

Investigation of Micro-Organisms Responsible for Urinary Tract Infections in Type 2 Dm Patients: A Retrospective Case Control Study

Lubna Salim¹, Abilash Kumar B²

¹Pharm D Intern, Nazareth College Of Pharmacy, Othara, Thiruvalla

²Assistant Professor, Department Of Pharmacy Practice, Nazareth College Of Pharmacy, Othara, Thiruvalla

ABSTRACT:

Introduction: Diabetes Mellitus is a chronic health condition which if not kept under control can lead to severe complications that could affect the quality of life and even lead to death. UTI is more common and more severe among the Type 2 DM patients.

Objective: To investigate the microorganisms responsible for UTI in type 2 DM patients.

Materials and methodology: The study was a hospital-based Retrospective case control study conducted in 2713 people with Type 2 DM who were tested for UTI at BCMCH hospital Thiruvalla over a period of 6 months.

Observation and conclusion: The study shows that E.coli and Klebsiella pneumoniae are the most common bacteria's that cause UTI in DM patients.

KEYWORDS: Type 2 Diabetes Mellitus, Urinary tract infection, micro- organisms.

INTRODUCTION

Diabetes mellitus (DM) is a growing public health concern in India, with an overall adult prevalence of about 7.1%, reaching much higher levels in urban populations. Obesity is a major risk factor for Type 2 diabetes, which develops due to impaired insulin action and elevated blood glucose levels. Normal fasting blood glucose is below 100 mg/dL, prediabetes ranges from 100–125 mg/dL, and diabetes is diagnosed at 126 mg/dL or higher.

There are four main types of diabetes. Type 1 diabetes is an autoimmune condition in which pancreatic beta cells are destroyed, resulting in absolute insulin deficiency. Type 2 diabetes is characterized by insulin resistance and progressive beta-cell dysfunction. Prediabetes refers to elevated blood glucose levels that are not yet high enough for a diabetes diagnosis. Gestational diabetes occurs during pregnancy and increases the long-term risk of Type 2 diabetes for both mother and child.[1]

Type 1 diabetes develops due to immune-mediated destruction of insulin-producing cells, often influenced by genetic and environmental factors. Type 2 diabetes begins with insulin resistance, where body tissues respond poorly to insulin. Initially, the pancreas compensates by increasing insulin production, but over time this becomes insufficient, leading to chronic hyperglycemia and long-term complications.

Diagnosis of diabetes is made using fasting plasma glucose, HbA1c testing (reflecting average blood glucose over three months), random plasma glucose testing in symptomatic individuals, oral glucose tol-

erance testing, and glucose challenge testing for gestational diabetes.

Diabetes can lead to both microvascular and macrovascular complications. Microvascular complications include diabetic retinopathy (a major cause of adult blindness), nephropathy (kidney damage due to glomerular changes), and neuropathy (nerve damage caused by reduced blood supply). Macrovascular complications involve large blood vessels and include coronary artery disease, stroke, and peripheral arterial disease.

Management of Type 1 diabetes requires insulin therapy delivered through injections or insulin pumps, using various insulin types based on onset and duration of action. Type 2 diabetes is treated with lifestyle modifications and oral or injectable medications such as metformin, sulfonylureas, thiazolidinediones, meglitinides, DPP-4 inhibitors, SGLT2 inhibitors, and alpha-glucosidase inhibitors.[2]

Urinary tract infections (UTIs) are common bacterial infections, particularly among individuals with diabetes. UTIs can be classified as uncomplicated (typically involving the bladder) or complicated, which occur in the presence of risk factors such as diabetes, catheter use, structural abnormalities, or impaired immunity. Bacterial adhesion to the urinary tract lining and anatomical factors contribute to infection.

Typical UTI symptoms include frequent urination, burning sensation during urination, and urgency. Diagnosis involves urine analysis, urine culture, imaging studies, or cystoscopy when needed. Risk factors include previous infections, pregnancy, advanced age, structural abnormalities, and poor hygiene.

Antibiotics are the main treatment for UTIs. Uncomplicated cases are treated with agents such as trimethoprim-sulfamethoxazole, nitrofurantoin, fosfomycin, or cephalexin, while complicated infections may require broader-spectrum antibiotics like fluoroquinolones. Preventive strategies may include post-coital antibiotics or vaginal estrogen therapy.[3][4]

E.coli and Klebsiella pneumoniae are the most common bacteria's that cause UTI in DM patients

OBJECTIVES

To investigate the microorganisms responsible for UTI in type 2 DM patients.

MATERIALS AND METHODOLOGY

The study was a hospital-based Retrospective case control study conducted in 2713 people with Type 2 DM who were tested for UTI at BCMCH hospital Thiruvalla over a period of 6 months (November 2022 to April 2023). It was approved by the Institutional Review Board of Believers Church medical College Hospital, Thiruvalla. The data was collected as Data collection form and Questionnaire format.

Calculating Proportion:

$$N=4PQ/d2$$

Where,

P= Prevalence (from previous studies)

Q= 100-P

STUDY CRITERIA

Inclusion criteria:

- Patients admitted during the study period.
- Patients aged > 18 years.
- Patients of both genders.

Exclusion criteria:

- NIL

STUDY PROCEDURE

The data was collected from Believers Church Medical College Hospital of all patients who were tested for UTI in the laboratory of BCMCH will be extracted from the Lab Information System (LIS). Their demographic factors, will be extracted from the Hospital Information System (HIS). Their drug history will be extracted from the prescription orders. DM status will be determined based on prescriptions. The data collected were entered in Microsoft Excel-2021 version, statistical analysis was done and the result were obtained.

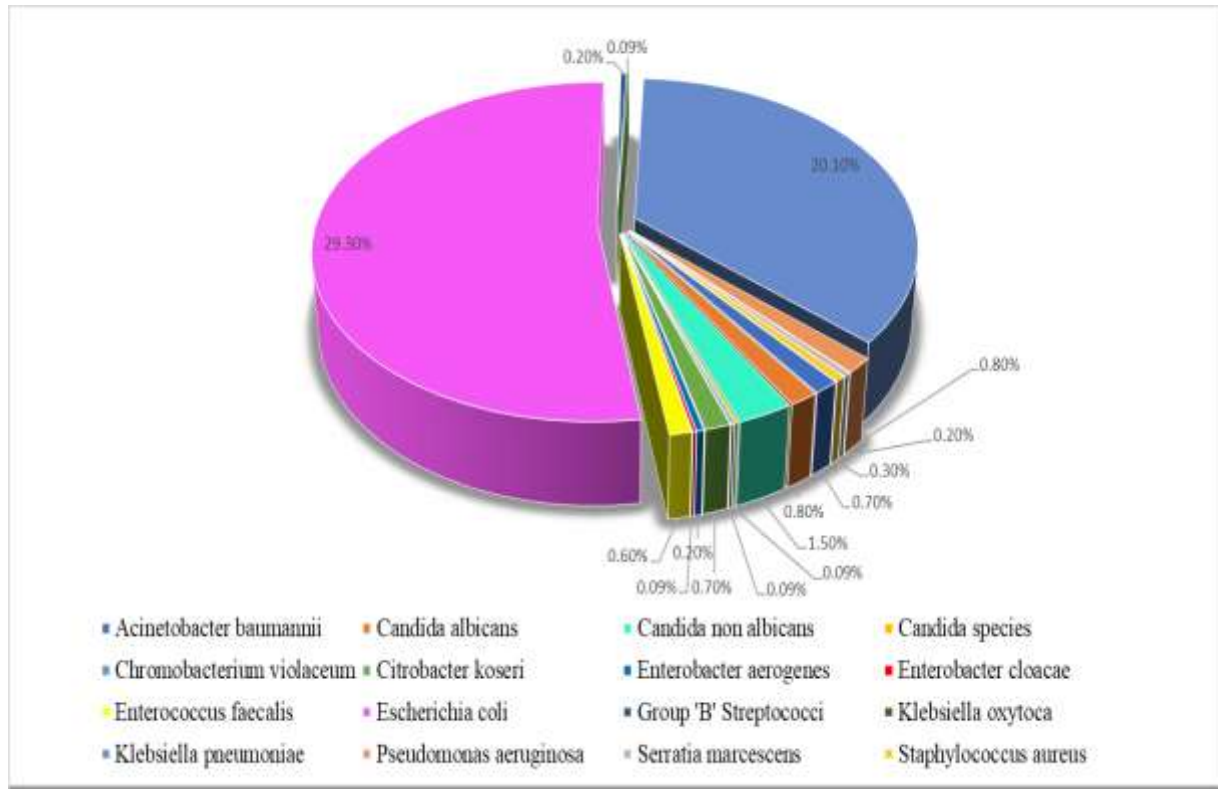
RESULTS

Table 1: Different Types Of Bacteria In Urine

Table 1 shows that, Among 616 sample, E.coli -29.3%, K.pneumoniae-20.1%.

SL.NO	BACTERIA	FREQUENCY	Percentage
1	Acinetobacter baumannii	8	0.7%
2	Candida albicans	9	0.8%
3	Candida non albicans	17	1.5%
4	Candida species	1	0.09%
5	Chromobacterium violaceum	1	0.09%
6	Citrobacter koseri	8	0.7%
7	Enterobacter aerogenes	2	0.2%
8	Enterobacter cloacae	1	0.09%
9	Enterococcus faecalis	7	0.6%
10	Escherichia coli	323	29.3%
11	Group 'B' Streptococci	2	0.2%
12	Klebsiella oxytoca	1	0.09%
13	Klebsiella pneumoniae	222	20.1%
14	Pseudomonas aeruginosa	9	0.8%
15	Serratia marcescens	2	0.2%
16	Staphylococcus aureus	3	0.3%

Figure 1: Different Types Of Bacteria In Urine



OBSERVATIONS AND DISCUSSIONS

DISTRIBUTION OF BACTERIA IN URINE

In our study it shows that E. coli (29.3%) and Klebsiella pneumoniae (20.1%) are the most common bacteria’s that causes UTI in DM patients. A study conducted by Nooralden Abdulkarem Jasim Al-Tulaibawi et al. inferred that. Escherichia coli was identified as the most common causative agent of UTIs (52.9%), followed by Klebsiella pneumoniae (9,1%). Streptococcus agalactiae and Klebsiella aerogenes were (4.2%, for each). Moreover, Pseudomonas aeruginosa, Klebsiella oxytoca and Staphylococcus haemolyticus were 2.48% for each. 71 which is similar to our study.[5] Another study conducted by Pooja Shakya et al., inferred that A total of 451 samples showed significant bacteriuria with 365 (80.9%) E. coli, 17 (3.8%) Klebsiella pneumoniae and 3 (0.7%) Klebsiella oxytoca. Of 451 isolates, 236 (52.3%) were found MDR strains.[6]

CONCLUSION

Diabetes is a chronic health condition and the risk of diabetes depends on age, gender, comorbid conditions and complications. One of major complications of Diabetes is recurrent UTI. The most common causative micro-organisms are E.coli and Klebsiella pneumoniae.

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CONFLICT OF INTEREST:

The authors declare that the case report was conducted in the absence of any commercial financial relationships that could be constructed as a potential conflict of interest.

ABBREVIATIONS

UTI: URINARY TRACT INFECTION

T2DM: TYPE 2 DIABETES MELLITUS

HBA1C: GLYCOSYLATED HEMOGLOBIN

LIS: LAB INFORMATION SYSTEM

HIS: HOSPITAL INFORMATION SYSTEM

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