



OCCURRENCE OF *Escherichia coli* INFECTION AMONG THE WOMEN OF DHAKA CITY

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ABSTRACT

Urinary tract infections are among the most common infectious diseases encountered in humans. *Escherichia coli* (*E. coli*) is the most predominant organism and its prevalence varies in different studies. The aim of this study were to determine the prevalence of *Escherichia coli* during the summer and winter season, were detected in different age group of male and female. A retrospective study was carried from urine samples that were received at Shandhani Diagnosis Complex, Unit-2, Mirpur-10, Dhaka, Bangladesh throughout from November 1999 to January 2000 (winter) and from April to June 2000 (summer). Growth on Mac-Conkey's agar and blood agar plate was analyzed by colonial characters. During the study period, 2000 urine samples were analyzed both the two seasons of the year and 952 urine samples showed *Escherichia coli* infection. A total of 794 urine samples were analyzed for the different adult age groups (from 16-80 years) of male and female during the summer season of the year. A total of 444 (55.91%) urine samples showed *E. coli* infection; among them 64.18% were prevalent of female and 35.81% were prevalent of male. During winter season, total 443 male and female were examined, 56.98% cases were positive; the prevalence of the UTI was 63.63% in female and 36.36% in male. The results of this study indicate *E. coli* is prevalent in women and it possesses virulence associated properties. So, appropriate measures should be taken for detection and treatment of such cases. From the present study it appears that the urinary tract infection is fairly common in women.

Keywords: *Escherichia coli*, UTI, infectious diseases, Dhaka.

INTRODUCTION

Urinary tract infection is defined as the colonization of and invasion of the structures in the urinary tract by micro-organisms (Metha *et al.* 1981). Infection of the urinary tract is an extremely common clinical problem. The urinary tract can be invaded by a variety of organisms from the normal flora micro organisms in the urinary tract is termed as urinary tract infection, UTI which act as opportunists and by pathogenic species as well. UTI can be categorized in terms of different criteria. Uncomplicated UTI is an infection of the bladder or kidney without any structural or functional abnormality of the urinary tract. Complicated UTI may be developing in patient with diabetes, mellitus, pregnancy, a transplanted kidney or other metabolic or immunogenic illness. Asymptomatic bacteriuria refers to significant bacteriuria in patient without symptoms attributable to the urinary tract. Symptomatic bacteriuria refers to significant in patients with symptoms attributable to the urinary tract. The causes of urinary tract infection are related to poor perineal hygiene, sexual intercourse, pregnancy, urinary tract obstruction, urethral reflux, catheterization, instrumentation and neurogenic bladder but in many instances the pathogenesis is equivalent.

Woman with continuous colonization with bacteria were more likely to develop symptomatic infection than those with intermittent or no colonization (O'Grady *et al.*, 1970). Microbiological studies have demonstrated that the urethra, periurethral region and vaginal vestibule of women with recurrent UTI's tend to be more commonly colonized with coliform bacteria (Flower and Stamey, 1977; Stamey, 1973). The urinary

tract is especially vulnerable to infection during pregnancy because the altered secretions of steroid sex hormones and the pressure exerted by the gravid uterus and bladder cause hypotonic and congestion and predispose to ureterovesical reflux. Urinary retention after delivery may also initiate or aggravate urinary tract infection (Cunningham, 1990). Almost 10% of the pregnant women suffer from urinary tract infection (Bear, 1976). Dysuria is a common complain in young women but only 50% to 60% of all dysuria women have bacterial urinary tract infections (Leibavi *et al.* 1989). In some women, the vaginal introitus contains a heavy flora resembling that of the perineum and perianal area. This may be a predisposing factor in recurrent urinary tract infection.

Manifestations include burning pain on urination after with turbid foul smelling or dark urine, frequency, and suprapubic or lower abdominal discomfort. There are usually no positive physical findings unless the upper tract is involved also (Culpapper and Andreoli, 1983). Cystitis is an inflammation of the urinary bladder and is very common, especially among females. Symptoms often include dysuria (difficult or painful urination) and pyuria (the presence of leukocytes in the urine). Dysuria and frequency often related to UTI may be produced by mechanical or chemical irritation without any relationship to infection of may be related to infection in the urethra only. Over 40% of symptomatic patients had sterile urine on insignificant bacteria. Cyatitis may progress to pyelonephritis, an inflammation of one or both kidneys. The disease is generally a complication of infection elsewhere in the body. The causative agent in about 75% of the cases is *E. coli*. Findings include headache malaise,



vomiting, chills and fever, renal angle pain and tenderness and abdominal pain. Indiscriminate use of drugs and antimicrobial therapy may alter periurethral flora of colonization with enteric organisms. Analgesic nephropathy may produce papillary necrosis and may also mimic bacterial pyelonephritis on radiography.

Despite the presence of this diverse normal flora, urine usually remains sterile. When pathogens gain access of the system, they can establish infection. The most common aerobic members causing UTI are *Escherichia coli*, *Klebsiella spp.*, *Enterobacter sp.*, *Pseudomonas spp.*, and *Proteus spp.* Other bacteria such as *Staphylococcus saprophyticus* occasionally appear in spontaneous urinary infection. It has been observed that only a small number of serologically distinct strains are responsible for the infections caused by *E. coli*. It has been observed that the greater dominance of *E. coli* in outpatient population are serologically distinct strains responsible for the UTI. Many investigators previously described that the property in 90% of the *E. coli* strain from patients with pyelonephritis and demonstrated the ability of mannose-resistant hemagglutination only in 41% of the cases. Smith and Bullen (1965) reported that bacteriuria persisted usually throughout pregnancy and was present six months after delivery in about a 1/3rd of the patients. Many investigators in Bangladesh also showed that woman were the usual victims of the urinary pathogens. Haque *et al.*, (1995) 78.8% of the *E. coli* infection in the urine were found in women. Nahar and Selim (1989) screened the urine samples of adult women. They reported that 70.9% organism was found to be the *E. coli*. Moreover, in accordance with the previous reports *E. coli* was found to be the predominant organism.

MATERIALS AND METHODS

Sample collection

Urine samples of 2000 cases attending at Shandhani Diagnosis Complex, unit-2, Mirpur-10, Dhaka was analyzed for the UTI during the summer and winter seasons of the years. The study was carried out from November 1999 to January 2000 and from April 2000 to June 2000 for the discovery of *E. coli*. Infection Urine is readily contaminated during urination and bacteria can multiply readily in the warm specimen before it is examined at the laboratory for that proper collection of the specimen is the single most important step in a urine culture.

Proper collection of specimen

A mid-stream or clean catch specimen of urine is taken and examined promptly, chilled and held cold until it is examined. Especially in the case of female patients it is essential to take special steps to avoid contamination at this stage. The deposit obtained from a centrifuged sample is examined microscopically for pus cells and bacteria. Red blood cells and epithelial cells may also be present. A sample of uncentrifuged tube is serially diluted and a

viable count is performed by culturing standard volumes of each dilution on plates of nutrient medium.

Microscopic examination

A fresh drop of uncentrifuged urine placed on a slide, covered with a cover glass and examined with restricted light intensity under the high dry objective of an ordinary clinical microscope. It can reveal leukocytes, epithelial cells and bacteria if more than 105 organisms/ml. are present a Gram-stained smear of uncentrifuged midstream urine that shows Gram-negative rods is diagnostic evidence of UTI. Brief centrifugation of urine readily sediments pus cells which may carry along bacteria and thus may help in microscopic diagnosis of infection.

Culture examination

MacConkey's agar was used for the isolation of Gram-negative enteric bacteria. Properly collected urine samples are cultured in measured amounts on solid media and colonies that appear after incubation are counted to indicate the number of bacteria per ml.

Preparation of culture media plates

After adjusting the media from pH 7.4 to 7.6 in molten condition, they were poured into sterile plates and allowed to solidify and similarly, replicate plates were prepared from each medium.

Isolation of colonies

The inoculated plates were incubated at 37° C. for 24 hours. In the Mac Conkey plate, *E. coli* colonies showed a rose pink colour and in the nutrient agar plate an opaque white color. The patients (both males and females) were categorized into four major groups: children (0-15 years), adults (16-35 Years), middle age adults (36-50 years) and old age adults (51-80 years). Each major category was divided into several age-groups.

RESULTS

A total 2000 urine samples were analyzed during the winter (November 1999 - January 2000) and summer (April -June 2000) which, showed 47.6% *E. coli* infection.

In summer, the prevalence of the UTI were 60.7% in females and 39.2% in males, similarly in winter, the prevalence was 61% in females and 39% males (Table-1). During the summer season the different age groups of adult (16-35 yr), total of 316 (61.2%) urine samples showed *E. coli* infection; among them 67% were prevalent of female and 33% were prevalent of male (Table-2). In the middle age groups (36-50 yr) out of 178 cases, 89 (50%) cases were positive; the prevalence of the UTI was 56.2% in female and 43.8% in male (Table-3). A total 100 cases were screened in old age (51-80 yr) groups. Among them 39 cases were found *E. coli* positive; Out of them 59% females and 41% males were positive (Table-4).

A total of 794 urine samples were analyzed for the different adult age groups (from 16-80 years) of male and female during the summer season of the year. A total



of 444 (55.91%) urine samples showed *E. coli* infection; among them 64.18% were prevalent of female and 35.81% were prevalent of male.

In winter season the different age groups of adult (16-35 yr), out of 250 cases, 153 (61.2%) were positive cases; 71.8% females and 28.2% males were observed to have *E. coli* positive (Table-5). In the middle age groups (36-50 yr) total 122 cases were screened, 53 (43.4%) cases found positive; among them 58% females and 42% males

were *E. coli* positive (Table-6). A total of 91 urine samples were analyzed in old age (51-80 yr) groups. Among them 51.6% cases were found *E. coli* positive; Out of them 42.6% females and 57.4% males were found to have urine infection (Table-7).

During the winter season, total 443 male and female were examined, 56.98% cases were positive; the prevalence of the UTI was 63.63% in female and 36.36% in male.

Table-1. Overall prevalence of UTI positive among the two seasons.

	Seasons							
	Summer				Winter			
	April	May	June	Total	Nov.	Dec.	Jan.	Total
No. of Positive Cases	184	169	276	629	130	78	115	323
Prevalence (%)	53	50	54	52.4	35	37	54	40.3
No. of Male	70	74	103	247	50	35	40	247
Prevalence of male (%)	38	44	37	39.2	38.4	45	35	39
No. of Female	114	95	173	382	80	43	75	198
Prevalence of Female (%)	62	56	63	60.7	62	55	65	61
Total Patients	350	340	510	1200	375	211	214	800

Table-2. The prevalence of UTI among the different age groups of adult male and female of Dhaka city during summer season.

Age groups	Patient examined	+ ve Results		Male prevalence		Female prevalence	
		Number	%	Number	%	Number	%
16-20	131	68	52	24	35	44	65
21-25	145	96	66	27	28	69	72
26-30	152	100	66	31	31	69	69
31-35	88	52	59	22	42	30	58
Total	516	316	61.2	104	33	212	67

Table-3. The prevalence of UTI among the middle age groups of male and female of Dhaka city during summer season.

Age groups	Patient examined	+ ve Results		Male prevalence		Female prevalence	
		Number	%	Number	%	Number	%
36-40	75	44	59	23	52	21	48
41-45	55	24	44	9	38	15	62
46-50	48	21	44	7	33	14	67
Total	178	89	50	39	43.8	50	56.2



Table-4. The prevalence of UTI among the old age groups of male and female of Dhaka city during summer season.

Age groups	Patient examined	+ ve Results		Male prevalence		Female prevalence	
		Number	%	Number	%	Number	%
51-55	27	11	41	0	0	11	100
56-60	26	10	38	3	30	7	70
61-65	11	4	36	3	75	1	25
66-70	11	7	64	4	57	3	43
71-75	11	2	18	2	100	0	0
76-80	14	5	36	4	80	1	20
Total	100	39	39	16	41	23	59
All age (16-80)	794	444	55.91	159	35.81	285	64.18

Table-5. The prevalence of UTI among the different age groups of adult male and female of Dhaka city during winter season.

Age groups	Patient examined	+ ve Results		Male prevalence		Female prevalence	
		Number	%	Number	%	Number	%
16-20	50	31	62	3	10	28	90
21-25	85	62	73	15	24	47	76
26-30	55	41	75	16	39	25	61
31-35	60	19	32	9	47	10	53
Total	250	153	61.2	43	28.2	110	71.8

Table-6. The prevalence of UTI among the middle age groups of male and female of Dhaka city during winter season.

Age groups	Patient examined	+ ver Results		Male prevalence		Female prevalence	
		Number	%	Number	%	Number	%
36-40	45	25	56	8	32	17	68
41-45	45	14	31	7	50	7	50
46-50	32	14	44	7	50	7	50
Total	122	53	43.4	22	42	31	58



Table-7. The prevalence of UTI among the old age groups of male and female of Dhaka city during winter season.

Age groups	Patient examined	+ ve Results		Male prevalence		Female prevalence	
		Number	%	Number	%	Number	%
51-55	27	10	37	4	40	6	60
56-60	22	9	41	5	56	4	44
61-65	10	10	100	6	60	4	40
66-70	10	6	60	4	67	2	33
71-75	16	8	50	5	63	3	37
76-80	6	4	67	3	75	1	25
Total	91	47	51.6	27	57.4	20	42.6
All age (16-80)	443	253	56.98	92	36.36	161	63.63

DISCUSSIONS

In this study, prevalence of *E. coli* in the urine samples is more in summer season than winter season because in summer season increased temperature causes sweating more than winter, therefore urine production becomes less and concentrated which provides the opportunity to multiply the bacteria. Conversely in winter season less sweating causes more dilute urine production, which washes away any multiplying bacteria. Women of different age groups were observed to be very much prone to UTI. The highest numbers of positive cases were found among the adult women, those of which were 21-25 yr (72%) during summer and those of which were 16-20 yr (90%) during winter season. In middle age groups which is about 43.8% in male and 56.2% in female during summer and 42% in male and 58% in female during the winter season.

Urine infection is an important cause of morbidity and mortality throughout the world. Bangladesh is a developing country, and the rate of mortality due to infectious diseases is also very high. Moreover the tropical weather of Bangladesh also facilitates the occurrence and spread of infectious disease more rapidly. Among the different types of infectious diseases, urine infection accounts for a large percentage of morbidity and mortality in our country. Quantitative bacteriology is necessary and hence a colony count is necessary to distinguish contamination from true infection particularly where mixed organisms are cultured. Indiscriminate use of antibiotics, lack of proper knowledge and negligence toward diseases increase anti-microbial resistance of common pathogens of urine infection.

The course of an infection is dependent on the ability of the pathogens to overcome the complex defense system of human body (Funfotuck *et al.*, 1989). For the development of a urinary tract infection the ability of the bacteria to adhere to the cells of the epithelial layer of the host organism is of great importance. Fimbrial antigens were responsible for the adhesive capacity of the micro-organisms. In our country significantly higher number of

E. coli isolated from urine. Patients of UTI were found to possess hemolytic and hemagglutinating properties (Mahammad *et al.*, 1990). The hospital environment is an important determinant of the nature of the bacterial flora in UTI.

In this study, the prevalence of *E. coli* in elder age groups also shown that female patients are more than male. UTI is always a very common infection among the women revealed by studies of several workers. Study by Kass *et al.*, 1956; Merback, 1972; Stamm and Turck, 1991 have shown that Women were the victims of UTI. Many investigators in Bangladesh also showed that women were the usual victims of the urinary pathogens. Many signs and symptoms of UTI were observed but symptoms are not a definite indication of an infection, because in some cases symptoms may be present in the absence of infection and vice versa. So, antimicrobial agents should only be administered when there is certain evidence of infection. The management procedures may vary on the basis of the following factors, type of infection, age of patient, sex of the patient, physical condition of the patient and any other co-exciting illness and its treatment process. Moreover, in accordance with the previous reports *Escherichia coli* was found to be the predominant organism. From the present study it appears that the urinary tract infection is fairly common in women. Unfortunately in most of the cases the women are not aware of this problem and remain without proper laboratory investigation and treatment. So it is necessary to screen out the *Escherichia coli* cases of female and appropriate measures should be taken, so that they do not develop symptomatic UTI.

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