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Bacterial Pattern and Risk Factors Associated with Urinary Tract Infection in Secondary School Going Girls in Dhaka City

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Abstract
Background: *Urinary tract infection is one of the most common bacterial infection in children. During adolescence, the incidence of UTI increases significantly in young women while remain constant in young men. Asymptomatic bacteriuria is also more common in female. Antibiotic resistance has become an important factor to be considered in the treatment of UTI. There are several risk factors of UTI in both symptomatic and asymptomatic bacteriuria in school going girls in these age group.*
Materials & Methods: *Midstream urine samples were collected from 200 school going girls of four secondary school spreading in four Thana of Dhaka city by random sampling. Each specimen was cultured on Mac Conkeys and Chromogenic media including microscopic examination. The inoculated plates were incubated at 37^{O}C aerobically for 24 hours. Antibiotic susceptibility testing of the isolates was also assessed. Risk factors like toilet training (wiping back to front), voiding during school time, incomplete evacuation, constipation, using unhygienic menstrual cloth during menstruation and tight jeans were evaluated.*
Results: *Prevalence of UTI was 9% of culture positive 18 cases with significant colony count > 10^{5}/ml. Among them 4% were symptomatic UTI and 5% were asymptomatic bacteruria. Esch. coli was found to be the most predominant pathogen 44% followed by Klebsiella spp. (17%), Enterobacter spp. (17%), Enterococci spp. (17%) and Proteus spp.(5%). Amoxycillin, cotrimoxazole and cephradine were the common resistant antibacterial agent among isolates. There was significant association of UTI with risk factors like toilet training (wiping back to front), constipation, using unhygienic cloth during menstruation and wearing tight pants (Jeans).*
Conclusion: *Frequency of UTI was 9% in secondary school going girls. Among them 4% were symptomatic UTI and 5% were asymptomatic bacteriuria. Risk factors like toilet training (wiping from back to front), constipation, unhygienic sanitary cloth during menstruation and using tight jeans pant were associated with UTI. Gram negative bacteria were more common and there were high level of resistance to Amoxycillin, cotrimoxazole and cephradine of the isolated organism.*
Keywords: *Bacterial pattern, risk factors, UTI, secondary school girls.*

Introduction

Urinary tract infection (UTI) is one of the most common serious bacterial infections causing illness in infants and children.[1] UTI is a term applied to a variety of clinical condition ranging from asymptomatic bacteriuria to severe infection of the kidney with resultant sepsis. It is one of the most common bacterial infections encountered by clinicians.[2]Inthe pre-antibiotic era, UTI had a mortality rate as high as 20% although acute complications in healthy children are now uncommon except in young infants, who may progress to systemic infection.[3,4] Long-term complications of UTI have been associated with renal scarring and include hypertension, chronic renal failure and toxemia in pregnancy. Long-term follow-up data are limited. One Swedish study found that children diagnosed with renal scarring due to pyelonephritis during the 1950s and 1960s developed high rates of hypertension (23%) and end-stage renal disease (10%).[5] But more recent studies question the association between pyelonephritis and end-stage renal disease.[6] Although the individual risks associated with UTI remain unclear, the high prevalence of UTI and potential morbidity associated with complications require careful attention to diagnosis and management.

Pooled prevalence of UTI (both febrile and afebrile), among <19 years older children, with urinary symptoms, the was 7.8% from a study in USA.[7] Ahmed et al. reported the prevalence of UTI among adolescent girls was 12.7%while Sing et al. reported the prevalence of 4.2 %.[8,9] In preschool and school age children prevalence of UTI is about 1-5% for females and is rare in males.[10] Following puberty the incidence increases for females and remains uncommon for males.[11] During adolescence, the incidence of UTI increases significantly (20%) in young women, while remaining constant in young men.[12] Smith et. al, found the incidence of UTI was 3.6% in boys and 11.3% in girls by the age of 16 years.[11]

Asymptomatic bacteriuria is a common finding with a past history of symptoms such as frequency and dysuria.[13] The prevalence of asymptomatic bacteriuria in a secondary school of University of Port Harcourt was 10% and among them 6% were female and 4% were male.[14] Kumar et al, reported asymptomatic bacteriuria in 11-15 years school going children were 10.57% with female preponderance over male.[15]

The risk of UTI can be increased by many factors such as urinary retention, urine stasis, reflux of urine, unstable bladder, constipation, sexual intercourse, chronic illness & prolonged use of antibiotics which can damage periurethral flora allowing the uropathogens to colonize & infect the urinary tract.[12] Heffner and Gorelick observed that various factors like age, gender, race, genetic factors, sexual activity among the teen age girl and uncircumcised boys, nocturnal enuresis are associated with occurrence of UTI.[16] The incidence of UTI is bimodal, highest during the first year of life and peaking again during adolescence.[16] Ahmed et al. revealed strong association between UTI and improper perineal washing technique, use of unsanitary pads during menses, malnutrition, vaginal discharge and pinworm infestation.[8]

The prevalence of UTI among Asian, Hispanic and white infants was reported to be 22%, 16% and 16%, respectively whereas the prevalence of UTI among black infants was 4% lower than other ethnic groups.[17] Sex shows a preponderance of UTI in boys during the first year of life, but after the first year more girls than boys have UTI. Uncircumcised boys have upto 10 times more risk of UTI than circumscribed boys in the first year of life.[12] Another study showed the prevalence of UTI among febrile male infants <3 months was 2.4% of circumcised males and 20% for uncircumcised males.[7]

Among 5-18 years of age, the overall prevalence of enuresis was 6.8%, urinary tract pathology was 2.9% which indicates high association between UTI and nocturnal enuresis.[18] Poor genital hygiene or toilet habits are sufficient to cause infection combined with other functional abnormalities such as infrequent voiding,

inadequate fluid intake, functional stool retention or voiding dysfunction.[19]Wan et al. observed that toilet habits wiping from back to front affect strongly the development of urinary tract infections because of contamination of fecal flora with urogenital system.[20] Constipation is one of the risk factors of UTI because it causes mechanical effect on bladder emptying and helps multiplication of organism and the risk of UTI is seven times more in children with constipation than without constipation.[21]

Most of the UTI are caused by gram-negative bacteria like *Esch. coli*, *Klebsiella spp.*, *Proteus spp.*, *Pseudomonas aeruginosa*, *Acinetobacter* and *Serratia spp.* Ninety nine percent of UTI cases are caused by gram-negative bacteria while only 10% by gram positive bacteria which include *Enterococcus spp.*, *Staphylococcus aureus* and *Streptococcus agalactiae*.[22] UTI in children are usually monomicrobic, often caused by *E. coli* (60-80%), *Proteus* (more common in boys), *Klebsiella*, *Enterococcus* and Coagulase Negative*Staphylococci*.[23]

Antibiotic resistance has become an important factor to be considered in the treatment of infection. Epidemiology and resistance patterns of bacterial pathogens in pediatric UTI show large interregional variability and rates of bacterial resistances are changing due to different antibiotic treatment.[24] Al-Mardeni found, E. coli was the most frequent organism below the age of14 years.[25] Resistance to ampicillin, sulfameth-oxazole and trimethoprim was common and MDR (multi drug resistant) among *E. coli* isolate was 59.9%. Knowledge of the patterns of resistance at community level helps in deciding empiric therapy for UTI.[25]

As UTI is a common infection in children and adolescence. Antibiotic resistance has become an important factor to be considered in the treatment of infection. Empiric antibiotic therapy for UTI is based on the knowledge of the predominant pathogens and their antimicrobial susceptibility in the area of practice and age. Several risk factors increases the incidence of UTI in adolescent School going girls like using unhygienic cloth during menstruation, improper toilet training, wearing tight jeans, not voiding urine during school period, constipation. As far as I have searched the literature and web no such study has yet been conducted in our country. The study was carried out to see the frequency of both symptomatic & asymptomatic UTI in secondary school going girls (Class IX & X), see the bacterial pathogens causing UTI in this age group, resistance pattern of isolated bacteria, as well as to identify the associated common risk factors. Microscopic examination of urine and culture and sensitivity pattern of isolated bacteria will help in accurate diagnosis of urinary tract infection and facilitate appropriate antibiotic of UTI.

Materials and Methods

This cross sectional study was performed in four girl's school in different Thana of Dhaka city over a period of six months from March to October 2011. Calculated sample size was 170. Four schools of four different Thana in Dhaka city which was selected by simple random sampling by lottery. The selected schools were Meherunnisa Girls School & College, Dhanmondi; Khilgaon Govt. Colony High school, Khilgaon; Mukulika High School, Hazaribag; Lalmatia Girls High School, Mohammadpur. Girls of class IX and X were included in this study, whose guardian has given the consent to be enrolled. Girls with known congenital anomalies of the urinary tract and any girl who has received antibiotic 48 hours prior to collection of urine sample and those whose parents did not give consent were excluded.

Total students of these four schools were 322. Among them 200 (62%) students were included in the study. Rest of the students was not included in the study because of unwillingness of parents and students to participate. Data related to age, history of urinary symptoms like fever, urgency, frequency, lower abdominal pain and BP, BMI, associated risk factors like toilet training, incomplete emptying, constipation, voiding during school time, sanitary pad using during

menstruation, wearing tight pants like jeans were noted. In this study, for confirmation of UTI only urine analysis and urine culture and sensitivity test were done. Other investigation like- CBC, C reactive protein, ESR, blood culture were not done in this study because of reluctance of the guardian and school authorities as well as student itself. Ultrasonogram of KUB region was not considered as a diagnostic tool in this study because of genitourinary tract abnormality was excluded from the study.

Before giving urine sample children were instructed how to give clean catch midstream urine. Urine samples from school girl were collected in sterile container and transported to department of microbiology, Bangabandhu Sheikh Mujib Medical University, within two hours by using a portable cooler filled with ice block to avoid any bacterial contamination.

Urine sample were tested within two hours of collection. The urine specimens were centrifuged at a rate of 5000 rpm for 10 minutes. The supernatant urine was discarded and suspended urine was examined under microscope for pus cell, RBC, epithelial cell and RBC casts. Urine sample was inoculated into Chromogenic and MacConkey agar plates with a 0.01ml calibrated loop. All plates were incubated at 35-37^{0}C for 24hrs. On culture of mid stream sample of urine, a colony count of more than 10^5 /ml organisms of a single species was considered significant. Antimicrobial susceptibility of isolates was tested by the disk diffusion method using Mueller—Hinton medium, using antibiotic discs. Antimicrobial agents tested were Amoxycillin, Cotrimoxazole, Cephradine, Cefuroxime, Ceftriaxone, Cefotaxime, Ceftazidime, Nitrofurantoin, Ciprofloxacin, Nalidixic acid, Gentamycin, Amikacin, Netilmycin, Mecillinum, Imepenem, Aztreonam. Those girls, who were symptomatic, were treated with antibiotic for 7-10 days according to culture and sensitivity results.

Data were analyzed by using the Statistical Package for Social Science (SPSS) software version 16. Chi-square (χ^2) test and Fisher Exact Test were used for categorical and quantitative variables respectively. Results were considered statistically significant at p value <0.05. The study protocol was approved by institutional review board (IRB) of BSMMU. Informed consent from the respective school authorities and the guardians of the enrolled subjects were taken prior to commencement of the study.

Results

Among the enrolled 200 children, 18(9%) children developed UTI, among them 8(4%) were symptomatic UTI and 10(5%) were asymptomatic bacteriuria.

Table- I: Demographic distribution of UTI cases in study subjects

Demographic	UTI positive(n-18) No (%)	**UTI negative**(n-182) **No (%)**	**p value**[#]
Class			
Class-IX	8 (44.44)	97 (53.30)	0.63
Class-X	10 (55.56)	85 (46.70)	
Area			
Affluent	9 (50.00)	109 (59.90)	0.74
Non affluent	9 (50.00)	73 (40.10)	
Age			
12-14	8 (44.44)	99 (54.40)	0.46
15-17	10 (55.56)	83 (45.60)	

[#] Chi-square (χ^2) test

There was no significant relation of UTI positive cases with class, area and age distribution (p-value 0.63, 0.74&0.46 respectively). There was increasing number of UTI with increasing age and class.

Table- II: Association of presenting features of UTI cases in the study subject

Presenting features	UTI positive(n-18) No (%)	UTI negative(n-182) No (%)	Total(n-200) No (%)	P value
Fever				
Present	4 (22.22)	12 (6.59)	16 (8.0)	0.04#
Absent	14 (77.78)	170 (93.41)	184 (92.0)	
Urgency				
Present	5 (27.78)	20 (10.99)	25 (12.5)	0.04##
Absent	13 (72.28)	162 (89.01)	175 (87.5)	
Burning sensation				
Present	6 (33.33)	17 (9.34)	23 (11.5)	0.002##
Absent	12 (66.67)	165 (89.66)	177 (88.5)	
Frequency				
Increase	1 (5.56)	15 (8.24)	16 (8.0)	0.56#
Normal	17 (94.44)	167 (91.76)	184 (92.0)	
Lower abdominal pain				
Present	6 (33.33)	22 (12.09)	28 (14.0)	0.01##
Absent	12 (66.67)	160 (87.91)	172 (86.0)	

Fisher exact test, ## Chi-square (χ^2) test

Fever, urgency, burning sensation during micturition and lower abdominal pain were significantly present in UTI cases (p-value 0.04, 0.04, 0.002 and 0.01 respectively). Increased frequency of micturition was not significant symptoms for UTI positive cases (p-value 0.56).

Table- III: Association of risk factors with UTI cases in study subjects

Risk factors	**UTI positive**(n-18) **No. (%)**	**UTI negative**(n-182) **No. (%)**	**Total** (n-200) **No. (%)**	**P value**#
Toilet training (Wiping)				
Back to front	7 (38.89)	33 (18.13)	40 (20.0)	0.03
Front to back	11 (61.11)	149 (81.87)	160 (80.0)	
Incomplete evacuation				
Yes	4 (22.22)	30 (16.84)	34 (17.0)	0.53
No	14 (77.78)	152 (83.56)	166 (83.0)	
Constipation				
Yes	7 (38.89)	31 (17.03)	38(19.0)	0.02
No	11 (61.11)	151(82.97)	162 (81.0)	
Voiding during school time				
Yes	5 (27.78)	61 (33.52)	66 (33.0)	0.62
No	13 (72.22)	121 (66.48)	134 (67.0)	
Unhygienic sanitary cloth				
Yes	12(66.67)	72(39.56)	84(42)	0.02
No	6 (33.33)	110 (60.44)	116 (58.0)	
Wearing tight pants				
Yes	13 (72.22)	84 (46.15)	97 (48.5)	0.03
No	5 (27.78)	98 (53.85)	103 (51.5)	

#Chi-square test

Improper toilet training (wiping back to front), constipation, unhygienic sanitary cloth and wearing tight pants were significantly associated with UTI cases (p-value 0.03, 0.02, 0.02 & 0.03 respectively). Not voiding during school time and incomplete evacuation was found not to be associated with UTI (p-value 0.62&0.53).

Table-IV: Sensitivity and specificity of microscopic examination (pus cell) with culture positive UTI cases

Pus cell*	UTI positive(n-18) No. (%)	UTI negative (n-182) No. (%)	Total (n-200) No. (%)	Sensitivity	Specificity
> 5	14 (77.78)	15 (8.24)	29 (14.5)	77.78%	91.76%
< 5	4 (22.22)	167 (91.76)	171 (85.5)		

*Number of pus cell >5/HPF was considered as significant

Out of 29 girls who had >5 pus cell/HPF, among them 14 girls were UTI positive. Total 171 girls had <5 pus cell/HPF among who only 4 girls were UTI positive. Sensitivity was 77.78% and specificity was 91.76%.

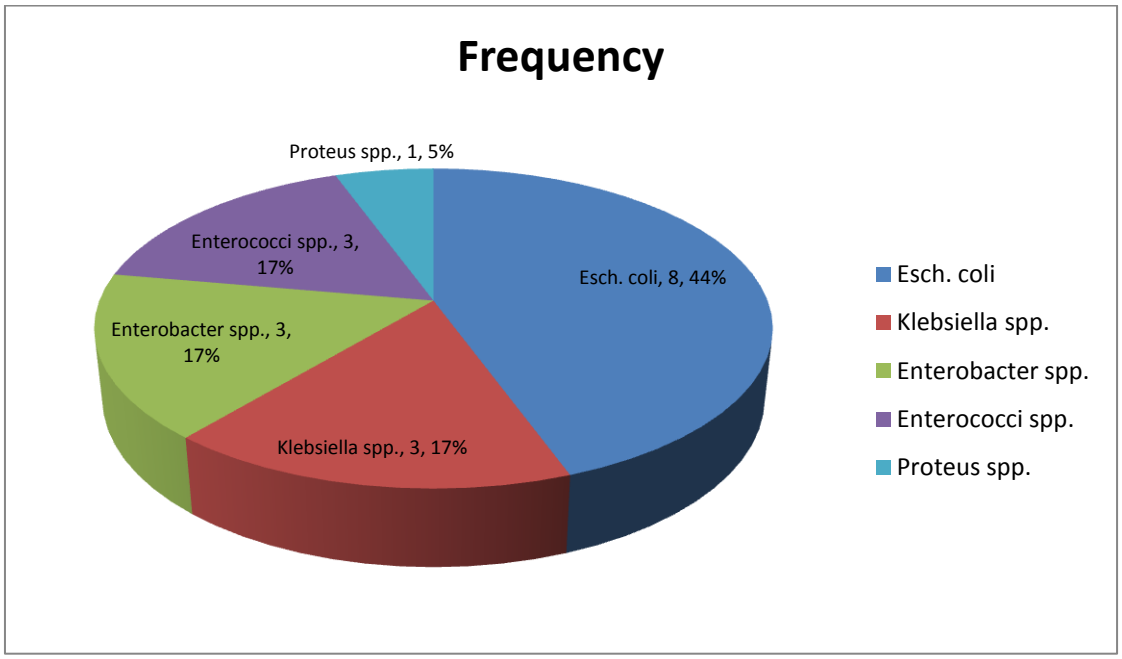

Figure-I: Types of organisms isolated from cases (n=18)

Esch. coli was the most predominant pathogen followed by *Klebsiella spp.*, *Enterobacter spp.*, *Enterococci spp*. and *Proteus spp* was least in number. Majority of the isolated organisms (83%) were gram negative and only 17% were gram positive *Enterococci spp* which is highly significant (p-value 0.002)

Table- V: Bacterial distribution of UTI according to symptoms (n=18)

Symptomatic UTI	**No (%)**	**Asymptomatic bacteriuria**	**No (%)**
Esch. coli	3(37.5)	*Esch. coli*	5(50.0)
Klebsiella spp.	2(25.0)	*Enterobacter spp.*	3(30.0)
Enterococci spp.	2(25.0)	*Klebsiella spp.*	1(10.0)
Proteus spp.	1(12.5)	*Enterococci spp.*	1(10.0)
Total	8(100.0)		10(100.0)

Table- V showed that most common symptomatic UTI was caused by *Esch. coli* (37.5%) followed by *Klebsiella spp.* (25%), *Enterococci spp*. (25%), *Proteus spp*. (12.5%) and most common asymptomatic bacteriuria was caused by *Esch. coli* (50%), *Enterobacer spp*. (30%), *Klebsiella spp*. (10%), *Enterococci spp.* (10%).

Table- VI (A): Sensitivity and resistant pattern of different microbial agent (n= 18)

Bacteria		Antibiotics						
		Amox.	Cotrim.	Ceph.	Cefurox	Ceftriax.	Cefotax.	Ceftazid
E. coli (n= 8)	S	4(50)	3(37.5)	4(50)	6(75)	7(87.5)	4(50)	6(75)
	R	4(50)	5(62.5)	4(50)	2(25)	1(12.5)	4(50)	2(25)
Klebsiella spp. (n= 3)	S	0	2(66.67)	1(33.33)	2(66.67)	2(66.67)	3(100)	3(100)
	R	3(100)	1(33.33)	2(66.67)	1(33.33)	1(33.33)	0	0
Enterobacter spp. (n= 3)	S	0	2(66.67)	1(33.33)	2(66.67)	2(66.67)	3(100)	3(100)
	R	3(100)	1(33.33)	2(66.67)	1(33.33)	1(33.33)	0	0
Proteus spp. (n= 1)	S	1(100%)	1 (100%)	1(100%)	1 (100%)	1 (100%)	1 (100%)	1 (100%)
	R	0	0	0	0	0	0	0
Enterococci spp. (n= 3)	S	1(33.33)	3(100)	2(66.67)	3(100)	2(66.67)	2(66.67)	2(66.67)
	R	2(66.67)	0	1(33.33)	0	1(33.33)	1(33.33)	1(33.33)

Table- VI (B): Sensitivity and resistant pattern of different microbial agent (n= 18)

Antibiotics										
Bacteria	S	Nitro.	Cipro.	Nalid.	Genta	Amika	Netil	Mecill	Imip.	Aztreo.
	R	7(87.5)	7(87.5)	7(87.5)	6(75)	7(87.5)	8(100)	5(62.5)	8(100)	7(87.5)
E. coli (n= 8)	S	1(12.5)	1(12.5)	1(12.5)	2(25)	1(12.5)	0	3(37.5)	0	1(12.5)
	R	2(66.67)	2(66.67)	2(66.67)	3(100)	3(100)	3(100)	3(100)	3(100)	3(100)
Klebsiella spp. (n= 3)	S	1(33.33)	1(33.33)	1(33.33)	0	0	0	0	0	0
	R	1(33.33)	3(100)	2(66.67)	2(66.67)	2(66.67)	3(100)	2(66.67)	3(100)	3(100)
Enterobacter spp. (n= 3)	S	2(66.67)	0	1(33.33)	1(33.33)	1(33.33)	0	1(33.33)	0	0
	R	0	1 (100%)	1 (100%)	1 (100%)	0	1 (100%)	1 (100%)	1 (100%)	1 (100%)
Proteus spp. (n= 1)	S	1 (100%)	0	0	0	1 (100%)	0	0	0	0
	R	3(100)	3(100)	1(33.33)	2(66.67)	3(100)	3(100)	1(33.33)	3(100)	3(100)
Enterococci spp. (n= 3)	S	0	0	2(66.67)	1(33.33)	0	0	2(66.67)	0	0

S= Sensitivity
R= Resistant

Amox.= Amoxicillin
Cotrim= Cotrimoxazole
Ceph= Cephradine
Cefurox= Cefuroxine

Ceftriax= Ceftriaxone
Cefotax= Cefotaxime
Ceftazid= Ceftazidime
Nitro= Nitrofurantoin

Cipro= Ciprofloxacin
Nalid= Nalidixic acid
Genta= Gentamicin
Amika= Amikacin

Netil= Netilmicine
Mecill= Mecillinum
Imip= Imipenem
Aztreo=Aztreonam

Table-VI Shows the sensitivity and resistant pattern of different microbial agents. Majority of the organisms were resistant to Amoxicillin, Cotramoxazole and Cephradin.

Discussion

Urinary tract infection is more common in adolescent girl than males.[26]Accurate diagnosis of urinary tract infection is important to facilitate appropriate management of acute illness and to ensure appropriate evaluation and follow up. It is also important to find out the risk factors of UTI in school going girls to prevent urinary tract infection through health education. The present study was a cross-sectional study to determine the frequency of symptomatic UTI and asymptomatic bacteriuria, associated risk factors, microbial pattern and resistant to antibiotic in secondary school going girl in Dhaka city. Total 200 girls were included in this study out of 322 students of class IX and X of four school of Dhaka city.

In our study 18 girls had UTI showing significant bacterial growth making a frequency of 9%. Ahmed et al, reported prevalence of UTI among adolescent girls was 12.7%.[8]They conducted the study in rural are which may be the reason for the difference in observation. Among these 9% UTI, symptomatic UTI were 4%. The prevalence of symptomatic UTI was reported by Singh et al. was 4.2% which is similar to our study.[9]

Shaikh et al, observed a 7.8% prevalence of UTI among children <19 years of age were both febrile and afebrile.[7] We found the frequency of asymptomatic bacteriuria was 5%. Frank et al, found the prevalence of asymptomatic bacteriuria in secondary school was 6% which is similar to our study.[27] Kumar et al, found asymptomatic bacteriuria in 11-15 years school going children was 10.57% with female preponderance over male.[15]

Our study showed no significant difference of class, area or age variant with culture positive UTI cases but showed gradual increasing of UTI with increasing age, 8 girls had culture positive UTI between 12-14 years, 10 between 15-17 years. Kumar et al. showed similar result of gradual increasing rate of UTI in girls from 11 years (7.5%) to 15 years (13.66%).[15]

The clinical symptoms of UTI usually include fever, urgency, frequency, burning sensation and lower abdominal pain. Our study showed significant relation of absence or presence of symptoms like fever, urgency, burning sensation and lower abdominal pain with UTI positive cases (p-value 0.04, 0.04, 0.002 & 0.01) but there was no significant association with frequency of micrurition (p-value 0.56). Sawalha found fever and burning sensation had a high significant relation with UTI (p-value <0.01 &<0.001). There were no significant relation of urgency and freq-uency of micturition (p-value 0.106& 0.099).[28]

The current study compared toilet training with UTI positive cases. Wiping from back to front was significantly associated with UTI (p-value 0.03). Ahmed et al, found significant relation of UTI with perineal washing technique.[8]Sawalha showed significant difference between the proper use of toilets by children and frequency of UTI.[28] Wan et al, observed that toilet habits affect strongly the development of urinary tract infection.[20] Our study showed no significant relation of incomplete emptying of bladder and voiding during school time or not with UTI positive cases (p-value 0.53 & 0.62). Sawalha also showed no significant difference of using school toilet.[28]We found significant relation of UTI with presence of constipation. Haque et al. also observed that risk of UTI is seven times more in constipation than without constipation in children.[21] There was also significance relationship of using unhygienic cloth and hygienic sanitary pad during menstruation with UTI positive cases (p-value0.02). Ahmed et al, showed that prevalence of UTI was significantly more in those adolescent girls using unsanitary cloth during menstruation.[8] Our study found a significant association of using tight pants with UTI positive cases (p-value 0.03). Foxman also observed a strong association of UTI with wearing tight jeans.[29]

In our study sensitivity and specificity of microscopic examination of pus cell with UTI positive cases were 77.78% and 91.76%.AAP reported the sensitivity and specificity of pus cell is 73% (32-100%) and specificity 81% (45-98%), which corresponds to our study.[30]

Esch. coli was the most predominant pathogens (44%) followed by *Klebsiella spp*. (17%), *Enterobacter spp.* (17%), *Enterococci spp.* (17%) and *Proteus spp.* (5%). Study conducted in Nigeria between the ages of 5-18 years children, *Esch. coli*was predominant (52.77%) followed by *Klebsiella spp*. (25%), *Proteus mirabilis* (13.89%), Streptococci faecalis (5.56%) and *Pseudomonas aeruginosa* (2.78%).[31] Studyin Israel showed gram negative rods caused 98% of UTI of which *Esch. coli* accounts for 87% followed by *Klebsiella* (4%) and *Proteus Mirabillis* 4%. This study included 151 children <14 years and 79% of them were females.[32] Study in USA on a group of patients aged ≤17 years had UTI due to *Esch. coli* 89%, *Klebsiella* 3.7%, *Proteus* 1.2%, *Citrobacteria* 1.2%, *staphylococcus* 1.2% and *enterococus* 3.7% respectively.[33] In Jordan among 5-15 years of age with UTI, *Esch. coli* (76%) was most common followed by *Klebsiella pneumonia* (13%), *Proteus* (6.5%), *Staphycococci* (2.2%) and *Pseudomonas* (2.2%).[34] These study was not similar to our study may be due to interregional variability as well as

variability in life style, more over the sample size is small.

The current study found gram negative bacteria was responsible for 83% of UTI cases compared to gram positive bacteria (17%) which was highly significant (p<0.002). Study in Palestine showed gram negative bacteria was responsible for 59.3% of UTI in comparison to gram positive bacteria which was 40.7%.[28]

In our study asymptomatic bacteriuria was mainly caused by *Esch. coli* (50%), followed by *Enterobacter spp*. (30%), *Klebsiella spp*. (10%) and *Entero cocci spp*. (10%). Study by Kumar et al, found asymptomatic bacteriuria mainly caused by *E.coli* (32.8%) followed by *Klebsiella Pneumonia* (22.4%), *Staphylococcus aureus* (15.1%), *Pseudomonas aeruginosa* (10.9%) and *Enterococcus faecalis* (6.3%) respectively.[15]The variation may be due interregional variation as well as small sample size.

Antibiotic resistance has become an important factor to be considered in the treatment of infections. Epidemiology and resistance patterns of bacterial pathogens in pediatric UTI show large interregional variability and rates of bacterial resistances are changing due to different antibiotic treatment.[24,35]In this study, *E. coli* showed resistance towards most of the oral antibiotics like Amoxicillin (50%), Cotrimoxazole (62.5%), Cephradine (50%).Al-Mardeni et al, revealed high bacterial resistance to *E.coli* to Ampicillin (81.9%), TMP-SMZ (73.5%), Nalidixic acid (49%) and Cephalexin (39.5%) and prevalence of multi drug resistance among *E. coli* was high (59.9%).[25] This is higher than our study. It may be due to interregional variability of resistant organism. In our study, resistance to both *Klebsiella spp*. and *Enterobacter spp*. to Amoxicillin, Cotrimoxazole, Cephradine were 100%, 33.33%, 66.67% respectively. Resistant to Enterococi to Amoxicillin, Cephradine, Nalidixic acid were 66.67% and 33.33%, 66.67% respec-tively. This high level of resistance was possibly due to easy access to antibiotics from pharmacies, poor patient compliance and use of antibiotics in poultry and dairy feeds.

Conclusion

Nine percent girls between 12-17 years of age were suffering from UTI, among them 4% were symptomatic UTI and 5%asymptomatic bacteriuria. Gram negative bacteria were responsible for 83% of UTI cases and *Esch. coli* was the most predominant organism. A significant number of girl's having UTI had some bad practices like not voiding urine during school time, using tight pants, using unhygienic cloths during menstruation, toilet training (wiping from back to front). There is also a high level of resistance of the isolated organisms to amoxicillin, cotrimoxazole and cephradine.

Recommendations

Based on the study, it may be recommended that a large screening program should be done to know the exact frequency of UTI of school going girls, their risk factors, causative bacterial pathogens and their sensitivity pattern. As most of the organism are resistant to common antibiotics like amoxicillin, cotrimoxazole and cephradine, physician should be cautious before prescribing empirical treatment of UTI. Health education about the risk factors of UTI should be given to school going girl to prevent recurrent UTI.

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