EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 8
Issue: 7
99-104
Year: 2021

CULTURE AND ANTIBIOTIC SENSITIVITY OF NONTYPHOIDAL *Salmonella* spp. ISOLATED FROM PATIENTS WITH URINARY TRACT INFECTIONS

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Article Received on 13/05/2021 **Article Revised on 02/06/2021** **Article Accepted on 23/06/2021**

ABSTARCT
In both veterinary and human medicine, antibiotic use is one of the most critical variables that encourages the emergence, selection, and spread of antibiotic-resistant bacteria. Urinary tract infection is the most frequent bacterial infection in humans, caused by the presence and proliferation of germs in the urinary tract. The current study was conducted to identify Salmonella from urinary tract infections in patients who had visited a hospital in Dhaka. Various cultural and biochemical approaches were used to prove the presence of this disease-causing pathogen. Antibiotic resistance is a major public-health concern, and antibiotic use is rapidly being recognized as the primary selective factor generating resistance. A total of 12943 urine samples were obtained in this investigation (male 3638 and female 9305). The disc diffusion method was planned to use to determine the sensitivity of the isolated organisms to antibiotics. Urinary tract infections are frequently treated in emergency rooms. In order to get the greatest outcomes for patients, clinicians must be aware of the benefits and limitations of diagnostic testing, as well as the right empiric antibiotic therapy for these illnesses. Urinary tract infection (UTI) is a common condition that urgent care physicians diagnose and treat. The goal of this study was to establish Salmonella as the etiological agent of UTI in people of various ages, as well as to look into their reactions to locally available antibiotics regularly prescribed by doctors. Nontyphoidal *Salmonella* spp. (NTS) was not found in the UTI-infected participants in this investigation. NTS may not be typically related to UTIs in Bangladesh, according to this study.

KEYWORD: UTI, Multidrug Resistance, Uropathogen, Antibiotics, Nontyphoidal *Salmonella* spp. (NTS).

INTRODUCTION
Urinary Tract Infection (UTI) represents as one of the most common diseases encountered in medical practices these days and encompasses a broad range of clinical fields that are associated with a common finding of positive urine cultures.[1] Urinary tract infections (UTIs) are serious health problem affecting 150 million people globally in each year.[2] Urinary Tract Infection (UTI) is a very common infection all over the world but it is more prevalent in developing south Asian countries like Bangladesh.[3] They are the second most common types of infection in humans accounting for 8.3 million doctor's visit annually in USA.[4] They are the most common bacterial infection in patients of all ages with high risk in young women resulting in significant morbidity and health care costs.[5]

Urinary tract infection is more common in female than male, because of the short length of the urethra and its proximity to anus. Pregnancy and sexual activity also make female more susceptible to UTI.[6] Different factors like age, sex, immunosuppression and urological instruments may affect prevalence of UTIs.[7]

The etiology of UTIs and the antibiotic susceptibility of urinary pathogens, both in community and hospitals, have been changing over the past years and recently, the antibiotic resistance has become a major global problem.[8] UTI can be nosocomially ubiquitous in clinical environment so that prevalence rate of uropathogens is being alarmingly accelerated. To prevent these pathogens, different types of antibiotics and their super generations are used irrespectively with different doses in misused and overused forms. So uropathogens are getting resistant to efficacious drugs adopting different mechanisms of mutations and genetic transformations.[9] Antibiotic resistance is an increasing threat to life and morbidity and mortality.[10]

Treatment of UTIs cases is often started empirically and therapy is based on information determined form the antimicrobial resistance pattern of the urinary pathogen.[11] However, a large proportion of uncontrolled antibiotic usage has contributed to the emergence of resistant bacterial infections.[12]

Urinary Tract Infections (UTIs) are the most frequent infectious infections, with over 10% of people suffering from one at some point in their lives. Due to the prevalence, recurrence, and difficulty in eradication, it is a significant illness in humans. Medical experts face a difficult task when it comes to UTI. Due to anatomic and physiological factors, UTI is far more common in women than in males. The urinogenital tract is particularly sensitive to bacterial infections caused by both internal and external flora because of its location.[13]

Urinary tract infection (UTI) is one of the most prevalent kinds of nosocomial bacterial infection, and it is responsible for a large aggregate burden of morbidity, death, and increased health-care costs due to its high occurrence. *E. Coli* is the most prevalent organism that causes UTI, with *Salmonella* spp., *Enterobacter* spp., *Proteus* spp., *Streptococcus* spp., *Enterococci* spp., *Shigell*a spp., Anaerobes, Yeast, and Mycobacteria being less prevalent. Males, the elderly, previous or actual hospitalization, pregnancy with symptoms lasting seven days, the presence of stones, in-dwelling catheters, recent instrumentation, anatomical abnormalities, a history of UTI in childhood, immune suppression, or recent use of antibiotics are all risk factors for UTI. To be cured, these infections require a long-term antibiotic treatment. Antimicrobial medicines are one of the most widely given drugs in nursing homes for urinary tract infections.[14] Urinary tract infections (UTIs) caused by Salmonella are infrequent. During the antibiotic era, 54 cases of culture-proven symptomatic Salmonella UTIs were documented. The average age was 41 years, with a male majority. The majority of infections were found in the upper urinary system (infection is defined as positive urine from the ureters or kidneys).[15] Non-typhoidal Salmonella urinary tract infection (UTI) is uncommon and mainly occurs in people who are predisposed to it. *S. typhimurium*, *S. typhi*, *S. manhattan*, *S. oranienburg*, *S. saint-paul*, *S. heidelburg*, *S. infantis*, *S. enteritidis*, *S. newport*, *S. agona*, *S. thompson*, *S. montevideo*, *S. anatum*, *S. derby*, *S. javiana*, *S. panama*, and *S. blockley* have all been previously. Salmonellae infect the urinary tract by directurethral penetration and ascending infection, or by hematogenous dissemination. Outside of the newborn period, the most prevalent route is thought to be ascending infection.[16] Non-typhoidal Salmonella are common food borne organisms that can cause gastroenteritis, bacteremia, and a secondary illness. Patients with cancer, HIV infection, or diabetes, as well as those on corticosteroid therapy or on other immunosuppressive medications, are especially vulnerable to these resistant bacteria. Opportunistic infections with intracellular bacterial pathogens, such as non-typhoidal Salmonella species, have become more common as a result of the growing cellular immunological deficiencies associated with human immunodeficiency virus infections. Salmonella bacteremia is a common and serious consequence in AIDS patients, and it is one sign of immunosuppression in people with human immunodeficiency virus infection. Salmonellosis is believed to be 20 to 100 times more common in HIV-positive people than in the general population.[17] Salmonella organisms are found in livestock, pets, wild mammals, poultry and other birds, reptiles, and amphibians, among other places. The majority of afflicted animals are long-term carriers. Salmonella typhi, on the other hand, has only human reservoirs, as does Salmonella paratyphi. As an uncommon mode of transmission, Salmonella paratyphi and other serogroups can be found in the urine.[18] Salmonella UTIs are uncommon and most commonly affect infants and people over the age of 60. Salmonella typhimurium, heidelberg, enteritidis, infantis, newport, and typhi are the most commonly isolated species from urine. Salmonella is thought to enter the urinary tract by hematogenous transmission or direct bladder invasion via the urethra.[19]

MATERIALS AND METHODS

Materials

Study Design: This cross-sectional study was designed to assess the antibiotic resistant pattern to *Salmonella* spp. cultured from urinary tract infected patients.

Study Location: Microbiology department of a healthcare Center, Dhaka, Bangladesh.

Study Time: February 2016 to January 2017.

Data Collection: Laboratory data routinely collected from the microbiology department from a healthcare Center, Dhaka, Bangladesh. The total sample volumes were 12943.

METHODS

Sample Collection and Bacteriological Assessment: Early morning midstream urine samples were collected aseptically from 12943 (Male-3638 & female-9305) patients. The urine samples were collected into sterile wide container (China) with screw cap tops. On the label were the name, age, sex and time of collection. All the patients were instructed on how to collect the urine samples aseptically and taken to the laboratory immediately for culture. In the diagnostic laboratory, each well mixed urine sample (1µL) was inoculated on MacConkey agar (Oxoid) and Blood agar (Oxoid) media plate under class-II laminar airflow (NUVO SanajiMalzemelzeni, ImalatVcTicaret A.S, Turkey). The inoculum on the plate was streaked out for discrete colonies with a sterile wire loop sterilized by auto loop sterilizer (Germany) following standard procedures. The culture plates were incubated at 37°C by an incubator (Germany) for 48 hours and observed for the growth of

bacteria through formation of colonies. All the bacteria were isolated and identified using morphological, microscopy (Japan) and biochemical tests like TSI (HiMedia), MIU (HiMedia) and Simmons Citrate (HiMedia) agar following standard procedures.[20]

Statistical Analysis: Data were assessed using the Statistical Package for Social Science (IBM SPSS Statistics, version 18, IBM Corporation, SPSS Inc. Chicago, III, USA).

RESULTS

The total 12943 urine samples collected from UTI suspected patients from a health care center at Dhaka. Among the suspected patients males were 3638 and females were 9305 (Figure-1).

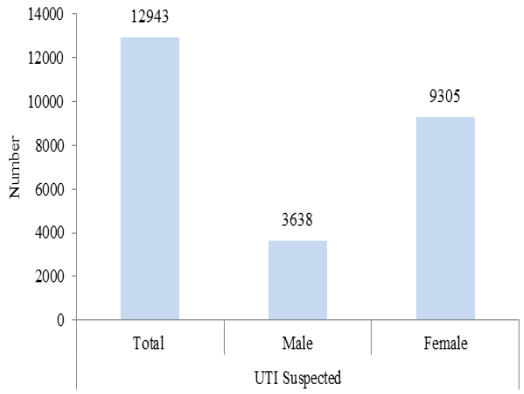

Figure 1: Sex distribution among UTI suspected patients.

After screening the urinary tract infection 1236 (9.55%) samples were found UTI positive and 11707 (90.45%) samples were found UTI negative (Figure-2).

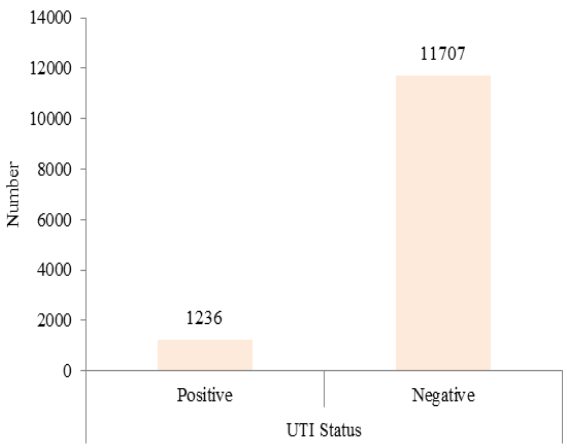

Figure 2: UTI status among UTI suspected patients.

Among 1236 UTI patients 275 patients were males and 961 patients were females (Figure-3).

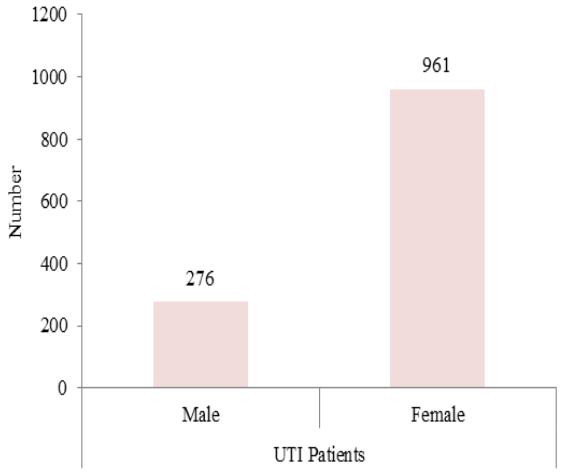

Figure 3: Sex distribution among UTI patients.

In our study, table-1 showed the distribution table of urinary tract infection affected patients by their age groups and gender. The highest of the study subjects under goes to the 21-30 years age.

Tabel 1: Distribution table of Urinary Tract Infection (UTI) patients by age groups and gender (n=1236).

Age	<10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	>90
Male	53	05	19	16	26	38	73	38	05	02
Female	103	83	181	113	149	130	124	56	14	08
Total	156	88	200	129	175	168	197	94	19	10

Group (200 patients=181 female + 19 male) and followed by 61-70 years age group (197 patients=124 female + 73 male), 41-50 years age group (175 patients=149 female + 26 male), 51-60 years age group (168 patients= 130 females + 38 males) and <10 years age group (156 patients= 103 females + 53 males) respectively. Most prevalent frequency of female and male patients affected by uropathogens was found in 21-30 years and 61-70 years age group respectively.

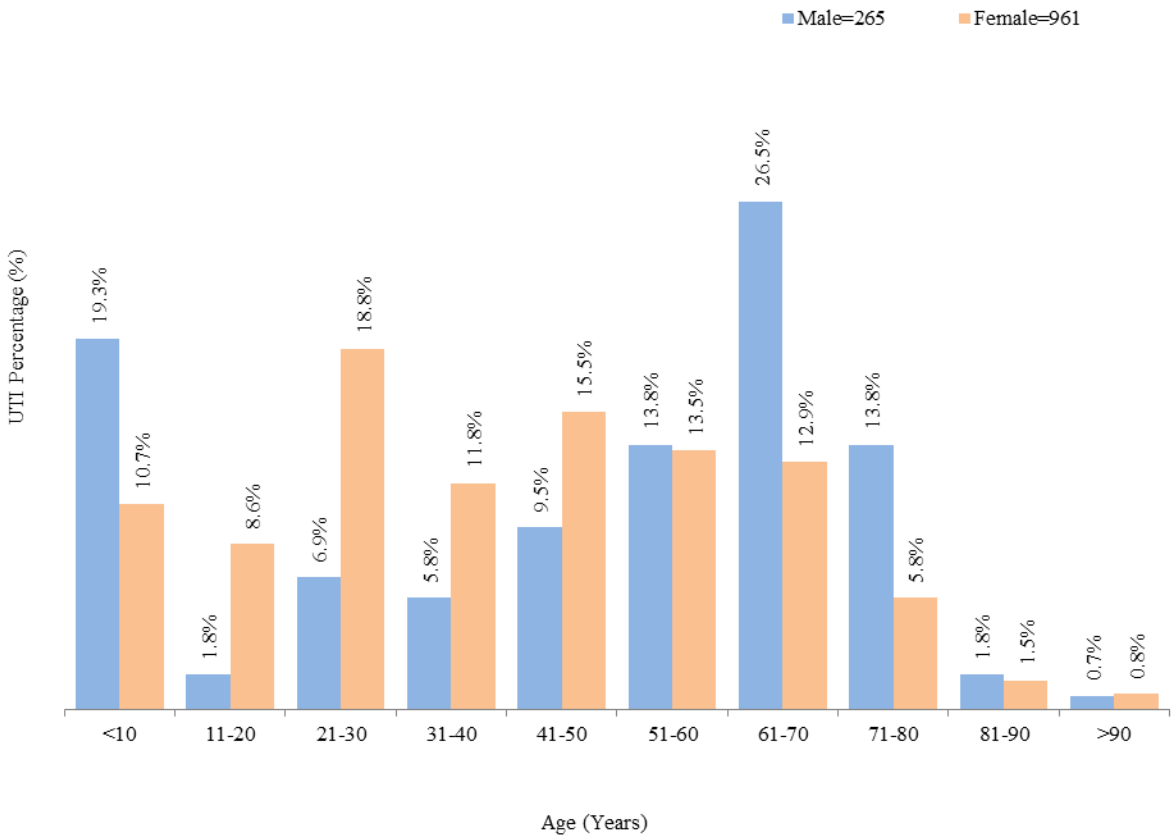

Figure 4: UTI percentage among different age groups of male (N=275) and female (N=961).

The percentage of male patients were more porne besides female patients (19.3% > 10.7%) under 10 years age groups. In between 11-20, 21-30, 31-40 and 41-50 years of age group female UTI infection (8.6%, 18.8%, 11.8% and 15.5% respectively) is higher than male (1.8%, 6.9%, 5.8% and 9.5% respectively). In between 51-60, 61-70, 71-80 and 81-90 years age male infection (13.8%, 26.5%, 13.8% and 1.8% respectively) is higher than female (13.5%, 12.9%, 5.8 % and 1.5% respectively). Above 90 years age female infection (0.8%) is higher than male (0.7%) but here number of patients were very few.

Table 2: Distribution of specific uropathogen mediated UTI among UTI patients.

Organisms	Percentage (n=1236)		
	Male	Female	Total
Salmonella spp.	0(0.0%)	0(0.0%)	0(0.0%)

Table-2 showed that the *Salmonella* spp. (non-typhoidal) was not found in 1236 (male 275 and female 961) UTI patients.

DISCUSSION

Non-typhoidal Salmonella infection of the urinary system was first reported in 1946.[21] Although it is a rare occurrence, accounting for 0.01 to 0.07 percent of UTI cases in various studies, the incidence of NTS infections has lately increased.[22,23] Infants and people over the age of 60 are the most usually affected.[24]

Hematogenous spread from gastroenteritis or contamination from fecal flora by direct urethral invasion, which is more prevalent in women[25], are two routes of urinary tract infection caused by NTS. Even though cases of asymptomatic bacteriuria have been described, it usually appears as typical symptoms of urinary tract infection. Patients with predisposing circumstances, such as severe immune weakness, occult urologic issues, chronic diseases (e.g., diabetes mellitus), or reptile exposure, such as the common green iguana, are more likely to get UTI from NTS.[25]

As a result, an episode of NTS urine infection must be viewed as a surrogate signal of underlying predisposing factor(s), such as immune system suppression or genitourinary architecture damage. Patients with such symptoms should be checked for concealed diabetes or recent reptile exposure.[25] Assessment didn't propose any proof of immunosuppression or diabetes in our patient.[26]

In our retrospective analysis of 1236 UTI patients urine, we did not found *salmonella* spp. According this study salmonella spp. (non-typhoidal) may not commonly associated with UTIs in Bangladesh.

Nephrolithiasis, chronic pyelonephritis, retrovesicular fistula, urethrorectal fistula, hydrocele, and post-TURP (Transurethral Resection of the Prostate) are all

genitourinary tract disorders that have been described in the literature to predispose to NTS UTI.[27]

However, it's important to realize that urine infections can strike even seemingly healthy and immune-competent people, and there's evidence that the link between NTS UTI and genitourinary abnormalities and immunosuppression is likely overstated due to bias. As a result, NTS should be considered in the differential of possible bacteria causing UTIs, even in patients who have no overt risk factors.[27] Self-limited gastroenteritis is the most common symptom of non-typhoidal Salmonellae (NTS) infection, however bacteremia and localized extraintestinal infections can also occur. Invasive salmonellosis has a wide range of incidence rates, with rates being higher in people at the ends of their lives, the immunocompromised, and those with hemoglobinopathies and hemolytic anemias.[28-32] Invasive illness, unlike NTS gastroenteritis, has a risky prognosis and requires urgent antibiotic treatment.

CONCLUSION

Non-typhi Salmonella enterica UTIs are uncommon. They are most commonly seen in persons over the age of 60 who have an immunodeficiency or a urological problem. In patients with signs and symptoms of non-typhi Salmonella enterica UTI, morphological examinations of the urine and detection tests for unknown immunodeficiencies should be done.

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