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Age and gender based study of urine microscopy in children and adolescents: a retrospective study

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ABSTRACT

Background: Urinary tract infection (UTI) is a common reason for accessing health care services in all age groups. Women are more susceptible to UTI across age groups. Among males, the prevalence decreases in adolescence. Socio-economic and behavioural factors may play a significant role in the higher prevalence of UTI among adolescent girls. A study on UTI among children and adolescents will give a better insight in to the gravity of the problem and suggest appropriate interventions. Aim of the current study was to investigate the prevalence of urinary tract infection in males and females in the age group 0 to 20 based on the urine routine examination.

Methods: This retrospective study included patients who had urine routine examination (URE) done based on clinical symptoms, during the period from January to December 2018 in a tertiary care teaching hospital. Data was obtained from the laboratory records and medical records department.

Results: 1574 (3.43%) out of 45896 patients had a URE. This included 716 males (46%) and 858 females (54%). Among those with positive URE results, females were more affected than their male counterparts and this was statistically significant (male 21.8%, female 78.2%, p<0.0001). As age advances, the prevalence decreases in males.

Conclusions: Urinary tract infection is more prevalent in females across the pre- adolescent and adolescent age group. It decreases with age in males. Understanding the factors responsible for the persistent higher prevalence in females may decrease the prevalence of urinary infection in adolescent females.

Keywords: Adolescent, Urinary tract infection, Prevalence

INTRODUCTION

Urinary tract infections (UTIs) are common bacterial infections affecting the population, across age and gender. Around 50-60% of women will develop UTIs in their lifetimes. Almost one-third of all women before the age of 24 would have had at least one episode of UTI which required antibiotic treatment. Studies have found significant medical and financial implications associated with UTIs. Acute uncomplicated UTI among young adults may be benign. However it can be associated with

impaired renal function and end-stage renal disease among paediatric patients.²A web-based survey on adult women in Europe found approximately 50% of women experienced uncomplicated UTI and 20-30 % experienced recurrent UTI, significantly affecting the quality of life. Antibiotic use and absence from work were the factors impacting quality of life. Recurrence was common in spite of prophylactic measures.³ The incidence of UTI is particularly higher during adolescence, a period during which there is a complex interplay of biological, psychological, and social factors.⁴

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World health organization (WHO) described adolescence as the age group 10-20 years.⁵

Adolescents, especially girls, have an increased awareness of themselves and their surroundings. This self-consciousness can lead to decreased usage of public facilities or even care for their own needs when in a public setting. Controlling the urge for urination, hesitation to use public toilets, embarrassment to inform guardians/parents of any difficulties with regard to urination can increase the chances of urinary tract infections and its complications. Adolescents in the lower socio-economic groups may be more at risk from these Among socio-economically disadvantaged factors population, girls and women are more prone to be affected. Identifying the prevalence and risk factors of UTI will enable us to carry out appropriate interventional measures.

METHODS

This was a retrospective study conducted at the Believers Church Medical College Hospital, a tertiary care hospital in South India. Patients below 20 years of age who attended the hospital with symptoms of probable UTI and underwent URE from January to December 2018 were included in the study. All the children and adolescents in the age group of below 20 years of age with urine routine examination were included in the study. There were none excluded. All the participants, who met the inclusion criteria mentioned above, were included in the study.

The data was collected from the laboratory records and medical records department. The age, gender and number of pus cells per high power field (HPF) in URE were recorded. The number of pus cells per high power field was used as an indicator of presence of UTI. Urine results with pus cells more than 5/ HPF were considered as positive. The results of URE were stratified into 4 groups containing 0-5 pus cells/ HPF, 6-10, 11-25, and more

than 25. The number of pus cells/HPF may not be an indicator of the severity of UTI. The positive urine routine tests were further stratified according to age and gender.

Data was entered into Microsoft excel with appropriate coding. Statistical package for social sciences (SPSS) software was used for data analysis. In addition to the descriptive measures, Chi-square test was used to compare the data.

RESULTS

A total of 45896 patients below twenty years of age attended various out-patient clinics in the hospital during the study period, January to December, 2018. There were 23594 males (51%) and 22302 females (49%). Among these, 1574 (3.43%) patients had a URE done. This included 716 males (46%) and 858 females (54%). Age and sex distribution of the study population is presented in (Table 1). Negative urine routine results were equally distributed among both genders (male, 48.4%; females, 51.6%). Among those with positive URE results, when characterized according to gender, females were more affected than their male counterparts and this was statistically significant (male 21.8%, female 78.2%, p< 0.0001). When characterized by age, the number of URE positive cases was similar across age groups (less than 10 years versus more than 10 years), and was found to be non-significant.

The URE negative results are equally distributed in the below 10 years and above 10 years in both sexes (Table 2). In the below 10 years age group, females (65, 38.2 %) are more affected than males (27, 15.9%). Also, in the above 10yrs age group, females (68, 40%) are more affected than the males (10, 5.9%). This is statistically significant (47.028 and p<0.0001).

Table 1: Distribution of urine microscopy (positive and negative) cases according to age and gender.

Variable		URE positive Frequency, (%)	URE negative Frequency, (%)	Chi-Square value	P value	
Gender	Male	37 (21.8)	679 (48.4)	43.26	<0.0001	
	Female	133 (78.2)	725 (51.6)			
Age	Less than 10 years	92 (54.1)	805 (57.3)		0.461 Nan aimifiant	
	Greater than 10 years	78 (45.9)	599 (42.7)	0.641	0.461, Non-significan	

Table 2: Urine microscopy results classified according to age group and gender.

Variables	URE positive (Frequency, %)	URE negative (Frequency, %)	Chi square test	P value
Males ≤ 10 years	27 (15.9)	405 (28.8)		
Males >10 years	10 (5.9)	274 (19.5)		
Females ≤ 10 years	65 (38.2)	400 (28.5)	47.028	< 0.0001
Females >10 years	68 (40.0)	325 (23.1)		

Variable	URE results	0-5 pus cells/HPF (Frequency, %)	6-10 pus cells/HPF (Frequency, %)	11-25 pus cells/HPF (Frequency, %)	>25 pus cells/HPF (Frequency, %)
Gender	Male	679 (48.4)	10 (16.9)	14 (19.7)	13 (32.5)
Gender	Female	725 (51.6)	49 (83.1)	57 (80.3)	27 (67.5)
	0-5	445 (31.7)	18 (30.5)	25 (35.2)	14 (35)
A go (yoong)	6-10	360 (25.6)	13 (22)	18 (25.4)	4 (10)
Age (years)	11-15	303 (21.6)	11 (18.6)	8 (11.3)	9 (22.5)
	16-19	296 (21.1)	17 (28.8)	20 (28.2)	13 (32.5)

Table 3: Distribution of urine microscopy result as per number of pus cells per HPF (pyuria).

The URE results were further tabulated based on the number of pus cells per HPF was categorized according to sex and age of individual and is presented in (Table 3). On further analysis, all the subgroups of URE results (based on the number of pus cells/HPF) showed over representation of females. For those with positive URE, the number of cases was more in either extremes of age group. We also performed binary logistic regression analysis with URE results (positive versus negative) as outcome variable and gender, age and their interaction as independent variables. We found gender (odds ratio: 3.367, p=0.0001) as significant variable, with female gender at higher risk compared to male.

DISCUSSION

Urinary tract infections are responsible for many of the urinary symptoms in adolescents, particularly in females. In young children, UTI is usually associated with congenital or anatomic defects. Febrile UTIs are more common in both sexes in the first year of life. There is a higher frequency of congenital anomalies of the kidney and urinary tract in males in the first months of life and may be associated with higher frequency of UTI in younger boys.⁸ Boys with phimosis had a higher incidence of UTI compared to the normal group. When associated with voiding symptoms like vesicoureteric reflux, the risk of pyelonephritis is high. 9 A meta-analysis showed higher incidence of UTI in uncircumcised boys. 10 In our study population also, males in the age group less than 10 years had higher prevalence of UTI compared to the further age groups and the prevalence decreases with age. However, even in the less than 10 years age group, the prevalence is higher among females.

In the adolescent age group, the prevalence is significantly higher in females. Various factors have been implicated for the higher incidence of UTI in adolescent females. Inadequate hydration, lack of clean toilets and poor menstrual and sexual hygiene predisposes a young girl to UTI.¹¹ They advocate educating girls regarding good hydration and hygiene. Another study however did not find any difference in rates of UTI between those who use pads and non-users. There was a decreased rate of vulvovaginal symptoms in users of menstrual pads.¹² Behavioural factors play an important role in the higher incidence of UTI in adolescents. One study has identified

host-mediated predisposing abnormalities like infrequent voiding, poor fluid intake, functional stool retention or voiding dysfunction as important risk factors for recurrent UTI. These risk factors were always associated with poor genital hygiene and toilet habits and suggest that infections are not necessarily related to poor genital hygiene or toilet habits only. ¹³

Adolescents are more similar to young adults and sexual activity may be related to UTI. It is important to counsel adolescents about sexual activity when dealing with adolescents with UTI. However, complicated UTIs arising from anatomic abnormalities, reflux disease and other neurogenic causes will need customized treatment plans. 14 Hooton et al reported that sexually active young women have higher incidence of symptomatic urinary tract infection.¹⁵A survey of teachers addressing voiding habits or behavioural factors related to occupation that could lead to UTI found that half of the respondents made a conscious effort to drink less at work, to avoid needing to use the toilet. They found no association between the prevalence of urinary tract infection and the number of voids or infrequent voiding at work. However those women who drank less than adequate water had a 2.21fold higher risk after controlling for other factors. They advocated further study to determine whether modification of behavioural factors at work can reduce the incidence of urinary tract infections. 16 A study carried out among adolescent and preadolescent girls (10-19 years) in a rural area found significant association between prevalence of UTI and improper perineal washing technique, malnutrition, presence of vaginal discharge and use of unsanitary pads during menses. This study identified low socioeconomic status as chiefly responsible for improper and inadequate hygiene practices resulting in UTI.¹⁷ A review on recurrent UTI has advised adequate fluid intake and to urinate frequently to help flush bacteria from the bladder. Infrequent voiding can result in cystitis. Preventive measures related to sexual intercourse may reduce the recurrence rate. Skin allergens including chemicals in bath soaps and vaginal creams may alter vaginal flora and ultimately result in UTIs.1 In this context, certain schools in Kerala have started the concept of water bell - defined times at which bells are rung to remind children to drink water. 18 One study tried to identify the prevalence of targeted and serendipitous treatment for, and associated

recovery from, urinary tract infection (UTI) in pre-school children. They found that children with a laboratorydiagnosed UTI were more likely to be prescribed antibiotics when UTI was clinically suspected than when it was not. Organism sensitivity to the prescribed antibiotic was higher when UTI was suspected than when given for other reasons. 19 This is important as antibiotic resistance is a significant concern now and in the setting of recurrent UTI can add to the cost burden from use of higher antibiotics.²⁰ Empirical treatment with antibiotics is more common in patients with elevated pus cells in urine.²¹ Urinary tract infection among adolescents can be associated with significant economic burden in the short run and health risks in the long run. The LUCI study aims to assess the short, medium and longer term outcomes from childhood UTI.22

Limitations

The symptoms which would warrant a URE were not defined. One study found that individual symptoms of UTI may be an inadequate guide on which to base diagnostic testing. There is however no other accurate clinical prediction tool.²³ The chance of an UTI is rare with a negative urine routine test.²¹ Urine culture adds to the cost of the treatment. Urine culture may also be infrequent and difficult for all symptomatic patients.²²

CONCLUSION

UTI is more prevalent among females across age groups, even as it decreases among male adolescents. The various socio-economic and behavioural factors may be responsible for the persistent high prevalence rates among females. Appropriate awareness programs on proper hygienic practices and hydration could help to abate UTI. Emphasis on adequate water intake should be ensured in schools and colleges. Clean and hygienic toilets should be made available. Sex education also plays a role in preventing UTI.

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Institutional Ethics Committee

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