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PREVALENCE RATE OF URINARY TRACT INFECTION IN RURAL SECTOR OF SINGUR, WEST BENGAL, INDIA: A COMPARATIVE STUDY BETWEEN DIABETIC MALE AND FEMALE PATIENTS

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ABSTRACT

The present study was conducted to determine the prevalence of urinary tract infection among diabetic patients and causative pathogens also. A total of 200, out of which 95 patients were male and 105 female patients were included in the present study. Diabetic state of the patients was assessed as per the guidelines of World Health Organization (WHO). For bacteriological study, urine samples were processed according to standard microbiological techniques. Identification of the species of microorganisms was performed by Gram's staining as well as by biochemical tests as per standard method. Only urine culture showed $>10^5$ colony forming units (CFUs/ml), were considered for UTIs infection and processed for antibiotic sensitivity test. Here, the results indicated that the urine sample of 36.1 % female patients and 12.6 % male patients were showed significant growth in culture media. From Gram's staining and biochemical tests it may be stated that the *Streptococcus faecalis*, *Escherichia coli*, *Staphylococcus epidermidis*, *Staphylococcus saprophyticus*, *Klebsiella oxitoka*, *Streptococcus pyogenes*, *Klebsiella pneumoniae*, *and Pseudomonas aeruginosa* are present in the culture those are causative pathogens for urinary tract infection. The results of the present study enlighted that in our study area the prevalence of UTIs was high in diabetic female than diabetic male patients.

Key words: Diabetes, Uropathogens, Urinary tract infection, Gram's staining

INTRODUCTION

Diabetes mellitus is the most common endocrine disease characterized by hyperglycemia, abnormal lipid and protein metabolism along with long term complications like retinopathy, neuropathy, nephropathy etc. (Ali et al., 2009). Diabetes mellitus has long been suspected as a risk factor for community acquired infections. The urinary tract is the principal site of infection in diabetes (Ronald and Ludwig, 2001). The belief that diabetes, a common metabolic disorder estimated to affect 16 million persons in the US, is associated with a higher risk of UTI is widespread (Patterson and Andriole, 1997). Diabetes results in several abnormalities of the host defense system that might result in a higher risk of certain infections (Sridhar, 2002). These abnormalities include immunologic impairments, such as impaired migration, intracellular killing, phagocytosis and chemotaxis in polymorphonuclear leukocytes from diabetic patients (Valerius et al., 1982) and local complications related to neuropathy, such as impaired bladder emptying (Hosking et al., 1978). Several severe and less commonly encountered UTIs are thought to occur more frequently in diabetic patients (Ankel, 1990). Recently, a study reflected that in Europe, asymptomatic bacteriuria was more prevalent among women with diabetes (26%) than in

women without diabetes (6%) (Geerlings, 2000). Different risk factors such as age, duration of diabetes, sexual intercourse, glycemic control and chronic complication of diabetes are associated with UTIs (Geerlings, 2002). Despite the clinical and economic significance of UTI in diabetes, research interest and activity have been inadequate. Some studies have shown that both common and rare infections are more prevalent among patient with diabetes than among the general population (Hu et al., 2004). Patients with diabetes appeared to have an increased risk of asymptomatic bacteriuria and urinary tract infection (Boyko et al., 2002) and of skin and mucous membrane infection, including Candida infections (Joshi et al., 1999; Pozzilli, 1994). Side by side, foot infections are the most common soft-tissue infections in patients with diabetes including osteomyelitis, amputation etc. (Joshi et al., 1999). In the light of existing report, the present study was carried out where the aim of the study was to determine the prevalence of urinary tract infection along with identification of causative pathogens in the rural population of Singur, West Bengal, India.

MATERIALS AND METHODS

Selected 200 diabetic subjects having age group 21-60 years were studied. Diabetic state of the patients was confirmed based on WHO criteria (WHO, 1999). Medical histories of all patients were recorded. Freshly voided mid-stream urine samples were collected in a clean sterile disposable container. Physical examination of the urine like volume, color, appearance, odor, and specific gravity of the urine samples were conducted as per standard method (Godkar and Godkar, 2003).

After completion of physical examination, urine samples were quickly transported to the microbiology laboratory. Here, urine sample were processed according to standard microbiological techniques for culture study. Then identifying the species of the microorganisms, Gram's staining as well as different biochemical tests were performed (Dubey and Maheshwari, 2004) and antimicrobial sensitivity was also assessed following standard protocol (Bauer et al., 1966). Only urine culture showed $>10^5$ colony forming units (CFUs/ml) were considered for UTIs infection and processed for antibiotic sensitivity test.

RESULTS AND DISCUSSION

Total number of diabetic patient in the present study was 200, out of which 95 patients were male and 105 patients were female. Physical examination of urine reveals that out of 95 male patients, 23 (24.2 %) patients showed different abnormal features of urine where 32 (30.4 %) female patient out of 105 showed abnormal features of urine.

Several bacteriological studies usually reveal the involvement of gram negative enteric organisms that commonly cause urinary tract infections, such as *E. coli, Klebsiella* species and the proteus species (Bova et al., 1985). In the present study, microbial culture of urine sample indicated that 38 (36.1 %) female patients and 12 (12.6 %) male patients were showed significant growth. Identification of microorganisms by Gram's staining as well as by biochemical tests (Table 1) reflected that *Streptococcus faecalis, Escherichia coli, Staphylococcus epidermidis, Staphylococcus saprophyticus, Klebsiella oxitoka, Streptococcus pyogenes, Klebsiella pneumoniae, and Pseudomonas aeruginosa* are present in the culture those causes UTIs in diabetic patients and these findings were supported by other reports (Bova et al., 1985; Geerlings et al., 2002). Several factors may responsible for the susceptibility of UTIs of diabetic patients. Various aspects of immunity are altered in patients with diabetes. Polymorphonuclear leukocyte function is depressed, particularly when acidosis is present and phagocytosis may be affected (Gallacher et al., 1995). Antioxidant systems involved in bactericidal activity may also be impaired (Muchova et al., 1999). As lower urinary concentration of cytokines has been shown to

correlate with a lower urinary leukocyte cell count in diabetic patients (Hoepelman et al., 2003), so it may contribute to the increased incidence of UTIs in this patient group. Hyperglycemia by itself does not predictably increase bacterial rates of multiplication (Geerlings, 1999) although neutrophils are impaired in the presence of higher urinary or tissue glucose concentration and indirectly helps to increase the chances of infection. Under some circumstances urine may be inhibitory or even bactericidal against small inoculi of uropathogens (Kaye, 1968). Micturition abnormalities secondary to diabetic neuropathy occurs in most of the patients with longstanding diabetes and increased residual urine. Alteration of chemical composition of urine in diabetes mellitus can alter this bactericidal ability of urine and some support the growth of microorganisms. This presumably accounts for some of the increased morbidity as well as most of the increased susceptibility to infection (Sawers et al., 1986).

Finally it may be concluded that UTIs in patients with diabetes are common. The results of the present study enlighted that in our study area the prevalence of UTIs is high in women with diabetes than in male diabetic patients.

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Table 1: Results of Gram staining and biochemical tests of microbial growth of urine sample.

Gram staining	Biochemical test (+ve)	Biochemical test (- ve)	Bacterial identification	Antibiotic sensitive	Antibiotic resistance
Gram positive cocci in chain	Bile esculin	Catalase	*Streptococcus faecalis*	Cloxacillin, Streptomycin, Amoxycillin, Linezolid, cefoperazone, Cephalexin	Erythromycin, Ofloxacin, Co-trimoxazole
Gram positive cocci in cluster	Catalase	Coagulase	*Staphylococcus epidermidis*	Linezolid, Augmentin, Novobiocin, AzithromycinStreptomycin, Cefoperazone.	Co-trimoxazole
Gram positive cocci in chain	None	Catalase, Bilesculin	*Streptococcus pyogenes*	Linezolid, ErythromycinCefoperazone, Gatifloxacin	Penicillin-G Doxycycline AzithromycinChloramphenicol
Gram positive cocci in cluster	Catalase	Coagulase, Novobiocin	*Staphylococcus saprophyticus*	Linezolid, ErythromycinChlorampenicol	Co-trimoxazole Penicillin-G
Gram negative bacilli	TSI, MIL, Indole, O/F	Urea, Citrate	*Escherichia coli*	Chlorampenicol, CefoperazoneNitrofurantoin, Norfloxacin, Ofloxacin	Nalidixic acid, Co-trimoxazole Amoxycillin
Gram negative bacilli	Oxidase, TSI, Urea, Citrate Oxidative in O/F	MIL, Indole	*Pseudomonas aeruginosa*	Cefoperazone, Norfloxacin, Azithromycin, Gentamycin.	Penicillin-G
Gram negative bacilli	Citrate, TSI, Urea, MIL with bubble	Indole, O/F	*Klebsiella pneumoniae*	Gentamycin, Chlorampenicol, Co-trimoxazole, Nalidixic acid.	Augmentin
Gram negative bacilli	TSI, Citrate, MIL, Indole, Urea, O/F	None	*Klebsiella oxitoka*	AzithromycinChlorampenicol, Co-trimoxazole	Augmentin, Ofloxacin Norfloxacin Tetracycline Cefoperazone