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Original Research Article

Study on urinary tract infection among females of reproductive age group in a rural area of Kancheepuram district, Tamil Nadu

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ABSTRACT

Background: Urinary tract infection (UTI) is defined as the presence of microbial pathogens in the urinary tract and women of the reproductive age group (15-44 years) are the most vulnerable population. UTIs are one of the most common bacterial infections seen in primary care. This study aims to estimate the prevalence rate of UTI among females of reproductive age group and to determine the association between socio demographic factors and prevalence of UTI.
Methods: This is a cross sectional descriptive study carried out in the rural field practice area attached to a Medical college in Kancheepuram district. The study group were 250 women of reproductive age group (15-44 years). The data was collected using a structured interview schedule followed by collection of urine for microscopic examination and culture. Data was analysed using SPSS 15 software. Prevalence of UTI was calculated using percentages and strength of association was tested between socio-demographic characteristics and prevalence of UTI.
Results: Prevalence of UTI among females of reproductive age group was found to be 20.4%. There was a strong statistical significant association between levels of education of the study subjects (Odds Ratio 18.11, p value <0.05), the socio economic status (Odds ratio 6.36, p value <0.05) and UTI.
Conclusions: UTI is a serious public health problem if untreated. Early diagnosis and prompt treatment will prevent the chances of developing further complication of UTI and will help to reduce the sufferings of the patient, hospital stay and economic loss.

Keywords: Bacteriuria, Women, Urinary pathogens

INTRODUCTION

Urinary tract infection (UTI) is defined as the presence of microbial pathogens in the urinary tract.[1,2] The infection of the bladder and urethra are referred to as the infection of the lower urinary tract whereas the kidney and ureter infection is an indication of upper urinary tract infection. UTIs can be classified as uncomplicated or complicated (based on the factor that triggers the infection) or primary or recurrent (depending on the nature of occurrence).[3]

UTI can be asymptomatic or symptomatic, characterized by a wide spectrum of symptoms ranging from mild burning micturition to bacteremia, sepsis, or even death.[4-6]

Although UTI affects both genders, women of the reproductive age group (15-44 years) are the most vulnerable, may be due to their anatomy and reproductive physiology.[7] Women are particularly at risk of developing UTIs because of their short urethra, and certain behavioural factors which include delay in micturition,

sexual activity and the use of contraceptives which promote colonization of the periurethral area with coliform bacteria.[8] They are particularly common among the female population with an incidence of about 1% among school girls and 4% among women through child-bearing years. Incidence of infection in females increases directly with sexual activity and child-bearing. It is found that nearly, 25-30% of women between 20-40 years of age will get UTIs.[2,9]

E. coli is usually the most prevalent organism responsible for UTI and accounts for 80–85% of the total isolates; with *Staphylococcus saprophyticus* being the cause in 5–10%.[1] Other bacterial causes of UTI include *Klebsiella, Proteus, Pseudomonas, Enterococcus, Enterobacter spp*. Etc.[10] Virus and parasite are not usually considered as urinary pathogens but however, virus plays a major role in the pathogenesis of hemorrhagic cystitis.[11]

Urinary tract infection usually develops in the lower urinary tract (urethra and bladder) and if not properly treated they ascend to the upper urinary tract (ureters and kidneys) and cause severe damage to the kidneys. Other complications caused by UTIs are bladder infection (cystitis), urethral infection (urethritis), kidney infection (pyelonephritis) and infection of the ureter (ureteritis).[10] Pregnant women with UTI are more likely to develop hypertensive disease of pregnancy, anaemia, chronic renal failure, prematurity, and low birth weight babies.[12-14]

UTI is a broad term that encompasses asymptomatic bacteriuria and symptomatic infection with microbial invasion and inflammation of the urinary tract. While up to 90% of the patients with UTIs complain of urinary tract symptoms (increased frequency of micturition, painful micturition and burning micturition), one third or more of the patients with these symptoms do not have bacteriuria.[15] Asymptomatic bacteriuria, or asymptomatic urinary infection, is isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms or signs referable to urinary infection.[16] The prevalence of asymptomatic bacteriuria has been estimated to range from 2% to 10% in various studies globally.[17] These women are more likely to experience subsequent symptomatic UTI.[18]

UTIs are one of the most common bacterial infections seen in primary care, next to respiratory tract infections.[1,2] Sixty-one per cent of all UTIs are managed in the primary care settings.[19] It has been estimated globally that UTIs result in as many as 8.3 million visits to outpatient clinics, 1 million visits to emergency departments, and 100,000 hospitalizations annually.[20]

With this background, this study was planned to find out the prevalence of UTI among females of the reproductive age group, in the rural field practice area of our institution with the following objectives.

- To estimate the prevalence rate of UTI among females of reproductive age group.
- To determine the association between socio demographic factors and prevalence of UTI among the study group.

METHODS

Study design

This is a population based cross sectional descriptive study carried out in a rural area of Padappai.

Study area

This study was conducted in the rural field practice area of the Rural Health Training Centre attached to our Institution, located at Padappai in Kancheepuram District of Tamil Nadu.

Study population

The population covered by the Rural Health Training Centre is about 21187 as per 2011 census. Total number of houses in Padappai village is 1851 and the total population is 7198, consisting of 3709 males and 3489 females. Females of 15–44 years age group residing in Padappai village are approximately 2093. Study population identified were females in the reproductive age group (15–44 years) residing in the study area permanently at the time of the study.

Study period

This study was carried out from November 2016–April 2017.

Sample size

The sample size for the study was calculated based on a previous study done by Nicolle et al, which showed a prevalence of 10% UTI in non-pregnant women.[21] Using the formula $4PQ/D^2$, the sample size was calculated to be 225 with an absolute precision of 4%. Adding 10% refusal rate, the sample size was calculated to be 248 which were rounded off to 250.

Inclusion criteria

The inclusion criteria for the study were females of reproductive age group (15–44 years) residing in the study area, who were apparently healthy and willing to participate in the study.

Exclusion criteria

The exclusion criteria for the study were females on any anti-biotic therapy, females on menstruation phase of the menstrual cycle, females with known urinary tract anomalies and females who were pregnant.

Sampling technique

Systematic random sampling technique was used to identify the study subjects. Sampling Interval (N/n) is calculated as follows: [N= total number of households in Padappai=1851, n = sample size = 250. N/n=1851/250= 7.4]. Thus every 7th household is selected for identifying females between 15-44 years age group. If there were no females of 15-44 years age group in that house, the next house with appropriate study subject (females of 15-44 years) was selected. From that house, next 7th household was selected for the sample identification for the study.

Study tool

A standardised pretested structured questionnaire consisting of the socio demographic particulars and clinical history for the symptoms of UTI.

Data collection

The data was collected using the standardized pretested structured interview schedule followed by collection of urine samples. About 5 ml of midstream urine was collected for microscopic analysis and cultured for finding presence of any microbes, by clean catch method in a sterile bottle. The sample processing was carried out within 2 hours of specimen collection. Microscopic examination of urine was done for pus cells. All samples were cultured on Mac Conkey agar plates. Incubation was done at 37°C aerobically for 12-24 hours.

Operational definition

- A woman is said to have symptoms of UTI when she had one or more of any of the following symptoms on the basis of history: increased frequency of micturition, burning micturition, and painful micturition.[22]
- Asymptomatic bacteriuria was defined as the presence of more than 1×10^5 colony forming unit (CFU) per millilitre of one organism in a culture of clean voided midstream urine from a patient without fever or symptoms of UTI.[23]
- A women was said to have symptomatic bacteriuria when any symptom of UTI was present, and the colony count in a single culture was 10^3 or more.[24]
- A woman was said to UTI when either of asymptomatic bacteruria or symptomatic bacteruria was present.[22]
- Pure growth less than 1×10^3 CFU/ml was taken as growth of no significance.[25]

Data analysis

All the data collected were entered into the Microsoft Excel and analysis was carried out using SPSS 15 Software. The prevalence of UTI was calculated using percentages. Statistical significance (chi square test and p value) and strength of association (Odds ratio and 95% Confidence Interval) were tested between socio-demographic characteristics and prevalence of UTI.

Ethical clearance and informed consent

The study was carried out after obtaining approval from the Institutional Ethical Committee. The participants were briefed about the purpose of the study and informed consent was obtained prior to the data collection.

RESULTS

Socio-demographic characteristics of the study population

The socio-demographic characteristics of the study population are presented in Table 1. Around 44% females belonged to 15-24 years of age followed by 36% who belonged to 35-44 years of age. Around 20% belonged to 25-34 years of age. Among the study participants 64% were Hindus, 22% were Christians and 14% were Muslims. Nearly 40% of the study subjects had high school education and 22% had primary school education. Socio economic status was classified based on BG Prasad scale. Around 38% belonged to Class IV socio economic status and 30% belonged to Class III socio economic status. Almost 76% females were married and 24%were unmarried.

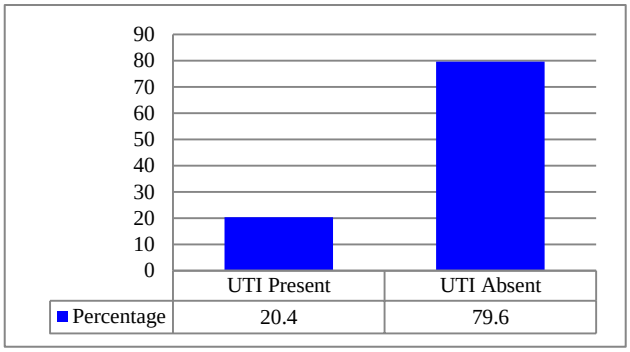

Figure 1: Prevalence of UTI among the study population (n=250).

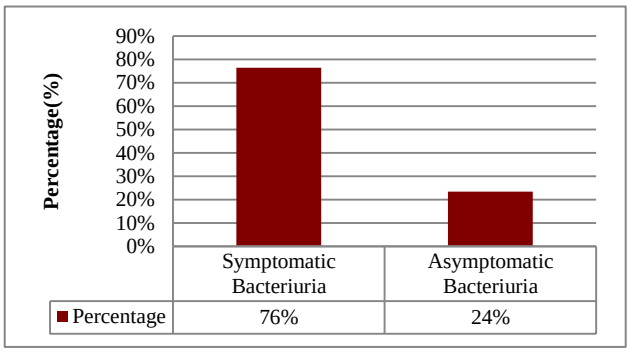

Figure 2: Prevalence of symptomatic and asymptomatic bacteriuria among the study population.

Prevalence of UTI (symptomatic and asymptomatic) among the study population

Prevalence of UTI among females of reproductive age group was found to be 20.4% as seen in Figure 1. From Figure 2, it is seen that among the females who had UTI, 76% had symptomatic UTI and 24% had asymptomatic UTI.

Clinical features of the study population

Distribution of various symptoms of UTI among the study population is shown in Figure 3. Most of the study subjects, 74.8% did not have any symptoms. Nearly 21.6% complained of burning micturition, 15.6% had increased frequency of micturition and 7.6% had complaints of painful micturition. Almost 25.2% had any one of the symptoms mentioned.

Symptoms of UTI and urine culture results

The association between the presence of UTI symptoms and urine culture is shown in Table 2. Culture was positive in 39 subjects who had symptoms of UTI and 12 subjects who did not have symptoms of UTI. Culture was negative for 24 subjects who said they had symptoms of UTI and 175 subjects who did not have symptoms of UTI. The odds ratio was found to be 23.7 with 95% CI of 10.92-51.44. This showed that people with symptoms of UTI are 23.7 times at a more risk of getting urine culture positive. This association was statistically significant with a Chi square value of 89.34 and p value <0.05.

Distribution of pathogenic species causing UTI among the study population with UTI is represented in the Figure 4. Among 20.4% who had UTI, 61% present suffered from *E.Coli* infection, 25% from *Proteus* species, 12% from *Staphylocoocus* species and 2% from *Klebsiella* species.

Association between socio-demographic characters and UTI

The statistical association between various socio-demographic characters and UTI is seen in Table 3. As shown, it is evident that there is a strong statistical significant association between education of the study subject (Odds Ratio 18.11, p value <0.05 at 95% CI (7.37–44.48)), socio economic status (Odds ratio 6.36, p value <0.05 at 95% CI (3.28-12.33)) and UTI. Age, religion and marital status did not show statistical significant association.

Table 1: Socio–demographic characteristics of the study population.

Sociodemographic Characters		Frequency (n=250)	Percentage (%)
1.	**Age (in years)**		
	15-24	110	44
	25-34	50	20
	35-44	90	36
2.	**Religion**		
	Hindu	160	64
	Christian	55	22
	Muslim	35	14
3.	**Education**		
	Illiterate	30	12
	Primary School	55	22
	Middle School	45	18
	High School	100	40
	PUC/Diploma	15	6
	Graduate	5	2
4.	**Socio economic status (BG Prasad scale)**		
	Class I	15	6
	Class II	55	22
	Class III	75	30
	Class IV	95	38
	Class V	10	4
5.	**Marital status**		
	Unmarried	60	24
	Married	190	76

Table 2: Association between the presence of UTI symptoms and urine culture results.

	Culture positive	Culture negative	Odds ratio (95% CI)	Chi square	P value
Symptomatic bacteriuria	39	24	23.697 (10.92 – 51.44)	89.349	0.000*
Asymptomatic bacteriuria	12	175			

*p value<0.05: statistically significant at 95% CI.

Table 3: Association between demographic characteristics and UTI.

S. no.	Socio-demographic characters	Frequency (n=250)	UTI present (n=51)	UTI present (%)	Odds ratio (95%CI)	Chi square	P value
1	**Age**						
	15-29 years	140	26	51	0.78 (0.42-1.43)	0.66	0.419
	30-44 years	110	25	49			
2	**Religion**						
	Hindu	160	36	71	1.45 (0.75-2.82)	1.21	0.274
	Others	90	15	29			
3	**Education**						
	Illiterate	30	22	43	18.11 (7.37-44.48)	58.82	0.01*
	Literate	220	29	57			
4	**Socio economic status (BG Prasad scale)**						
	Class I & II	70	31	61	6.36 (3.28-12.33)	34.16	0.01*
	Class III,IV,V	180	20	39			
5	**Marital status**						
	Unmarried	60	10	20	0.73 (0.34-1.56)	0.68	0.41
	Married	190	41	80			

*p value <0.05 – statistically significant at 95%CI

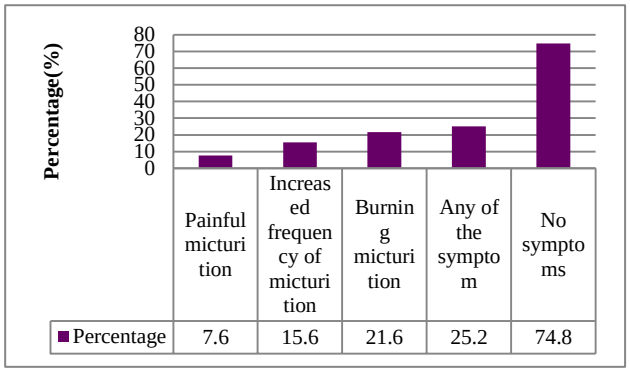

Figure 3: Distribution of various symptoms of UTI among the study population.

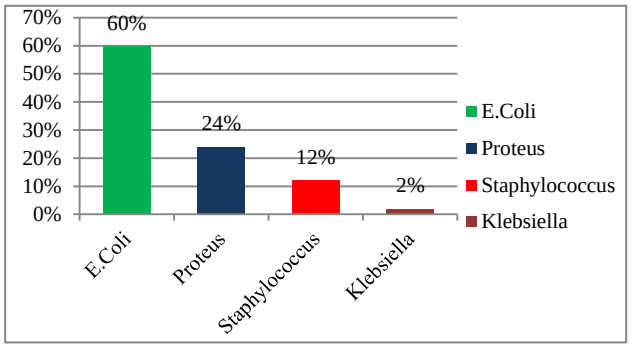

Figure 4: Distribution of pathogenic species causing UTI among study population.

DISCUSSION

Untreated UTIs are a major threat to the quality of life of people. This necessitates the need for early diagnosis and treatment of UTI. This study aimed to find out the prevalence of UTI among the females of reproductive age group in the rural community. The results from this study give a new insight to the existing problem in identifying and managing UTIs at a very early stage.

In this study 44% females belonged to 15–24 years age group followed by 36% in 35-44 years age group and 20% in 25-34 years age group. In this study, 64% of the females were Hindus. Nearly, 76% of the females were married. The distribution of socio demographic characteristics were found to be almost similar to the findings of other studies done elsewhere.[26-28]

The prevalence of UTI (symptomatic and asymptomatic bacteriuria) in the study population was found to be 20.4%. In a study by Subhashini et al the prevalence of UTI was found to be 84%.[27] In a study by Kolawole et al the prevalence of UTI was estimated to be 60% and in a study by Shaifali et al the prevalence was 44.53%.[26,29] The vast difference in the prevalence of UTI between this study and other studies may be due to the study setting. This study was carried out in the community, whereas the other studies were hospital based studies. Either people reporting to the hospital come with symptoms of UTI or

people admitted in the hospitals may develop nosocomial UTI. This major difference in the study setting has brought about a huge difference in the prevalence of UTI.

Out of 20.4% who had UTI, 76% had symptomatic bacteriuria and 24% had asymptomatic bacteriuria. In a study by Steward et al, the prevalence of asymptomatic bacteriuria among healthy premenopausal women was ranging from 1–5%.[30]

In this study 74.8% of the study subjects did not have any symptoms of UTI. Nearly 21.6% of the study participants had burning micturition, 7.6% had painful micturition and 15.6% had increased frequency of micturition. Almost 25.2% of the study population had at least any one symptom of UTI. In Shaifali et al study 73.4% had burning micturition, 43.9% had increased frequency and 20.1% had painful voiding.[26] They have also reported to have had urgency, difficulty and nocturnal incontinence. This study included patients from the outpatient department who were clinically suspected to have UTI and persons with no symptoms of UTI were excluded. May be this has led to the increased percentage of these symptom compared to this study.

In a study conducted by Subashini et al, various clinical features have been estimated. Painful and burning micturition of 14% has been noted in that study. Almost 10% had a strong feel to urinate; even right after the bladder was empty.[27] That study also estimated the presence of other symptoms like cloudy or bloody urine, chills, night sweats, fever, fatigue, flank and groin pain, mental change or confusion, nausea and vomiting. The study subjects were patients in a tertiary care hospital, who are obviously very much prone to such infections compared to people in the community.

In this study 61% of the females with UTI suffered from *E. coli* infection, 25% suffered from *Proteus*, 12% suffered from *Staphylococcus sp.* and 2% suffered from *Klebsiella sp.* Iram et al's study showed a different result, 33.1% had *E. coli* infection, followed by 7.9% with *Klebsiella pnuemoniae*, 2.2% *Staphylococcus aureus*, 1.4% *Streptococcus pnuemoniae*, and 0.7% with *Proteus mirabilis*.[26]

In this study, people with symptoms of UTI are at 23.7 times more at a risk of getting a urine culture positive compared to people who do not have symptoms of UTI. There was strong statistical significant association between education, socio economic status of the participant and presence of UTI. There was no statistical significant association between age, religion, marital status and presence of UTI in this study. In a cohort study conducted by Hoton et al marital history was found to have a statistically significant association with the incidence of UTI in one of the groups.[28]

CONCLUSION

UTI is a serious public health problem, if untreated. The burden of UTI among females of reproductive age group was 20.4%, more among those who presented with the symptoms of UTI. The symptoms of UTI can bring about a great discomfort to the patients resulting in a compromised quality of life. Early diagnosis and treatment of UTIs can prevent complications. Early diagnosis and prompt treatment will prevent the chances of developing further complication of UTI and will help reduce the sufferings of the patient, hospital stay and economic loss. Managing UTIs among affected women efficiently will help them to lead a healthy and economically productive life in the future.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee, Sree Balaj Medical College and Hospital

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