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# Surveillance of microorganisms and their drug sensitivity patterns in diabetic UTI patient at a tertiary care teaching hospital

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## Abstract

**Background:** Urinary Tract Infection (UTI) is one of the common infections affecting people, both from the community and hospital. The causative pathogens for UTI and their drug sensitivity patterns vary from region to region. Changes in their genetic constituents with time might be the reason.
**Aim:** In this study, we aimed investigate the profile of common uropathogens and assess their antibiotic sensitivity patterns with commonly used drugs for UTI patients.
**Materials and methods:** In this study, 153 urine samples were analyzed with routine microscopy, culture and sensitivity for a period of six months at Institute of Medical Science and SUM Hospital, Bhubaneswar, Odisha. Both bacteria and fungi were used for drug sensitivity test.
**Result:** A total no. of 54Gram positive bacteria and 40 Gram Negative bacteria were isolated. *S. aureus* was the most common GPC isolated and *P. aeruginosa* was the most common GNB. *E. coli* was the second most GNB which showed resistance to Cephalosporins and Aminocoumarin group. 4 Candida species were isolated, to which Clotrimazole was the most susceptible antifungal agent. *Staphylococcus* sp. showed resistance to β-lactams and Macrolides group of antibiotics. *Shigella* sp. showed resistance to β-lactams. *C. albicans* was found to be the common Fungi isolated, followed by *C. krusei*.
**Conclusion:** Since the drug sensitivity pattern changes from place to place and varies from time to time. The culture sensitivity therapy should be practiced before empirical administration of antibiotics.

**Keywords:** Diabetes, drug resistance, *Candida*, oxacillin, bacteria

## 1. Introduction

The occurance of diabetes mellitus is at an alarmingly increasing rate all around the world

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and has almost become a serious health issue especially in developing countries [1]. At least one diabetic patient will be found at every door.

Urinary tract infections and diabetes share an immense relationship. Urinary tract infections are one of the most common microbial disease that has been encountered in medical practice and affects people of all ages. Urinary tract infection's prevalence has been estimated, all around the world to be 150 million persons per year. Diabetic patients has higher risk of getting an UTI than non-diabetic ones [2].

This is because diabetes mellitus is an heterogeneous group of disorders that has been characterized by variable degrees of insulin resistance, impaired insulin secretion and increase in production of urine [3]. Diabetic patients encounter urinary urgency, incontinence during night, painful urination and retention of urine in the bladder, making the urinary tract most frequent infection site.

Explanation to increased UTI in diabetic patients might be the nerve damage, caused due to high blood glucose levels, which affects the ability of the bladder to sense the presence of urine and hence allowing the urine to stay in the bladder for longer time, increasing the probability of infection. Another possible reason can be, high glucose level in urine adds to the environment for bacterial growth [2].

Besides, diabetic patients suffer various impairments in the immune system and poor metabolic control. This causes long term complications like Diabetic Neuropathy and Cystopathy [3]. In most cases microorganisms causing UTIs are multi drug resistant and are difficult to be treated. Lots and lots of money is spent each year for the treatment of such patients. But it is of no use if the antibiotics are administered empirically. Such pathogens are needed to be identified and the susceptibility is needed to be tested and then the antibiotic must be administered. Hence our aim of the study is to identify the causative organism and pattern of sensitivity to different antibiotics so that there would be specific antibiotic administered for specific organism.

## 2. Materials and Methods

An observational prospective of six month study was carried out on UTI cases in Medical Research Laboratory, IMS, Sum Hospital, Bhubaneswar. Study was carried out among out patient department, in patient department of Diabetes and Neuro science ICU. Samples included urine and high vaginal swabs. Both male and female from 20 years of age were taken into consideration for study. Samples were taken from patients suspected to have fungal infections attending the out patient department and obtained from in-house hospitalized patients, from both, who had no prior history of UTI as well as who were administered antibiotics (in order to study the multidrug resistance). This study was approved by the Institutional ethical committee vide letter no DMR/IMS/IEC-2018/011.

The necessary information was collected in the form of requisition form (that was filled up by the nurse attending the patient by following the interview). All the study subjects were advised to collect the mid-stream urine in wide-mouthed sterile containers. Samples were processed within one hour of collection. For routine microscopy loop full of centrifuged palettes were taken on a glass slide and smeared on one drop of double distilled water and the cover slip was placed and viewed first at 40X and then at 100X magnification. Presence of more no of Pus cells, hyphae, mycelium, coccus or bacillus was considered significant infection.

## 3. Bacterial isolation and identification procedures

Isolation of uropathogens was performed by surface streak procedure on both Blood Agar and Cystine lactose electrolyte deficient agar medium and vaginal swab was streaked on Blood

ISSN 2515-8260 Volume 09, Issue 02, 2022

Agar and MacConkey Agar. The plates were studied after overnight aerobic incubation at 37 degree C (BOD incubator, REMI, Mumbai, Maharashtra, India).
After incubation, the plates showing growth of colony mainly on the mother colony and streaked lines are considered as positive result. Gram's stain was employed. Atleast 10 fields were examined under 100 X with emersion oil for detection of one or more morphologically similar bacteria. In case of presence of more than one morphologically different bacteria, the cultures are streaked on nutrient agar for pure cultures.
Bacterial identification was made using biochemical tests, namely catalase, coagulase, oxidase, indole, citrate, triple sulfur iron, Methyl red, $H_2S$ production, Lactose fermentation.

**Susceptibility testing**

Antimicrobial susceptibility of isolates was tested for all 18 bacterial and fungal pathogens by disc diffusion method. The plates that showed growth of another colony within the inhibition zone were again isolated and identified and antimicrobial susceptibility was checked. The antibiotic discs and their concentrations were: Amikacin (AK, 30mcg), Amoxiclav (AMC, 30mcg), Azithromycin (AZM, 15mcg), Cefoperazone (CPZ, 75mcg), Cefotaxime (CTX, 30mcg), Cefuroxime (CXM, 30mcg), chloramphenicol (C, 30mcg), Ciprofloxacin (CIP, 5mcg), Clarithromycin (CLR, 15mcg), Colistin (CL, 10mcg), CoTrimoxazole (COT, 25mcg), Gentamycin (GEN, 10mcg), Levofloxacin (LE, 5mcg), Linezolid (Lz, 30mcg), moxifloxacin (MO, 5mcg), Nalidixic acid (Na, 30mcg), Norfloxacin (Nx, 10mcg), Ofloxacin (Of, 5mcg), Oxacillin (OX, 1mcg), Penicillin-G (P, 10units), Novobiocin (NV, 5mcg), Tetracycline (Te, 30mcg), Tigecycline (TGC, 15mcg). All the antimicrobials used for study were obtained from Himedia. A standard inoculum was made by inoculation single colony in 2ml nutrient broth, after 3hrs of incubation, spreaded on Muller-Hinton agar (Himedia); antibiotic discs were dispensed after drying the plate for 3-5 minutes and incubated at 37 degree C overnight. Antifungal susceptibility was also tested. The antifungal discs and there concentrations were- Clotrimazole (CC, 10 mcg), Miconazole (MIC, 30 mcg), Ketoconazole (KT, 10 mcg), Itraconazole (IT 10 mcg), Nystatin (NS 50 mg), Fluconazole (FLC 10 mcg), Amphotericin-B (AP 20 mcg). All the antimicrobials used for study were obtained from Himedia. A standard inoculum was made by inoculation single colony in 2ml nutrient broth, after 3hrs of incubation, spreaded on Muller-Hinton agar (Himedia); antibiotic discs were dispensed after drying the plate for 3-5 minutes and incubated at 37 degree C overnight.

**4. Results**

A total of 153 samples were received, out of which 137 were urine and 16 were high vaginal swabs. Among which 57.51% showed growth and 42.48% did not show any growth. Out of all 153 samples 56.86%were female patients and 43.13% were male patients. (Table 3)
The samples received from patient's aged-21 to 88 years. Culture positivity was seen mostly from age 21-70, but higher culture rate was seen in 51-70 (53.33%). (Table 2)
47.71% samples were from IPD, 35.94% were from NSICU and 16.33% were from OPD.15.90% showed multiple infection i.e., more than one organism were found. (Table 5)
Total of 18 isolates were found including Bacteria and Fungus. (Table 4). They are: *Citrobacter* sp. (fig1a), CONS (fig 1k), *Escherichia coli* (fig 1b), *Enterobacter aerogenes* (fig1c), *Enterococcus* (fig1d), GPB (fig1l), *Klebsiella pneumonia* (fig1e), *Pseudomonas aeruginosa* (fig1m), *Staphylococcus aureus* (fig1f), *Serratia marcescens* (fig1g), *Staphylococcus* sp. (fig1h), *Shigella sonnei*, *Shigella* sp. (fig1i), *Streptococcus* sp. (fig1j), *Candida albicans* (fig2b), *Candida glabrata* (fig2c), *Candida krusei* (fig3a), *Candida tropicalis* (fig2d).
Patients suffering from different diseases were taken into concern. Patients suffering from

ISSN 2515-8260 Volume 09, Issue 02, 2022

Diabetes were more in no. 68.63% (48.57% male patients and 51.42% female patients), followed by patients suffering from UTI 25.49% and Hypertension (22.87%). (Table 1)
The resistance rates for the antibacterials studied are summarized as: *Enterococcus* showed 92.03% resistance to Oxacillin, 84.61% to Penicillin-G, 46.15% to Amoxyclav, 53.84% to Amikacin, 53.84% to Gentamicin, 7.69% to Chloramphenicol, 90% to Cefuroxime, 14% to Cefoperazone, 69.23% to Cefotaxime, 69.23% to Cefoxitin, 38.46% to Novobiocin, 38.46% to Vancomycin, 38.46% to Azithromycin, 80% to Nalidixic Acid, 53.84% to Ciprofloxacin, 69.23% to Ofloxacin, 53.84% to Norfloxacin. *S. aureus* showed 100% resistance to Oxacillin, 90.47% to Penicillin-G, 66.66% to Amoxyclav, 33.33% to Amikacin, 9.52% to Gentamicin, 9.52% to Chloramphenicol, 75% to Cefuroxime, 14.28% to Cefoperazone, 61.90% to Cefotaxime, 75% to Cefoxitin, 66.66% to Novobiocin, 52.38% to Vancomycin, 42.85% to Azithromycin, 68.75% to Nalidixic Acid, 28.57% to Ciprofloxacin, 19.04% to Ofloxacin, 28.57 to Norfloxacin. GPB showed 100% resistance to Oxacillin, 75% to Penicillin-G, 100% to Amoxyclav, 0% to Amikacin, 25% to Gentamicin, 0% to Chloramphenicol, 100% to Cefuroxime, 100% to Cefoperazone, 75% to Cefotaxime, 50% to Cefoxitin, 50% to Novobiocin, 100% to Vancomycin, 100% to Azithromycin, 66.66% to Nalidixic Acid, 75% to Ciprofloxacin, 75% to Ofloxacin, 75% to Norfloxacin. CONS showed 75% resistance to Oxacillin, 100% to Penicillin-G, 25% to Amoxyclav, 25% to Amikacin, 25% to Gentamicin, 25% to Chloramphenicol, 25% to Cefuroxime, 0% to Cefotaxime, 25% to Cefoxitin, 75% to Novobiocin, 75% to Vancomycin, 50% to Azithromycin, 75% to Nalidixic Acid, 25% to Ciprofloxacin, 25% to Ofloxacin, 50% to Norfloxacin. *Staphylococcus* sp. showed 100% resistance to Oxacillin, 25% to Penicillin-G, 50% to Amoxyclav, 25% to Amikacin, 25% to Gentamicin, 0% to Chloramphenicol, 0% to Cefuroxime, 0% to Cefoperazone, 50% to Cefotaxime, 75% to Cefoxitin, 25% to Novobiocin, 50% to Vancomycin, 100% to Azithromycin, 75% to Nalidixic Acid, 50% to Ciprofloxacin, 75% to Ofloxacin, 50% to Norfloxacin. *Streptococcus* sp. showed 100% resistance to Oxacillin, 50% to Penicillin-G, 50% to Amoxyclav, 100% to Amikacin, 100% to Gentamicin, 0% to Chloramphenicol, 100% to Cefuroxime, 50% to Cefotaxime, 0% to Cefoxitin, 50% to Novobiocin, 50% to Vancomycin, 100% to Azithromycin, 100% to Nalidixic Acid, 0% to Ciprofloxacin, 0% to Ofloxacin, 0% to Norfloxacin. (Table 6), (fig3a)
*Citrobacter* sp. showed 100% resistance to Amoxyclav, 100% to Ticarcillin, 0% to Cefotaxime, 0% to Imipenem/Cilastin, 0% to Imipenem, 0% to Azithromycin, 100% to Clarithromycin, 100% to Tetracycline, 100% to Tigecycline, 0% to Norfloxacin, 0% to Ofloxacin, 0% to Levofloxacin, 100% to Moxifloxacin, 0% to Ciprofloxacin, 0% to Amikacin, 100% to Gentamicin, 100% to Co-Trimoxazole, 100% to Linezolid, 100% to Colistin. *E. aerogenes* showed 100% resistance to Ticarcillin, 100% to Cefotaxime, 100% to Imipenem/Cilastin, 100% to Azithromycin, 100% to Clarithromycin, 0% to Tetracycline, 100% to Tigecycline, 100% to Norfloxacin, 100% to Ofloxacin, 100% to Levofloxacin, 100% to Moxifloxacin, 0% to Amikacin, 100% to Gentamicin, 100% to Co-Trimoxazole, 100% to Linezolid, 0% to Colistin. *E. coli* showed 71.42% resistance to Amoxyclav, 57.14% to Ticarcillin, 100% to Imipenem/Cilastin, 100% to Imipenem, 71.42% to Azithromycin, 57.14% to Clarithromycin, 0% to Tetracycline, 42.85% to Tigecycline, 71.42% to Norfloxacin, 42.85% to Levofloxacin, 71.42% to Moxifloxacin, 28.57% to Ciprofloxacin, 42.85% to Gentamicin, 100% to Co-Trimoxazole, 42.58% to Linezolid, 42.85% to Colistin. *K. pneumoniae* showed 100% resistance to Ticarcillin, 100% to Cefotaxime, 100% to Imipenem/Cilastin, 100% to Azithromycin, 100% to Clarithromycin, 0% to Tetracycline, 100% to Tigecycline, 100% to Norfloxacin, 100% to Ofloxacin, 100% to Levofloxacin, 100% to Moxifloxacin, 100% to Amikacin, 100% to Gentamicin, 0% to Co-Trimoxazole, 0% to Linezolid, 0% to Colistin. *Pseudomonas* sp. showed 68.75% resistance to Amoxyclav, 47.05% to Ticarcillin, 100% to Cefotaxime, 76.46% to Imipenem/Cilastin, 75% to Imipenem, 58.82% to Azithromycin, 76.47% to Clarithromycin, 35.29% to Tetracycline, 58.82% to

ISSN 2515-8260 Volume 09, Issue 02, 2022

Tigecycline, 76.47% to Norfloxacin, 100% to Ofloxacin, 41.17% to Levofloxacin, 58.82% to Moxifloxacin, 43.73% to Ciprofloxacin, 47.05% to Gentamicin, 47.05% to Co-Trimoxazole, 70.58% to Linezolid, 70.58% to Colistin. *S. marcescens* showed 100% resistance to Amoxyclav, 0% to Ticarcillin, 50% to Cefotaxime, 100% to Imipenem/Cilastin, 25% to Azithromycin, 100% to Clarithromycin, 0% to Tetracycline, 100% to Tigecycline, 0% to Norfloxacin, 0% to Ofloxacin, 0% to Levofloxacin, 100% to Moxifloxacin, 0% to Ciprofloxacin, 0% to Amikacin, 0% to Gentamicin, 0% to Co-Trimoxazole, 100% to Linezolid, 25% to Colistin. *S. sonnei* showed 0% resistance to Amoxyclav, 0% to Ticarcillin, 100% to Imipenem/Cilastin, 100% to Imipenem, 0% to Azithromycin, 100% to Clarithromycin, 0% to Tetracycline, 100% to Tigecycline, 100% to Norfloxacin, 0% to Levofloxacin, 100% to Moxifloxacin, 0% to Ciprofloxacin, 0% to Gentamicin, 100% to Co-Trimoxazole, 100% to Linezolid, 100% to Colistin. *Shigella* sp. showed 100% resistance to Amoxyclav, 87.5% to Ticarcillin, 62.5% to Imipenem/Cilastin, 33.33% to Imipenem, 50% to Azithromycin, 62.5% to Clarithromycin, 25% to Tetracycline, 25% to Tigecycline, 33.33% to Norfloxacin, 50% to Ofloxacin, 37.5% to Levofloxacin, 37.5% to Moxifloxacin, 33.33% to Ciprofloxacin, 0% to Amikacin, 50% to Gentamicin, 50% to Co-Trimoxazole, 62.5% to Linezolid, 0% to Colistin. (Table 7), (fig3b)

**Antifungal screening result**

*C. albicans* showed 33.33% resistance to Clotrimazole, 50% to Miconazole, 83.33% to Ketoconazole, 66.66% to Itraconazole, 66.66% to Nystatin, 83.33% to Fluconazole, 75% to Amphotericin-B. *C. krusei* showed 50% resistance to Clotrimazole, 75% to Miconazole, 50% to Ketoconazole, 75% to Itraconazole, 56% to Nystatin, 25% to Fluconazole, 25% to Amphotericin-B. *C. glabrata* showed 0% resistance to Clotrimazole, 50% to Miconazole, 0% to Ketoconazole, 0% to Itraconazole, 0% to Nystatin, 0% to Fluconazole, 0% to Amphotericin-B. *C. tropicalis* showed 50% resistance to Clotrimazole, 60% to Miconazole, 100% to Ketoconazole, 100% to Itraconazole, 100% to Nystatin, 100% to Fluconazole, 100% to Amphotericin-B. (Table 8) (fig3c)

**Discussion**

Despite the wide spread availability of antibiotics, urinary tract infection (UTI) remains the most common bacterial infection in human population [4]. The risk of developing infection in diabetes is higher due to abnormalities in the host defence and high glucose in urine [5]. *E. coli* was the predominant isolate in significant bacteriuria. *E. coli* was followed by *Klebsiella pneumoniae*, as a common isolate in our study. Whereas CONS were the majority isolates [5]. *E. coli* were the predominant 10 (31.25%) isolates causing UTI, followed by *Staphylococcus aureus*-8 (25%), *Pseudomonas aeruginosa*-5 (15.62%), *Proteus mirabilis*-5 (15.62%), *Klebsiellapneumoniae*-2 (6.25%) and *Serratiamarcescens*-2 (6.25%) [6]. *E. coli* was chief isolate accounting 56.7% followed by *K. pneumoniae* as 21.62% and others among total isolates in diabetics [7]. The isolation rate of *E. coli* from urine culture was higher (64.6 per cent) among diabetic patients followed by *Klebsiella pneumoniae* (12.1 per cent) and *Enterococcus* (9.9%) [8]). The bacteria isolates were; Coagulase negative Staphylococci (CNS) (37.5%), *E. coli* (24%), *Klebsiella pneumoniae* (12.5%), *Staphylococcus aureus* (15%) and *Streptococcus* sp. (10%) (Joseph Aje *et al*.). Escherichia coli was the predominant uropathogens followed by *Klebsiella pneumoniae* and they were to gether involved in 76.2% of UTI cases [2] Escherichia coli was the most common isolated bacterial uropathogen followed by *Enterococcus faecalis, Staphylococcus saprophyticus* and *Pseudomonas aeruginosa* [9]. *E. coli* is the most common organism. Organism responsible for the hospital acquired infection may have tendency to develop multiple drug resistance [10]. The six overall

ISSN 2515-8260 Volume 09, Issue 02, 2022

most common isolates were: *Escherichia coli*, accounting for 47% of isolates in both hospitals, followed by *Candida* spp. (10.8%), *Klebsiella pneumoniae* (9.6%), *Streptococcus agalactiae* (GBS; 9.5%), *Enterococcus faecalis* (4.2%) and *Pseudomonas aeruginosa* (4.1%) [11]. The most common bacterial isolate was found to be *E. coli* (45.7%, 1103/2412), which was followed by Coagulase-negative Staphylococci (18.6%, 449/2412) and Klebsiella species (8.3%, 199/2412) [12]. The most common organism isolated was *Klebsiella pneumonia* at 42.4%. Gram-negative bacilli made up about 23 (69.7%) of the isolates [13]. Commonly recovered UTI isolates were *E. coli*, *K. pneumoniae*, *Pseudomonas* sp. and *S. aureus* [14]. *E. coli* was the commonest isolated uropathogen followed by coagulase-negative *Staphylococci* [1].

In this study 61.43% of samples showed growth. Among which 45.28% were gram positive, 38.67% was gram negative, 18.86% was found to be *candida* and 6.6% was found to be GPB. *Staphylococcus* and *Enterococcus* was found to be predominant and showing resistance mostly to beta lactams and cephalosporins group of antibiotics. Among gram negative bacteria, *Pseudomonas* sp. and *Shigella* sp. were predominant and showed resistance to carbapenems, macrolides and oxazolidinones group of antibiotics. *C. albicans* was predominant which was resistance to Ketoconazole and Amphotericin-B.

## 5. Conclusion

UTIs are prevalent among diabetic patients due to their weak immune system and excess sugar in urine. Ignorance of risk factors and empirical use of drug leads to antibiotic resistance. The susceptibility patterns as seen in this study tend to suggest that it is absolutely necessary to obtain sensitivity reports before initiation of antibiotic therapy in cases of suspected urinary tract infection (UTI). This paper opines that the ultimate decision to use a particular antimicrobial against UTIs depends on culture susceptibility otherwise it became toxic/resistant. Hence, the empirical therapy should be eliminated and drugs should be administered only after Antibiotic Sensitivity Test.

**Table 1:** Clinical characteristics

| Sl. No. | Name of Diseases | No of Male Patients | No of Female Patients | Organism |
|---|---|---|---|---|
| 1. | T2DM | 51 | 54 | 57 |
| 2. | UTI | 12 | 27 | 29 |
| 3. | HTN | 24 | 11 | 18 |
| 4. | CKD | 2 | 2 | 2 |
| 5. | CVA | 3 | 3 | 3 |
| 6. | ICH | 4 | 2 | 2 |
| 7. | Left RTI | 2 | 3 | 3 |
| 8. | Acute Abdomen Evaluation | 0 | 1 | 0 |
| 9. | AKI | 2 | 1 | 2 |
| 10. | Anemic | 0 | 2 | 1 |
| 11. | Antepartum | 0 | 1 | 0 |
| 12. | Brain Stream Injury | 2 | 0 | 1 |
| 13. | Cholecystitis | 0 | 1 | 0 |
| 14. | Cryoglobulinemia colitis | 0 | 1 | 1 |
| 15. | RT Hemiplegia | 0 | 1 | 0 |
| 16. | DIEA | 1 | 0 | 1 |
| 17. | GI and Vaginitis and Pregnancy | 0 | 1 | 1 |
| 18. | MND | 3 | 0 | 1 |
| 19. | IUH | 1 | 0 | 1 |
| 20. | Mass Effect | 1 | 0 | 0 |
| 21. | Midline Shift | 0 | 1 | 1 |

ISSN 2515-8260 Volume 09, Issue 02, 2022

| | | | | |
|---|---|---|---|---|
| 22. | Intraventricular Bleed | 1 | 0 | 1 |
| 23. | Respiratory distress | 2 | 0 | 1 |
| 24. | RTA and head injury | 2 | 0 | 0 |
| 25. | Ruptured septic pregnancy | 0 | 1 | 0 |
| 26. | SAH | 1 | 0 | 1 |
| 27. | Sepsis and Hyponatremia | 0 | 2 | 1 |
| 28. | COPI | 1 | 1 | 1 |
| 29. | GER2 | 0 | 1 | 1 |
| 30. | ARTS | 1 | 2 | 3 |
| 31. | Hypoglycemia | 2 | 0 | 1 |
| 32. | Ischemic Encephalopathy | 2 | 0 | 1 |
| 33. | Polymyositis | 0 | 1 | 1 |
| 34. | VA Ischemic | 0 | 1 | 0 |
| | Total | 120 | 121 | |

Samples were received from NSICU, general IPD and OPD. Hence, patients suffering from different diseases were included, among which 68.62% were Diabetic, which included 48.57% male patients and 51.42% female patients. 25.49% of patients suffered from UTI among which 30.76%were male patients and 69.23% were female patients. 22.87% of patients suffered from Hypertension among which 68.57% were male patients and 31.42% were female patients. Most of the patients suffered from Diabetes and Urinary Tract Infection and Hypertension. Hence, UTI found to be more common and frequent among Diabetic patients. Female patients suffered more, their anatomy must be the reason.

**Table 2:** Age and sex distribution of patients that showed maximum growth

| Sl. No. | Age Group | No of Male Patients | No of Female Patients | Organism |
|---|---|---|---|---|
| 1. | 21-30 | 4 (21.O5%) | 15(78.94%) | 12 |
| 2. | 31-40 | 8 (32%) | 17(68%) | 19 |
| 3. | 41-50 | 13 (46.42%) | 15(53.57%) | 16 |
| 4. | 51-60 | 19 (42.22%) | 26(57.77%) | 24 |
| 5. | 61-70 | 13 (52%) | 12 (48%) | 11 |
| 6. | 71-80 | 5 (71.42%) | 2(28.57%) | 4 |
| 7. | 81-90 | 4 (100%) | 0 | 2 |
| | TOTAL | 66 | 87 | 116 |

Patients from age 21-90 years were taken under consideration, including male and female patients. It was observed that patients of 50-60 years of age showed more growth, followed by patients aged 31-40 years and 41-50 years aged people. Patients aged 81-90 years showed least growth. Hence, patients between 31-60 years suffered more from infection.

**Table 3:** Total no of clinical samples cultured for the study

| Sl. No. | Sample Type | No. of Sample | Sample Showed Growth | Sample Showed No Growth |
|---|---|---|---|---|
| 1 | URINE | 137 (89.54%) | 74(54.01%) | 63 (45.98%) |
| 2 | H.V.SWAB | 16(10.45%) | 14(87.5%) | 2(12.5%) |
| | TOTAL | 153 | 88(57.51%) | 65(42.48%) |

The samples received included Urine and High Vaginal Swabs.89.54% of samples were Urine and 10.45% were High Vaginal Swabs. Among 89.54% of urine samples, 54.01% showed growth and 45.98% sowed no growth. Among 10.45% of High Vaginal Swabs, 87.5% showed growth and 12.5% showed no growth.

**Table 4:** Organism isolated from Urine and High vaginal swab culture

| Sl. No. | Types of Organisms | Frequency | % |
|---|---|---|---|
| 1. | *Candida albicans* | 12 | 10.34 |
| 2. | *Candida glabrata* | 2 | 1.72 |
| 3. | *Candida krusei* | 4 | 3.44 |
| 4. | *Candida tropicalis* | 2 | 1.72 |
| 5. | *Citrobacter* sp. | 1 | 0.86 |
| 6. | CONS | 4 | 3.44 |
| 7. | *Escherichia coli* | 8 | 6.86 |
| 8. | *Enterobacter aerogenes* | 1 | 0.86 |
| 9. | *Enterococcus* | 13 | 11.2 |
| 10. | GPB | 7 | 6.03 |
| 11. | *Klebsiella pneumoniae* | 1 | 0.86 |
| 12. | *Pseudomonas* sp. | 17 | 14.65 |
| 13. | *Staphylococcus aureus* | 25 | 21.11 |
| 14. | *Serratia marcescens* | 3 | 2.58 |
| 15. | *Staphylococcus* sp. | 5 | 4.31 |
| 16. | *Shigella sonnei* | 1 | 0.86 |
| 17. | *Shigella* sp. | 9 | 7.75 |
| 18. | *Streptococcus* sp. | 1 | 0.86 |
| | Total | 116 | |

From all the samples 18 different types of organisms were identified. Both Bacteria and Fungus were obtained. *S. aureus* was more common, followed by *Pseudomonas* sp., *C. albicans* and *Enterococcus*.

**Table 5:** Occurrence of colony from single culture

| Sl. No. | No of Colony | Frequency | % |
|---|---|---|---|
| 1. | No growth | 65 | 41.13 |
| 2. | Single colony | 78 | 49.36 |
| 3. | Double colony | 11 | 6.96 |
| 4. | Triple colony | 3 | 1.89 |
| 5. | More than 3 colonies | 1 | 0.63 |
| | Total | 158 | |

After processing all the samples 41.13% samples showed no growth. Among samples that showed growth, 49.36% single colonies were obtained, 6.96% two different colonies were obtained, 1.89% three different colonies were obtained, 0.63% more than three colonies were obtained. More than one colony from single sample.

**Table 6:** Antibiotic resistance pattern for Gram positive bacteria

| For GPC | | β-LACTAM Antibiotics | | | Cephalosporins | | 3rd Generation Cephalosporins | | Glycopeptides | Macrolids | Quinolones & Fluoroquinolones | | | | Aminoglycosides | | Chloramphenicol | Aminocoumarin |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Organism** | **OX 1** | **P 10** | **AMC 30** | **CXM 30** | **CPZ 75** | **CTX 30** | **CX 30** | **VA 30** | **AZM 15** | **NA 30** | **CIP 5** | **OF 5** | **NX 10** | **AK 30** | **GEN 10** | **C 30** | **NV 5** |
| 1 | CONS | 75% | 100% | 25% | 25% | ND | 0% | 25% | 75% | 50% | 75% | 25% | 25% | 50% | 25% | 25% | 25% | 75% |
| 2 | Enterococcus | 92.03% | 84.61% | 46.15% | 90% | 14% | 69.23% | 9.23% | 38.46% | 38.46% | 80% | 53.84% | 69.23% | 3.84% | 53.84% | 53.84% | 7.69% | 38.46% |
| 3 | GPB | 100% | 75% | 100% | 100% | 100% | 75% | 50% | 100% | 100% | 66.66% | 75% | 75% | 75% | 0% | 25% | 0% | 50% |
| 4 | Staphylococcus aureus | 100% | 90.47% | 66.66% | 75% | 14.28% | 61.90% | 75% | 52.38% | 42.85% | 68.75% | 28.57% | 19.04% | 28.57 | 33.33% | 9.52% | 9.52% | 66.66% |
| 5 | Staphylococcus sp. | 100% | 25% | 50% | 0% | 0% | 50% | 75% | 50% | 100% | 75% | 50% | 75% | 50% | 25% | 25% | 0% | 25% |
| 6 | Streptococcus sp. | 100% | 50% | 50% | 100% | ND | 50% | 0% | 50% | 100% | 100% | 0% | 0% | 0% | 100% | 100% | 0% | 50% |

**Note:** OX (Oxacillin), P (Penicillin G), AMC (Amoxyclav), CXM (Cefuroxime), CX (Cefoxitin), AZM (Azithromycin), NA (Nalidixic acid), CIP (Ciprofloxacin), OF (Ofloxacin), NX (Norfloxacin), AK (Amikacin), GEN(Gentamicin), VA (Vancomycin), C (Chloramphenicol), ND (Not done). NV (Novobiocin)

**Table 7:** Antibiotic resistance pattern for Gram negative bacteria

| | For GNB | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Organism** | **β-Lactam Antibiotics** | | **3rd Cephalosporins** | **Carbapenems** | | **Macrolids** | | **Tetracyclines** | | **Quinolones & Fluoroquinolones** | | | | | **Aminoglycosides** | | **Sulfonamides** | **Oxazolidinones** | **Polymyxins** |
| | | AMC 16 | TI 75 | CTX | IC 10/10 | IPM 10 | AZM 15 | CLR 15 | TE 30 | TGC 15 | NX 10 | OF 5 | LE 5 | MO 5 | CIP 1 | AK 30 | GEN 10 | COT 25 | LZ 30 | CL 10 |
| 1 | *Citrobacter* sp. | 100% | 100% | 0% | 0% | 0% | 0% | 100% | 100% | 100% | 0% | 0% | 0% | 100% | 0% | 0% | 100% | 100% | 100% | 100% |
| 2 | *E. coli* | 71.42% | 57.14% | ND | 100% | 100% | 71.42% | 57.14% | 0% | 42.85% | 71.42% | ND | 42.85% | 71.42% | 28.57% | ND | 42.85% | 100% | 42.58% | 42.85% |
| 3 | *E., aerogenes* | ND | 100% | 100% | 100% | ND | 100% | 100% | 0% | 100% | 100% | 100% | 100% | 100% | ND | 0% | 100% | 100% | 100% | 0% |
| 4 | *K. pneumoniae* | ND | 100% | 100% | 100% | ND | 100% | 100% | 0% | 100% | 100% | 100% | 100% | 100% | ND | 100% | 100% | 0% | 0% | 0% |
| 5 | *Pseudomonas* sp. | 68.75% | 47.05% | 100% | 76.46% | 75% | 58.82% | 76.47% | 35.29% | 58.82% | 76.47% | 100% | 41.17% | 58.82% | 43.73% | ND | 47.05% | 47.05 | 70.58% | 70.58% |
| 6 | *S. marcescens* | 100% | 0% | 50% | 100% | ND | 25% | 100% | 0% | 100% | 0% | 0% | 0% | 100% | 0% | 0% | 0% | 0% | 100% | 25% |
| 7 | *S. sonnei* | 0% | 0% | ND | 100% | 100% | 0% | 100% | 0% | 100% | 100% | ND | 0% | 100% | 0% | ND | , 0% | 100% | 100% | 100% |
| 8 | *Shigella* sp. | 100% | 87.50% | ND | 62.50% | 33.33% | 50% | 62.50% | 25% | 25% | 33.33% | 50% | 37.50% | 37.50% | 33.33% | 0% | 50% | 50% | 62.50% | 0% |

**Note:** AMC (Amoxyclav), TI (Ticarcillin), AZM (Azithromycin), CLR (Clarithromycin), IC (Imipenem/Cilastin), CTX (Cefotaxime), NX (Norfloxacin), OF (Ofloxacin), LE (Levofloxacin), TE (Tetracycline), TGC (Tigecycline), AK (Amikacin), GEN(Gentamicin), COT (Co-trimoxazole), LZ (Linezolid), CL (Colistin), ND (Not done).

ISSN 2515-8260 Volume 09, Issue 02, 2022

Most of the organisms showed resistance to Oxacillin, Azithromycin and Cefuroxime. And drugs that were sensitive are, Chloramphenicol among all the GNB obtained most were resistance to Imipenem/Cilastin, Clarithromycin, Tigecycline, Moxifloxacin, Co-trimoxazole, Linezolid and sensitive to Tetracycline, Ciprofloxacin.

**Table 8:** Anti-fungal resistance pattern for *Candida* sp.

| | | CC 10 | MIC 30 | KT 10 | IT 10 | NS 50 | FLC 10 | AP 20 |
|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Organism** | | | | | | | |
| 1. | *Candida albicans* | 33.33% | 50% | 83.33% | 66.66% | 66.66% | 83.33% | 75% |
| 2. | *Candida glabrata* | 0% | 50% | 0% | 0% | 0% | 0% | 0% |
| 3. | *Candida krusei* | 50% | 75% | 50% | 75% | 56% | 25% | 25% |
| 4. | *Candida tropicalis* | 50% | 60% | 100% | 100% | 100% | 100% | 100% |

Most of them were mostly resistance to Ketoconazole, Miconazole, Itraconazole and sensitive to Clotrimazole.


**Fig 1a:** *Citrobacter* species on Nutrient Agar Plate


**Fig 1b:** *E. coli* on Nutrient Agar Plate

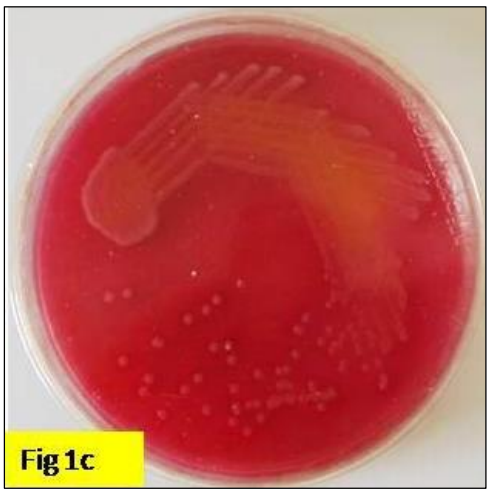


**Fig 1c:** *Enterobacter* species on MacConkey agar plate


**Fig 1d:** *Enterococci*

ISSN 2515-8260 Volume 09, Issue 02, 2022


**Fig 1e:** *Klebsiella pneumoniae* on Blood Agar plate

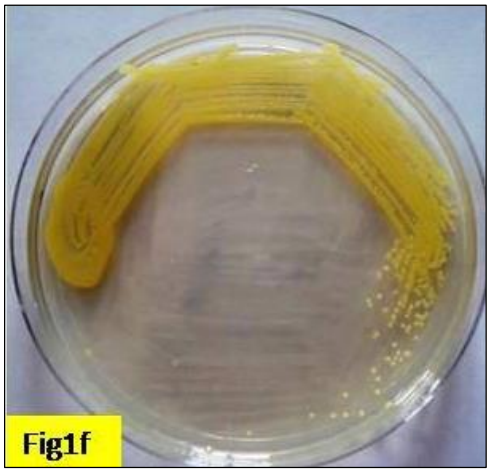


**Fig 1f:** *Staphylococcus aureus* on Nutrient Agar Plate

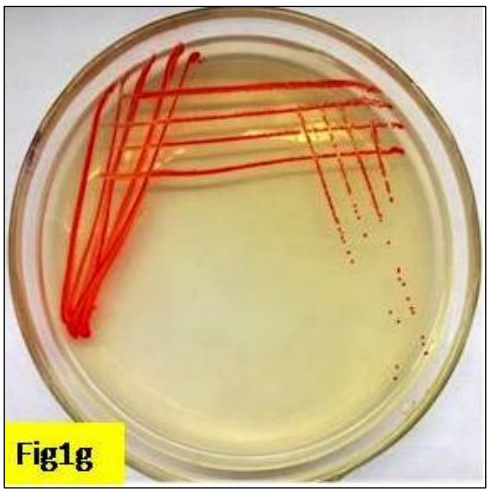


**Fig 1g:** *Serratia marcescens* on Nutrient Agar Plate

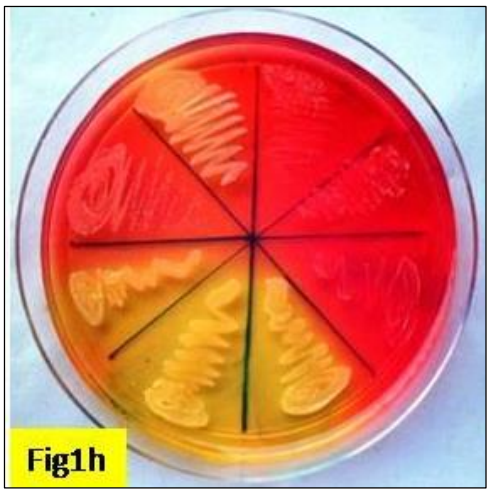


**Fig 1h:** *Staphylococcus* species on mannitol salt agar


**Fig 1i:** *Shigella* species on Blood Agar plate


**Fig 1j:** *Streptococcus* species on Blood Agar plate

ISSN 2515-8260 Volume 09, Issue 02, 2022


**Fig 1k:** CONS on Nutrient Agar Plate


**Fig 1l:** Gram Positive Bacillus on Nutrient Agar Plate

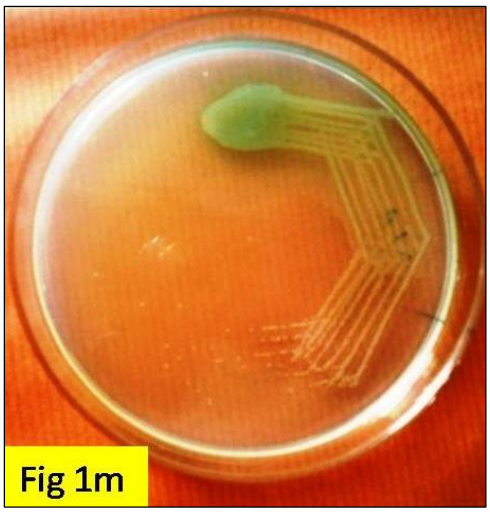


**Fig 1m:** *Pseudomonas aeruginosa* on Nutrient Agar Plate


**Fig 2a:** *Candida* krusei on Candida Differential Agar plate


**Fig 2b:** *Candida* albicans on Candida Differential Agar plate

ISSN 2515-8260 Volume 09, Issue 02, 2022


**Fig 2c:** *Candida* glabrata on Candida Differential Agar plate


**Fig 2d:** *Candida* tropicalis on Candida Differential Agar plate


**Fig 2e:** *Candida* sp. on Candida Differential Agar plate

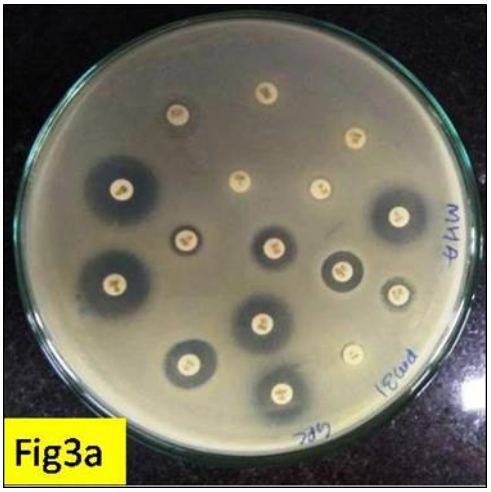


**Fig 3a:** Antibiotic Sensitivity Test for Gram Positive Cocci on Muller-Hinton Agar

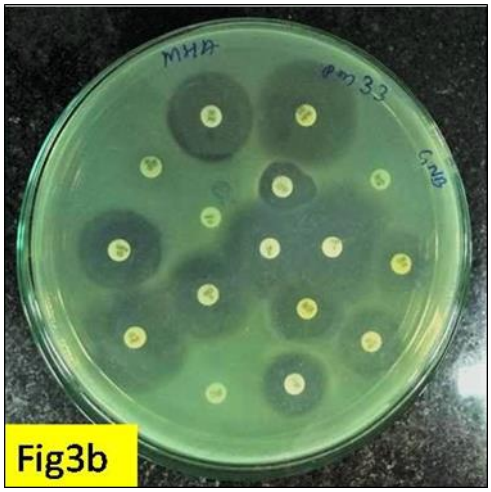


**Fig 3b:** Antibiotic Sensitivity Test for Gram Negative Bacilli on Muller-Hinton Agar

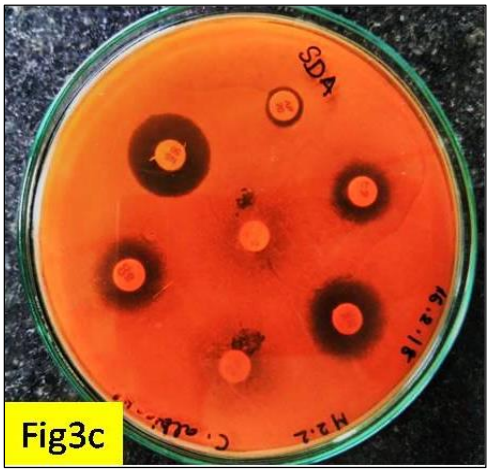


**Fig 3c:** Anti-fungal screening of Candida on Sabouraud Dextrose Agar plate

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