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Antibiotic Sensitivity in UTI among Diabetic Pregnant Women

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Abstract

Background: *Urinary tract infection (UTI) is common during pregnancy and especially so in pregnant patients with diabetes mellitus. The emergence of drug resistance and particularly the extended spectrum Beta-lactamase production by Escherechia Coli and Methicillin resistance in staphylococci, limits the choice of anti-microbials.*

Method: *A cross-sectional study was conducted on 50 pregnant women with sign and symptoms of UTI in the Department of Obstetrics and Gynaecology, BIRDEM general Hospital-2 from January to June 2017. The objectives of the study were to determine the presence and type of pathogens found in pregnant diabetic women presenting with features of urinary tract infection, and to analyze their antibiotic sensitivity pattern. Clean catch mid-stream urine samples were collected using standard procedure and culture and sensitivity was done following standard bacteriological method.*

Results: *Mean age of the study subjects was 29.84±5.29 yrs; 48% were in third trimester of pregnancy; 52% had Gestational Diabetes Mellitus (GDM) and 48% had Diabetes Mellitus (DM). Out of fifty pregnant women, thirty eight (76.0%) study subjects had positive growth. Of them,* Escherechia coli *was found in 57.9% cases,* Klebsiella *in 21.1%, S*taphylococcus aureus *in 7.9%,* Enterococcus *and* Pseudomonas aeruginosa *each in 2.6% case. Amikacin was found to be sensitive to 100% cases of* E. Coli, Klebsiella & Enterococcus *but 100% resistant to* Streptococcus*.*

Conclusion: *In this study,* E. Coli *was the most common organisms causing UTI, which is less susceptible to conventional oral antibiotics but more susceptible to* amikacin*. So carefull drug selection is required for successful outcome in UTI.*

Key words: *Pregnancy UTI, Urinary Tract Infection, UTI and GDM*

Introduction:

Urinary tract infection is a common health problem among women due to shorter urethra, closer proximity to the vagina and pathogen entry facilitated by sexual activity[1,2]. It is estimated that one in three women of child-bearing age contracts UTI, which may manifest symptoms or remain asymptomatic[3]. Prevalence of symptomatic UTI in Diabetic patient was 67% (65% in GDM and 8.6% in PGDM)[4]. When compared with non-pregnant women and pregnant women have a two fold increase in risk of being affected with symptomatic UTIUTI. This is due to the urinary stasis during pregnancy caused by anatomical and physiological changes in the urinary tract, such as pressure effect by the gravid uterus on the ureters and the relaxant effect of progesterone on the urinary tract muscles[5].

The prevalence of S UTI during pregnancy in nondiabetic women varies from 3% to 10.1% while in diabetic pregnant women it can be as high as 27.6%[6-7]. The UTI could be either lower UTI, which could be either asymptomaticbacteriuria or acute

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cystitis, or the less common but more serious acute pyelonephritis. During pregnancy, there are physiological and anatomical changes that occur in the urinary tract which increases the incidence of asymptomatic bacteriuria and its progression to either acute cystitis and/or acute pyelonephritis.

Even though the precise mechanisms for the predilection of pathogens to cause UTI in diabetics remains unclear, a few research have revealed that the reasons could be immunological impairments such as impaired migration of neutrophils, intracellular killing, phagocytosis, defects in the local urinary cytokine secretions (IL-8, IL-6), increased adherence of the microorganisms to the uroepithelial cells, partly due to a changed and lowered Tamm Horsfall protein, and chemotaxis of polymorphonuclear leukocytes from diabetic patients and neuropathic complications such as impaired bladder emptying, as a result static pools of urine will remain in the bladder. In addition, a higher glucose concentration in the urine acts as a favorable culture medium for pathogenic bacteria and promotes rapid bacterial colonization and growth [8,9].

Escherechia coli is the predominant uropathogenfound in UTI (cyctitis and pyelonephritis) in approximately 70-90% of cases. Other organisms responsible for UTI includes streptococcus (10%), Klebsiella and enterobactor species (3% each) and proteus an staphylocoous (2% each), saprophyticus. The bacteria with their sensitivity to various antimicrobial agents vary from place to place and in the same place from time to time[10]. The aims of this study were to identify organisms responsible for UTI in diabetic pregnant women.

Methods:

A total of 50 urine samples from pregnant women with GDM or DM at different gestational ages who presented with clinical features of UTI were processed for the isolation of the uropathogen and treated with antibiotics namely ciprofloxacine, amikacin, ceftriaxone, cefuroxime, gentamicin, nitrofurantoin, penicillin, amoxyclav, vancomycin. Clean catch midstream urine was collected in a sterile container maintaining sterility and was sent to the laboratory immediately. Informed written consent was obtained. The culture and sensitively was done following the standard bacteriological method.

Results:

Mean + SD age of study subjects was 29.84 + 5.29 yrs; 30 % patients were of age group < 25 years; 73 ;32% were of 26-30 yrs age: 20% were in age group 31-35 yrs and 18% were > 35 years age (table-1). Highest frequently of occurrence of UTI was in third trimester (45%), followed by second trimester (44%) and only 8% cases were in first trimester (table 2). GDM patients were 52% and DM patients were 48% among the patients with symptoms of UTI, but among then 4% also had anemia (table-3).

Culture was positive in 76% (n=38) cases (table-4). A positive culture percentage of 48% was obtained with highest urinary tract infection in the third trimester gestational age. Among the uropathogens isolated, *E. coli* was found in 57.9% cases, *Klebsiella* in 21.1% cases, *Streptpcoccus* in 7.9% cases, *Staphylococcus aureus* in 7.9% cases, *Enterococcus* in 2.6% cases and *Pseudomonas aeruginosa* in similar number of cases. Amikacin was found sensitive to 100% cases in *E. coli, Klebsiella and Enterococus* but 100% resistant in *Streptococcus.*

Table-I

Distribution of the study subjects according to age (n=50)

Age (years)	Frequency (n)	Percentage
22 - 25	15	30.0
26 - 30	16	32.0
31 - 35	10	20.0
>35	9	18.0
Total	50	100.0
Mean ± SD	29.84 ± 5.29	

Table-II

Distribution of the study subjects according to trimesters (n=50)

Trimesters	Frequency (n)	Percentage
1st	4	8.0
2nd	22	44.0
3rd	24	48.0
Total	50	100.0

Table-III

Distribution of the study subjects according to trimesters (n=50)

Co-morbidities	Frequency (n)	Percentage
DM	22	44.0
GDM	26	52.0
DM with anemia	2	4.0

Table-IV

Distribution of the study subjects according to growth and type of organism (n=50)

Growth	Frequency (n)	Percentage
Positive	38	76.0
Escherichia coli	22	57.9
Klebsiella	8	21.1
Streptococcus	3	7.9
Staphylococcus aureus	3	7.9
Enterococcus	1	2.6
Pseudomonas aeruginosa	1	2.6

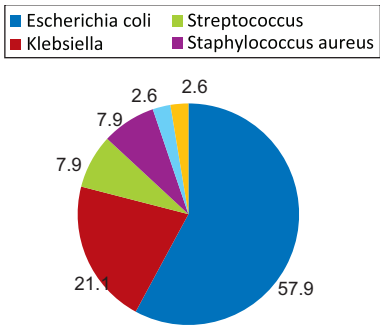

Fig.-1: *Distribution of study subjects according to type of organism (n=100)*

Table-V

Sensitivity and resistant pattern of antibiotic in different organisam

Antibiotic/ Organism		Escherichia coli	Klebsiella	Streptococcus	Enterococcus	Staphylococcus aureus	Pseudomonas aeruginosa
Amikacin	S	12 (100.0)	5 (100.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
	R	0 (0.0)	0 (0.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Amoxicillin	S	3 (37.5)	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
	R	5 (62.5)	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)
Ampicillin	S	1 (50.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
	R	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Azithromycin	S	2 (100.0)	0 (0.0)	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cefixime	S	4 (36.4)	2 (50.0)	0 (0.0)	0 (0.0)	1 (50.0)	1 (100.0)
	R	7 (63.6)	2 (50.0)	0 (0.0)	0 (0.0)	1 (50.0)	0 (0.0)
Ceftazidime	S	4 (36.4)	2 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
	R	7 (63.6)	2 (50.0)	2 (100.0)	0 (0.0)	1 (100.0)	1 (100.0)
Ceftriaxone	S	5 (41.7)	6 (100.0)	2 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
	R	7 (58.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)
Cefuroxime	S	4 (57.1)	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)
	R	3 (42.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
Ciprofloxacin	S	6 (66.7)	2 (40.0)	3 (100.0)	1 (100.0)	1 (100.0)	0 (0.0)
	R	3 (33.3)	3 (60.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cloxacillin	S	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Colistin	S	4 (100.0)	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Co-trimoxazole	S	3 (50.0)	0 (0.0)	1 (100.0)	0 (0.0)	1 (100.0)	1 (100.0)
	R	3 (50.0)	2 (100.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)
Fimoxyclav	S	2 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Gentamicin	S	7 (58.3)	4 (80.0)	0 (0.0)	1 (100.0)	1 (100.0)	0 (0.0)
	R	5 (41.7)	1 (20.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Levofloxacin	S	4 (100.0)	0 (0.0)	2 (100.0)	0 (0.0)	1 (100.0)	0 (0.0)
Netilmicin	S	11 (91.7)	5 (100.0)	1 (100.0)	1 (100.0)	1 (100.0)	0 (0.0)
	R	1 (8.3)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Nitrofurantoin	S	7 (53.8)	2 (50.0)	1 (100.0)	1 (100.0)	1 (100.0)	0 (0.0)
	R	6 (46.2)	2 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Penicillin	S	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)	0 (0.0)	0 (0.0)
	R	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Vancomycin	S	0 (0.0)	0 (0.0)	1 (100.0)	1 (100.0)	0 (0.0)	0 (0.0)

Table-VI
Antibiotic sensitivity pattern of the isolates

Antibiotics		Frequency	Percentage	
			Sensitive	Resistance
Penicillin	Amoxicillin	13	38.5	61.5
	Cloxacillin	1	100.0	0.0
Cephalosporin	Ceftriaxone	22	63.6	36.4
	Cefuroxime	10	60.0	40.0
	Ceftazidime	19	31.6	68.4
	Cefixim	18	44.4	55.6
Fluroquinolones	Ciprofloxacin	19	68.4	31.6
Aminoglycosides	Amikacin	22	86.4	13.6
	Gentamicin	19	68.4	31.6
Glycopeptide	Vancomycin	2	100.0	0.0
Sulfonemide	Co-trimoxazole	13	50.0	50.0
Nitrofuran	Nitrofuratoin	21	57.1	42.9

Discussion:

Infection of the urinary tract is the most common bacterial infections encountered during pregnancy. The predominant bacterial isolates observed in this study were *E. coli* (76.0%). This is similar to most other studies throughout the world where consistently *E. coli* has been consistently the predominant organisms causing UTI[11-13]. The major contributing factor for isolating higher rate of E. coli due to urine stasis in pregnancy which favours for *E. coli* strain colonization[14,15].

The sensitivity of amikacin was high (100%) in this study, which is similar to other studies[8,16]. Sensitivity to nitrofurantoin and penicillin were low. No case of vancomycin resistant *Staphlococcus aureus* was seen in this study.

In a study done on 150 diabetic & 250 non-diabetic patients A cross-sectional study was conducted in Lahore Pakistan, in which total of 400 patients were studied out of which 150 were diabetics and 250 were non-diabetics[17]. Patients with negative urine culture (n = 240) were excluded from the study and 160 patients with positive culture of UTIs of which 80 were diabetics and 80 were non-diabetics, included in this study. Clinical data were obtained from individual study participant with informed written consent using pre-tested questionnaire. According to the clean-catch procedure, midstream urine samples were collected and cultured for the diagnosis and susceptibility of bacteriuria. Out of 160 uropathogenic isolates, E. coli was found as a leading pathogen i.e. 46.25% followed by Candida spp. 30.62%, S. Faecalis 15.62%, P. aeruginosa 3.13%, Pneumococcus. 1.25%, MSSA 1.25%, MRSA 0.63%, Proteus spp. 0.63% and Vancomycin resistant enterococcus spp. 0.63%[17].

In a study in Nigeria on 100 diabetic patients with symptomatic and asymptomatic UTI, uropathogens were isolated in 40% of cases[18]. The bacteria isolates were; Coagulase negative *Staphylococci* (CNS) (37.5%), *Escherichia coli* (24%), Klebsiella pneumoniae (12.5%), Staphylococcus aureus (15%) and Streptococcus spp (10%). *Esherichia coli* and *Klebsiella pneumoniae* were highly resistant to most antibiotics used, while coagulase negative *staphylococci*, *Staphylococcus aureus* and *Streptococcus* were highly sensitive to most antibiotics used in this study.

Conclusion:

The finding revealed that UTI is a common problem in pregnanacy with GDM. Uropathogens were more resistant to penicillin. Self-medication including antibiotics and not completing the full course of antibiotics may be the reason. Common causative bacteria and their antibiotic sensitivity pattern are to be determined along with their safety to mother and fetus for effective treatment of urinary tract infection during pregnancy.

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