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Characterization and the biofilm formation of uropathogens in the diabetic patients with catheter associated urinary tract infections (UTIs)

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Abstract

Background: There is confirmation that patients with diabetes have an extended peril of asymptomatic bacteriuria and urinary tract sicknesses (UTIs). UTI is the most notable bacterial defilement in diabetic patients. The purpose of this examination was to review the inescapability of UTIs among hospitalized diabetic patients and to perceive the most progressive microorganisms accountable for UTI.

Material and Method: The examination masses included 1470 diabetic patients (847 women and 623 men), admitted to the Diabetes Clinic of IMS and SUM Hospital, Bhubaneswar, among January and December 2015. We assembled patients' near and dear history data and performed pee social orders. For real examination we used Graph Pad Prism 5; the significance of the difference between the rate regards was reviewed using Fisher's right test.

Results: From irrefutably the quantity of patients, 158 had positive pee social orders, which implies 10.7%. Out of the hard and fast number of 158 UTIs, 124 (78.4%) were asymptomatic bacteriuria. The most standard microorganisms drew in with UTI was *Escherichia coli* (68.9%).

Conclusions: UTIs are visit in diabetic patients. Because of the unprecedented degree of asymptomatic structures among diabetic patients, the pee culture should be performed in all hospitalized patients with diabetes.

Keywords: Diabetes mellitus, urinary tract contamination, asymptomatic bacteriuria

Introduction

Urinary Tract Infections (UTIs) are portrayed as diseases which are achieved by a microbial interruption of the genitourinary tract, that connects from the renal cortex of the kidney to the urethral meatus. They address the most normally increased bacterial illnesses and they speak to a normal 25-40% of the nosocomial defilements^[1]. The risk of making urinary tract illnesses augments in a general sense with the usage of occupying devices, for instance, catheters and urethral stents or sphincters. The urinary catheters are round and hollow latex or silicone contraptions, which when inserted, may quickly verify biofilms on the inside or outer surfaces. The existence frames which by and large spoil these contraptions and make biofilms are *Staphylococcus epidermidis*, *Enterococcus faecalis*, *Escherichia coli*, *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae* and other gramnegative life shapes^[2]. The more drawn out the urinary catheter remains set up, the more imperative is the affinity of these living things to make biofilms, which may result in urinary tract maladies. Biofilms are the microbial systems of the surface-joined cells which are embedded in a self-made extracellular polymeric structure^[3]. They can cause tremendous issues in various zones, both in the therapeutic settings (for instance continuing on and tedious illnesses, device related pollutions) and in the non-helpful (current) settings (for instance bio fouling in the drinking water transport systems and in the sustenance getting ready conditions). The biofilms have an imperative remedial centrality as they decay the vulnerability to the antimicrobial administrators. Besides, the closeness of cells inside a biofilm can empower a plasmid exchange and subsequently overhaul the spread of antimicrobial check^[4]. As such, the present examination was done to isolate and to perceive the biofilm surrounding utmost of the uropathogens in diabetic patients with catheter related urinary tract illnesses.

Material and Methods

Study masses. We played out a therapeutic facility based examination drove at the Diabetes Clinic of the IMS and SUM Hospital, Bhuaneswar, incorporating patients surrendered in 2015 (January - December). The examination was avowed by the Ethics Committee of the Institution. We assembled for pee culture 570 pee tests from a total number of 1470 hospitalized diabetic patients (847 women and 623 men), with both kind 1 and sort 2 diabetes mellitus. Pee culture was performed in patients with a suspected UTI: reactions prescribing UTI (dysuria, desperation, repeat, supra-pubic distress or delicacy, fever) or urinalysis with the closeness of nitrite, leukocyte esterase, more than 5 white platelets for each ground-breaking field. We in like manner assembled patients' near and dear history data. Definitions. Basic bacteriuria was portrayed as the proximity of $\geq 10^5$ colony forming units (CFU) per milliliter of pee. A symptomatic urinary tract ailment was described as the closeness of bacteriuria in a patient with fever or urinary signs. Asymptomatic bacteriuria (ASB) was described as bacteriuria without fever or urinary indications. Lower UTI (cystitis) was dissected inside seeing dysuria, sincerity, repeat of pee, suprapubic misery or delicacy. Upper UTI (pyelonephritis) was depicted by the closeness of fever (without another prominent etiology) with or without the recently referenced indications. Diabetes was described by the World Health Organization's criteria as a fasting plasma glucose ≥ 7.0 mmol/l (126 mg/dl) or a 2-h plasma glucose ≥ 11.1 mmol/l (200 mg/dl) in the midst of an OGTT [15, 16]. Pee examination. Pee models were assembled in the midst of hospitalization. The criteria for mentioning a pee culture were: urinary symptoms (dysuria, criticalness, repeat or suprapubic torment or delicacy) with or without fever at presentation or in the midst of hospitalization, modified urinalysis (positive nitrite, positive leukocyte esterase, more than 5 white platelets for each incredible field), fever or high leukocyte count of darken etiology. Pee was assembled in sterile uricols as perfect catch midstream tests and transported to the exploration office inside one hour of collection. Quantitative bacterial culture of a pee precedent was performed by inoculating society media (Columbia agar improved with 5% sheep blood and Mac Conkey agar) with a conscious proportion of pee with adjusted hover expected to pass on a known volume. The conspicuous verification of germs relied upon outskirts appearance and biochemical qualities. Last bacterial distinctive verification was performed using the customized Vitek2 Compact System (bio Merieux France). Authentic examination. Patients' data were assembled using an Excel worksheet database. Authentic examination was performed in Graph Pad Prism 5. Power is conveyed as rate from the considered people having the foreordained condition. The vitality of the refinement between rate regards was assessed using Fisher's right test. $P < 0.05$ was considered quantifiably essential.

We evaluated the repeat of UTI in the diabetic patients of our examination gathering. Out of the full scale number of hospitalized patients, 158 (10.7%) had UTI. In order to evaluate if there is a qualification concerning the inescapability of UTI in sort 1 and sort 2 diabetes patients, we assembled the data seemed Table 1.

Table 1: The prevalence of UTI by type of diabetes.

Parameter	Type 1 DM	Type 2 DM	Total
With UTI	16(12.8%)	142(10.5%)	158
Without UTI	109(87.2%)	1203(89.5%)	1312
Total	125	1345	1470

We saw that 12.8% of sort 1 and 10.5% of sort 2 diabetic patients had UTI. The thing that matters was not factually critical ($p = 0.45$). With respect to distinction between sexes, 15.3% of ladies and 4.5% of men created UTI, a very huge contrast ($p < 0.0001$) (Table 2).

Table 2: The prevalence of UTI by genders.

Parameters	Women	Men	Total
With UTI	130(15.3%)	28(4.5%)	158
Without UTI	717(84.7%)	595(95.5%)	1312
Total	847	623	1470

Out of the all-out number of 158 UTIs, 22 (13.9%) were bring down UTIs, 12 (7.6%) were upper UTIs and 124 (78.4%) were ASBs. From each of the 1470 hospitalized diabetic patients, bring down UTI happened in 1.5%, intense pyelonephritis in 0.8%, and ASB in 8.4% of the cases. There was no critical distinction between the specific restrictions of UTI in patients with sort 1 and sort 2 diabetes (Table 3).

Table 3: The prevalence of UTIs by site of infection and type of diabetes.

Parameters	Types 1 DM (%)	Type 2 DM (%)	p
Lower UTI	2.4	1.4	0.4
Upper UTI	1.6	0.8	0.27
ASB	8.8	8.3	0.8
Total (%)	12.8	10.5	

The predominance of lower UTI, upper UTI and ASB in ladies was: 2%, 1.1% and 12.2%, individually. In men, the extents were: 0.8%, 0.5% and 3.2%, individually (Table 4). The contrast between sexual orientations can be clarified by the way that, because of anatomical contrasts of the urinary tract, generally, the commonness of UTIs in men is lower than in ladies. On the off chance that present, an UTI in men is prompting manifestations, ASB being an exceptionally uncommon condition.

Table 4: The prevalence of UTI by site of infection and by gender.

Parameters	Women (%)	Men (%)	p
Lower UTI	2	0.8	0.08
Upper UTI	1.1	0.5	0.2
ASB	12.2	8.3	<0.0001
Total (%)	15.3	4.5	

In the event that considering the most successive microorganisms engaged with UTI, we found that 109 (68.9%) were with *E. coli*, 22 (13.9%) with *Klebsiella* species (spp.) and the staying 17.2% with different microorganisms: *Candida* spp. 10 (6.4%), *Proteus* spp. 6 (3.8%), *Enterococcus* spp. 4 (2.6%), *Streptococcus* spp. 2 (1.3%), *Pseudomonas* spp. 2 (1.3%), *Citrobacter* spp. 1 (0.6%), *Acinetobacter* spp. 1 (0.6%), *Staphylococcus* spp. 1 (0.6%) (Figure 1).

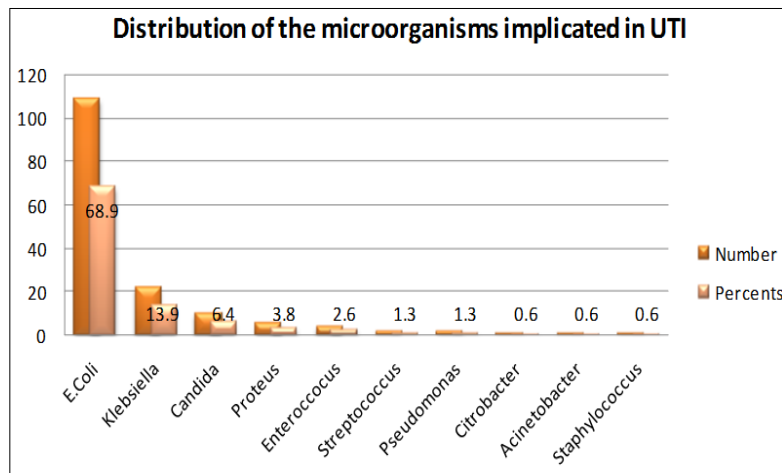


Fig 1: Distribution of the microorganisms encountered in UTI.

As to 109 UTI with E. coli, 14 (13%) were bring down UTI, 11 (10%) upper UTI and 84 (77%) ASB. From the complete number of 22 UTI with Klebsiella spp. 5 (22.8%) were bring down UTI, 1 was upper UTI (4.5%) and 16 (72.7%) were ASB. Out of the complete number of lower UTI, E. coli was in charge of 14 (63.6%) and Klebsiella spp. for 5 (22.7%) of them ($p = 0.014$). At the point when upper UTIs were investigated (12 cases), we saw that E. coli was in charge of 11 (91.7%) and Klebsiella spp. for 1 (8.3%) of the cases ($p = 0.0001$). Clearly these two microscopic organisms caused all the upper UTIs from the considered gathering. From the all-out number of bASB, E. coli decided 84 (67.7%) positive pee societies and Klebsiella spp. 16 (12.9%), with $p < 0.0001$.

Discussions

The normality of ASB among diabetic patients in our examination, was 8.4%, higher in women (12.2%) than in men (3.2%). Our result resembles the one noted in a metaanalysis of twenty-two examinations concerning ASB in diabetic patients, which found a power of ASB of 12.2%, with 14.2% in women and 2.3% in men [7]. Another examination coordinated in Manitoba, Canada, which enrolled 1,072 outpatient diabetic women, showed a prevalence of ASB of 7.9% [18]. In an examination drove at the University-Hospital of Pisa (Italy), that included 10,221 diabetic and non-diabetic patients, the prevalence of ASB in diabetic women was 14.97% [9]. The infinitesimal living beings related with UTI were overwhelmingly E. coli (68.9%) and other Enterobacteriaceae (20.2%). These revelations resemble those seen by Boyko *et al.* [5] on 218 diabetic postmenopausal women exhibiting that the inescapability of E. coli was 74.4% and of Klebsiella spp. 7%. Another case-control look at, coordinated in New Delhi, India, that evaluated the normality of UTI and renal scarring in 155 patients with diabetes, furthermore found that E. coli was the most normally included animal (64.3%), trailed by Staphylococcus aureus (21.4%) besides, Klebsiella pneumoniae (14.3%) [20]. We found a high inescapability of UTI achieved by parasites (Candida species). It is understood that diabetes is a slanting variable for parasitic maladies of the urinary tract. A champion among the most basic elucidations for this tendency is glycosuria [11]. The majority of UTIs realized by developments are clinically asymptomatic. In our examination gathering, 9 of 10 Candida defilements were ASB and only a solitary could be named cystitis. In our examination, 15.3% of diabetic women developed an UTI, result that resembles the one gotten by

Geerlings and associates [6] who found an ordinariness of 20% in women. Our examination shows that the inescapability of UTI in diabetic patients is three overlay higher in women than in men. This indispensable qualification can be illuminated by an arrangement of men-related components, for instance, the more unmistakable length of the urethra, the more important detachment between the urogenital meatus and the backside, and the antibacterial properties of the prostatic fluid [12]. One of the limitations of this examination could be the manner in which that the pee culture wasn't performed to all hospitalized patients, thus some positive results could have been blocked, reducing the certifiable prevalence of UTI.

Ends

UTIs are visit in patients with diabetes. The most relentless uropathogen is E. coli, yet parasitic maladies are also typical in diabetic patients. Various UTIs are asymptomatic, especially in women. Because of the inconceivable degree of asymptomatic UTIs among diabetic patients, we prescribe that pee culture should be performed in all hospitalized diabetic patients. In like manner, considering the high power of ASB in diabetics, this condition could address one of the makes driving an unexplained strengthening of the glycemic control in a couple of patients.

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