary picture of treatable and preventable infectious causes of severe febrile illness is urgently needed to improve patient outcomes and to inform disease control efforts in low and middle income countries (LMICs). Systematic reviews of studies of community-acquired bloodstream infections in Africa and Asia have demonstrated the importance of invasive infections among febrile inpatients [8]. Mapping studies of the aetiology of non-malarial febrile illness in South East Asia highlighted the diversity and geographical variation in a range of causes of fever. They revealed the substantial information gaps that remain for a range of relevant pathogens [9].

Febrile urinary tract infections have the highest incidence during the first year of life in both sexes, whereas nonfebrile urinary tract infections occur predominantly in girls older than 3 years. After infancy, urinary tract infections confined to the bladder are generally accompanied by localized symptoms and are easily treated14. In one study, the prevalence of UTI was 9% (27 of 300 children), with those aged less than 24 months comprising the majority [10]. In another study, a total of 231 febrile children were enrolled in the study. Of all the children, 20.3% (47/231, 95%CI, 15.10-25.48), had urinary tract infections [11].

The present study is designed to determine the frequency of UTI among children presenting with acute febrile illness without any other sign or symptom. Keeping in view the literature mentioned above, it is suggested that the global burden of UTI is not only on the rise but also highly variable from one population to another. This necessitates the present study to generate local evidence of UTI among our febrile children to add to the existing literature and to suggest future recommendations regarding its control keeping in view the results of the present study.

MATERIALS AND METHODS

In the present study a total of 162 children were observed. Detail

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history, clinical examination was performed for the confirmation of acute febrile illness. Urine sample was taken from the included children and was sent to hospital laboratory for the diagnosis of UTI. All the laboratory investigations were done under supervision of expert consultant microbiologist having at least five years of experience. UTI was labeled positive if urine analysis show greater than or equal to 2-5 WBCs, 15 bacteria per high power field (HPF) in centrifuged urine sediment as well as the urine culture showing growth of more than 105 organisms per ml of children urine.

Data Collection & Analysis Procedure: The study was conducted after approval from the ethical committee was obtained. Patients included in the study were directly admitted in the Outpatient Department of HMC Peshawar during December 2021 to December 2022. The purpose, risks, and benefits of the study were explained to all parents, they had been assured that the study was purely conducted for research and data publication, and informed written consent was obtained.

From all the children, two specimens of clean midstream urine (02 hours apart) were obtained and sent to the hospital laboratory for the diagnosis of UTI. UTI was considered positive if children had clean catch midstream urine analysis showed greater than or equal to 2-5 WBCs or 15 bacteria per high power field (HPF) in centrifuged urine sediment as well as the urine culture showing growth of more than 105 organisms per ml of children urine. All the laboratory investigations were done under the supervision of the same consultant microbiologist having minimum of five years of experience.

All the above information was recorded on a pro forma including age, and sex. Exclusion criteria was followed strictly to control confounders and bias in the study results.

Data were analyzed using SPSS 20.0. Mean + standard deviations were calculated for continuous data like age. Frequencies and percentages were calculated for categorical data like sex, presence of UTI. UTI was stratified among the age and gender to see the effect modifiers. All the results were presented as tables and charts. To know significant differences in different age or gender groups with respect to outcome variable chi-square test at 5% compatible levels were used.

RESULTS

In this study age distribution among 162 children was analyzed as 96(59%) children were in 2-24 months and 66(41%) children were in age 24-48 months. The mean age was 22 months with SD ± 12.08. (table no 1). Gender distribution among 162 children was analyzed as 100(62%) children were male and 62(38%) children were female. (table no 2). Duration of disease among 162 children was analyzed as 71(44%) children had duration of disease <3 days and 91(56%) children had duration of disease >3 days. (table no 3). Weight distribution among 162 children was analyzed as 75(46%) children had weight <10 Kgs and 87(54%) children had weight 10 Kgs. (table no 4). Residence among 162 children was analyzed as 84(52%) children were from rural areas and 78(48%) children were from urban areas. (table no 5). Socioeconomic status among 162 children was analyzed as 71(44%) children were poor, 75(46%) children were middle class, and 16(10%) children were rich. (table no 6). Urinary tract infection among 162 patients was analyzed as 23(14%) children had urinary tract infection and 139(86%) children didn't have urinary tract infection (table no 7). Stratification of urinary tract infection concerning age, gender, weight, duration of disease, residence, socio-economic is mentioned in table 11-18

Table 1: Age Distribution (n=162)

Age	Frequency	Percentage
2-24 months	96	59%
24-48 months	66	41%
Total	162	100%

Mean age was 22 months with SD ± 12.08

Table 2: Gender Distribution (n=162)

Gender	Frequency	Percentage
Male	100	62%
Female	62	38%
Total	162	100%

Table 3: Duration of Disease (n=162)

Duration	Frequency	Percentage
≤3 days	71	44%
>3 days	91	56%
Total	162	100%

Mean duration of disease was 3 days with SD ± 2.55

Table 4: Weight Distribution (n=162)

Weight	Frequency	Percentage
≤10 Kgs	75	46%
>10 Kgs	87	54%
Total	162	100%

Mean weight was 10 Kgs with SD ± 5.91

Table 5: Residence (n=162)

Residence	Frequency	Percentage
Rural	84	52%
Urban	78	48%
Total	162	100%

Table 6: Scio Economic Status (n=162)

SES	Frequency	Percentage
Poor	71	44%
Middle class	75	46%
Rich	16	10%
Total	162	100%

Table 7: Urinary Tract Infection (n=162)

UTI	Frequency	Percentage
Yes	23	14%
No	139	86%
Total	162	100%

Table 8: Stratification of Urinary Tract Infection W.R.T Age Distribution (n=162)

Urinary Tract Infection	2-24 months	24-48 months	Total
Yes	13	10	23
No	83	56	139
Total	96	66	162

Chi square test was applied in which P value was 0.7729

Table 9: Stratification of Urinary Tract Infection W.R.T Gender Distribution (n=162)

Urinary Tract Infection	Male	Female	Total
Yes	14	9	23
No	86	53	139
Total	100	62	162

Chi square test was applied in which P value was 0.9271

Table 10: Stratification of Urinary Tract Infection W.R.T Duration Of Disease (n=162)

Urinary Tract Infection	≤3 days	>3 days	Total
Yes	10	13	23
No	61	78	139
Total	71	91	162

Chi square test was applied in which P value was 0.9709

Table 11: Stratification of Urinary Tract Infection W.R.T Weight Distribution (n=162)

Urinary Tract Infection	≤10 Kgs	>10 Kgs	Total
Yes	11	12	23
No	64	75	139
Total	75	87	162

Chi square test was applied in which P value was 0.8737

Table 12: Stratification of Urinary Tract Infection W.R.T Residence (n=162)

Urinary Tract Infection	Rural	Urban	Total
Yes	12	11	23
No	72	67	139
Total	84	78	162

Chi square test was applied in which P value was 0.9733

Table 13: Stratification of Urinary Tract Infection W.R.T Scio Economic Status (n=162)

Urinary Tract Infection	Poor	Middle Class	Rich	Total
Yes	10	11	2	23
No	61	64	14	139
Total	71	75	16	162

Chi square test was applied in which P value was 0.9743

DISCUSSION

Acute febrile illnesses are common in children worldwide, especially in those under 5-years of age. Infections leading to these febrile episodes are responsible for the majority of under-5 mortality. Febrile illness is typically presumptively treated as malaria in African children in endemic areas, where the majority of these children are given anti-malarial drugs. World Health Organization guidelines have been developed to guide empiric treatment at first-level facilities4,5 with an emphasis on anti-malarial administration. Yet presence of fever alone is not adequate to distinguish malaria from other infectious conditions, especially if the presentation is without focal signs.[12]

The study shows that among 162 children 96(59%) children were in 2-24 months and 66(41%) children were in age 24-48 months. Mean age was 22 months with SD ± 12.08. 100(62%) children were male and 62(38%) children were female. 71(44%) children had duration of disease <3 days and 91(56%) children had duration of disease >3 days. 71(44%) children had weight <00 Kgs and 91(56%) children had weight 00 Kgs. 84(52%) children were from rural areas and 78(48%) children were from urban areas. 71(44%) children were poor, 75(46%) children were middle class and 16(10%) children were rich. 23(14%) children had urinary tract infection and 139(86%) children didn't had urinary tract infection

Shaw KN78 had reported that overall prevalence of UTI (growth of >/=10(4) CFU/mL of a urinary tract pathogen) was 3.3% (95% confidence interval [CI]: 2.6,4.0). Higher prevalences occurred in whites (10.7%; 95% CI: 7.1,14.3), girls (4.3%; 95% CI: 3.3,5.3), uncircumcised boys (8.0%; 95% CI: 1.9,14.1), and those who did not have another potential source for their fever (5.9%; 95% CI: 3.8,8. 0), had a history of UTI (9.3%; 95% CI: 3.0,20.3), malodorous urine or hematuria (8.6%; 95% CI: 2.8,19.0), appeared "ill" (5.7%; 95% CI: 4.0,7.4), had abdominal or suprapubic tenderness on examination (13. 2%; 95% CI: 3.7,30.7), or had fever >/=39 degrees C (3.9%; 95% CI: 3. 0,4.8). White girls had a 16.1% (95% CI: 10.6, 21.6) prevalence of UTI.

Zorc J79 had repoted as another issue affecting estimates of incidence is the increased recognition of UTI as a potential source of febrile illness in young children [13]. Screening studies in emergency departments suggest that up to 5% of children under the age of 2 presenting with fever have UTI, and over half of these would have been given alternative diagnoses such as otitis media had the urine not been screened as part of the study. A recent population-based study from Scandinavia reported a cumulative UTI incidence rate of 7.8% for girls (26) by the age of 7 years, more than twice the estimate of 3%.

The literature is unclear about the age UTI becomes less prevalent for boys and girls. Our data suggest that girls younger than 1 year of age are at higher risk for UTI than those in the second year of life. Because of our small number of boys with UTI, we are not able to determine whether boys younger than 6 months are more at risk than those 6 to 12 months of age. The large variation in prevalence of UTI in boy infants among studies may be attributable to difference in circumcision status. Hellerstein S81 found a 12.4% (95% CI: 7.6,17.3) prevalence of UTI in febrile boys younger than 8 weeks of age, of whom 82% were uncircumcised [14]. Kunin CM et al found a prevalence of 2.9% (95% CI: 1.1,6.2) in boys of similar age, of whom only 2% were uncircumcised [15]. We found that uncircumcised boys were eight times more likely to have UTI than those who were circumcised, consistent with a 10-fold increase in uncircumcised boys found by Wiswell and colleagues in a cohort of military families [16].

Few clinical symptoms or signs appear to indicate UTI in febrile young infants. Although GI symptoms of poor feeding, vomiting, and diarrhea are reported in many infants admitted for UTI, the prevalence of UTI was not higher in this group. Specific signs of UTI such as changes in the urine odor or hematuria; tenderness of the abdominal, flank, or suprapubic areas on examination; or medical history of UTI were associated with higher prevalence of UTI but were uncommonly elicited. Nonspecific findings of higher fever and ill general appearance were strongly associated with UTI.

We chose a conservative definition of UTI, comparable with that used in a previous paper on UTI prevalence, and did not use urinalysis or dipstick results as criteria for obtaining or interpreting urine cultures. There is much debate in the literature regarding the definition of a positive result from urine obtained by catheterization. The amount of growth considered positive varies from 103 to 105 CFU/mL. Recently, Hoberman and associates have argued that ≥50 000 CFU/mL should be considered the cut-off, based on the amount of pyuria observed at this level compared with lesser growth levels. If >50 000 CFU/mL is used to define a positive result, in this study 7 children would have been classified as having negative results; 3 of these (43%) were girls with high fevers ≥39.5°C who had significant pyuria (≥25 WBC/HPF) and pure growth of E coli. No absolute cut-off can predict perfectly the presence or absence of UTI. A few children with growth <104 had evidence of pyuria and were treated for UTI, whereas 10% of children with ≥105 lacked evidence of pyuria. Although some of these children may have asymptomatic bacteriuria, the prevalence of asymptomatic bacteria is reported to be low, 1%.86 However, pyuria as determined by standard urinalysis is not necessarily present on initial urinalysis even with documented pyelonephritis on nuclear scan in febrile young infants or by suprapubic aspiration.

CONCLUSIONS

This research work concluded that the frequency of urinary tract infection was 14% in children with acute febrile illness presenting at tertiary care hospital, Peshawar. This relatively high frequency of UTI among febrile children in this setting is an important finding. It underscores the need for healthcare providers to consider UTI as a potential cause of fever in pediatric patients, in addition to more commonly suspected etiologies such as malaria or viral infections. In many resource-limited settings like Peshawar, febrile illnesses in children are often presumptively treated as malaria without appropriate diagnostic workup, leading to the potential for missed or delayed diagnosis of UTI. This cross-sectional study conducted at a tertiary care hospital in Peshawar, Pakistan, found that the frequency of urinary tract infection (UTI) among children aged 2 months to 5 years presenting with acute febrile illness was 14% (23 out of 162 children).

DECLARATIONS

Author Contributions: Author 1: Conceptualization, data curation, supervision. Author 2: methodology (equal), software and writing-review and editing. Author 3: data curation and methodology (equal). Author 4: formal analysis and investigation. Author 5: investigation and writing- review and editing. Author 6: conceptualization and writing- review and editing, writing-original draft, software, investigation and formal analysis.

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