e-ISSN: 0975-1556, p-ISSN:2820-2643

Available Online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(10); 1434-1439

Original Research Article

Bacteriological Profile of the Patients of Diabetes Mellitus

Md. Razique Anwar[1], Sheelu Shafiq[2], Kamlesh Chandra[3]

[1]Senior Resident, Department of ENT, Anugrah Narayan Magadh Medical College and Hospital, Gaya, Bihar, India

[2]Professor, Department of Endocrinology, J.N. Medical College, AMU Aligarh, Uttar Pradesh, India

[3]Professor & Chairman, Department of Otorhinolaryngology, J.N. Medical College, AMU, Aligarh, Uttar Pradesh, India

Received: 17-08-2023 / Revised: 20-09-2023 / Accepted: 15-10-2023

Corresponding Author: Md. Razique Anwar

Conflict of interest: Nil

Abstract

Introduction: Diabetes mellitus is a common metabolic condition characterised by chronic hyperglycemia and disruptions in the metabolism of proteins, lipids, and carbohydrates. The three most common bacteria found in bacterial isolates from patients with ear discharge were S. aureus, Proteus spp., and P. aeruginosa.

Method: From 2017 to 2019, this research was conducted at the Rajiv Gandhi Centre of Diabetes and Endocrinology and the Department of Otorhinolaryngology at the Jawaharlal Nehru Medical College and Hospital, AMU, Aligarh.

Result: The majority of diabetic patients with ear discharge tested positive for staphylococcus aureus (37%) and pseudomonas species (30%), while some also tested positive for proteus mirabilis (15%), E. coli (11%), and klebsiella species (4%). Statistics showed that this was significant ($p < 0.05$).

Conclusion: Gram-negative bacteria predominated among the recruited patients, according to the results of our investigation. The most frequent bacteria found in ear discharge pus cultures were staphylococcus aureus and pseudomonas species.

Keywords: Diabetes mellitus, bacterial isolation, ear discharge, Pus swabs

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Diabetes mellitus is a common metabolic condition characterised by persistent hyperglycemia and irregularities in the metabolism of carbohydrates, lipids, and proteins. Reduced insulin secretion, decreased glucose uptake, and increased glucose production are the causes of T2DM, which leads to hyperglycemia.(2015) Powers [1]

A deficiency in insulin secretion, action, or both, is used to define it. According to the International Diabetes Federation (IDF), there are currently 415 million T2DM patients worldwide between the ages of 20 and 79, with a global prevalence of 8.8%. It is predicted that by 2040, this number will increase to 642 million, with a prevalence of 10.4% Ogurtso(va et al, 2017). [2]. In terms of gender distribution, men are somewhat more likely to have T2DM (215.2 million) than women are (199.5 million), a difference that will remain in 2040 (328.4 million versus 313.3 million). In terms of the environment, the most of them reside in urban In a survey undertaken by Zheng et al. in 2017 [3] to determine the global aetiology and epidemiology of type 2 diabetes mellitus and its consequences, they found that diabetes mellitus has quadrupled in prevalence over the previous three decades and is the ninth leading cause of death.

The three most common bacterial isolates from ear discharge patients were S. aureus, Proteus spp., and P. aeruginosa. The profile and prominent bacteria that were isolated emphasise the need for ongoing monitoring and reporting of the microbiology of ear infections in our local community so that doctors can employ the proper antimicrobials to treat the implicated aetiologies. High levels of antibiotic resistance were found in the bacteria that were isolated from ear discharge. The majority of the identified bacteria exhibited significant resistance, especially to widely used antibiotics as ampicillin, amoxicillin, amoxicillin/clavulanic acid, and trimethoprim-sulfamethoxazole. All of the bacterial isolates are susceptible to gentamicin, amikacin, and ciprofloxacin. In general, the findings of this study showed that the management of patients with middle ear infections is becoming severely complicated by the alarming rise in antibiotic-resistant bacteria found in patients with ear infections. One can advise swabbing the ear first and waiting for the results because antibiotic resistance is rising [4].

Public health risks associated with ear infections include frequent antibiotic prescriptions, hearing loss, severe disability, and even death. The study area has, however, a dearth of documented data. Determining the bacterial etiologic agents and their antibiotic susceptibility patterns among patients of all age groups sent to Bahir Dar Regional Health Research Laboratory Centre was the goal of this investigation. For analysis, retrospective information on culture and the antimicrobial susceptibility profile was retrieved.

Pus swabs from discharge-producing ears were taken, processed, and tested for sensitivity to aerobic bacteria. 296 (80.4%) of the 368 pus swab samples evaluated in total tested positive for cultures. 7 (2.4%) were yeast cells while 289 (97.6%) were bacteria. Males were more likely than females to have an ear infection (92.7%) (P = 0.014). Under the age of 21, ear infections occurred 65.2% of the time. Pseudomonas aeruginosa (29.7% of the isolates) outnumbered Staphylococcus aureus (26.3%) and Proteus spp. (21.9%). Amoxicillin/clavulanic acid, ampicillin, and penicillin all had high antimicrobial resistance rates, although ciprofloxacin, ceftriaxone, chloramphenicol, cotrimoxazole, gentamicin, and amikacin were found to be effective against isolated bacteria. A significant public health issue in the research area is ampicillin and amoxicillin/clavulanic acid- and ampicillin-resistant aerobic bacterial otitis media. Additionally, a high incidence of oxacillin-resistant S. aureus points to the spread of methicillin-resistant S. aureus in the neighbourhood. Antibiotic susceptibility testing of isolates must thus be used to direct the treatment of otitis media in the research area [5].

The ear is a crucial sensory organ. It is important to remember that ear infections are a widespread issue. Ear discharge is one of the most typical symptoms of ear infection, which is an ear inflammation. Worldwide, ear infections affect 65–330 million people, and 60% of them have severe hearing loss. In the tropics, the discharging ear is a common issue.

Although it occurs in people of all ages, it is more common in babies and young children. The pharynx is growing and developing, which accounts for its declining occurrence throughout and after the adolescent stage. But it continues to be one of the main issues that individuals who visit ENT clinics (department) face.

In cases of otitis externa or otitis media, the middle ear cavity may be the source of ear discharge. One of the most prevalent childhood chronic disorders is chronic suppurative otitis media (CSOM). In India, it is one of the main causes of deafness. Children and adults alike frequently experience ear infections, but the severity varies by country. Because of their shorter, more horizontal, and more flaccid Eustachian tubes, which can readily hinder their opening, children frequently experience ear infections, especially those who come from low socioeconomic backgrounds. Poor hygienic conditions and inadequate antimicrobial therapy are linked to the development of CSOM. Pseudomonas, Staphylococcus, Proteus spp., and Klebsiella are the most prevalent bacteria connected to CSOM, according to the majority of investigations on the microbiology of CSOM. Other research revealed Staphylococcus aureus to be the most prevalent bacterium, particularly in cases when cholesteatoma was present. The pattern of bacterial antibiotic sensitivity and dominance changes throughout time. Therefore, understanding the local pattern of infection is crucial for effective therapy of this illness. Most specialists would start with a wide-spectrum antibiotic on an empiric basis and request cultures if drug resistance is suspected because topical antibiotic treatment is frequently successful and rarely dangerous. (2014) Raakhee T* and Sreenivasa Rao Unguturu [6]

Materials and Methods:

Study Area:

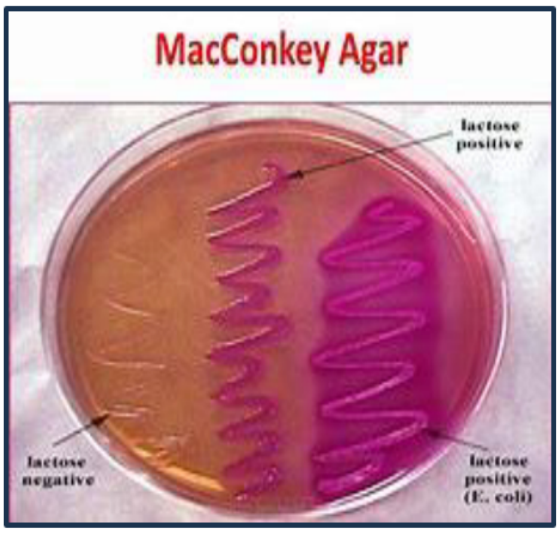
From 2017 to 2019, this research was conducted at the Rajiv Gandhi Centre of Diabetes and Endocrinology and the Department of Otorhinolaryngology at the Jawaharlal Nehru Medical College and Hospital, AMU, Aligarh.

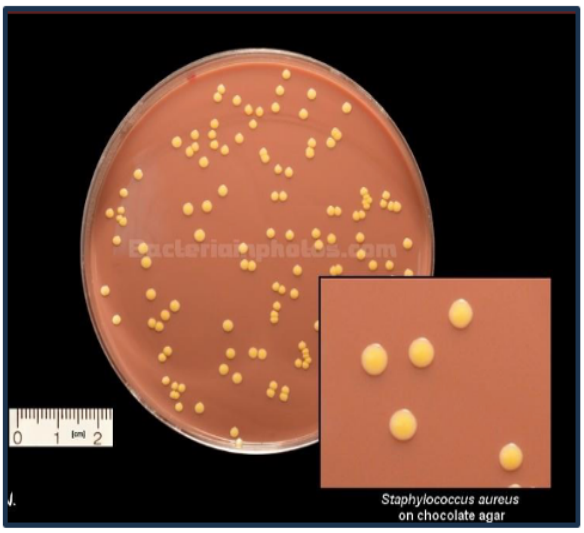
Study Population:

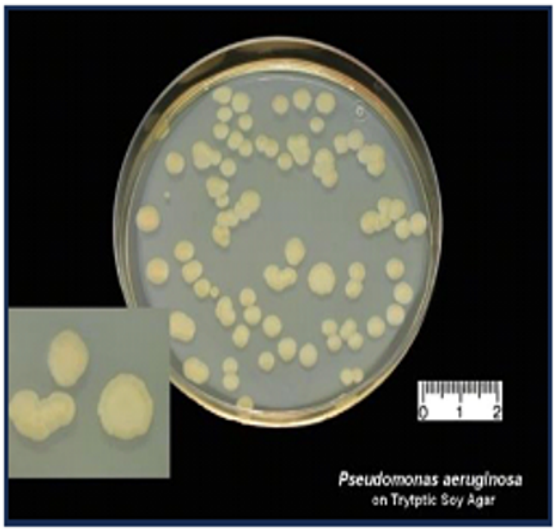
This study included both indoor patients admitted to the otorhinolaryngology and endocrinology wards at Jawaharlal Nehru Medical College and Hospital, AMU, as well as patients who visited the outpatient departments (OPDs) of these specialties.

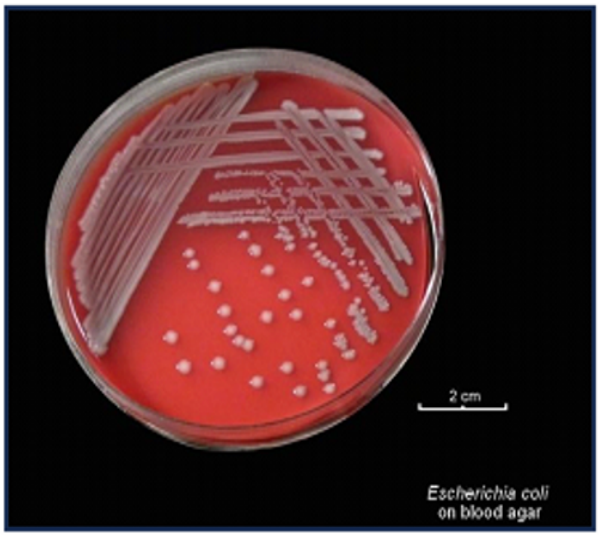
Collection of Specimen:

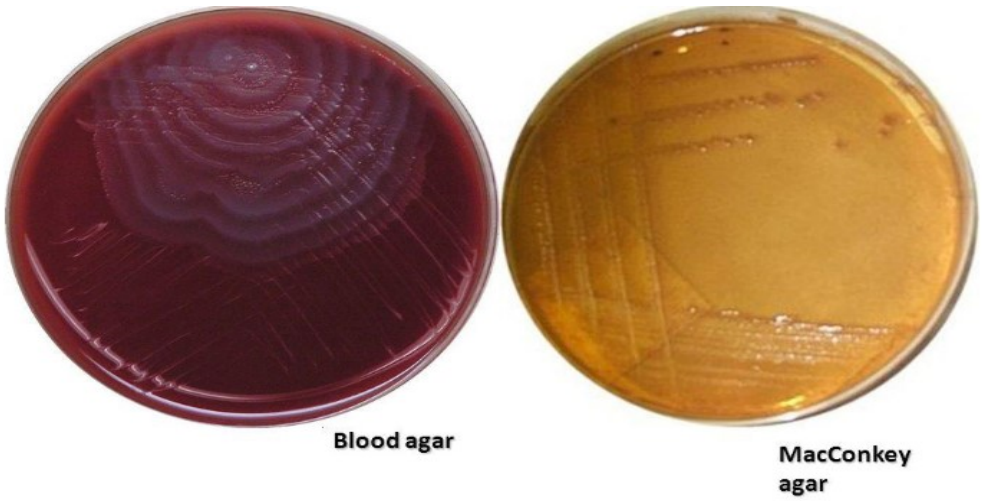
By placing a sterile specimen stick deep inside the canal, swab samples were obtained from the discharging ears. When being transferred to the microbiology test lab, the obtained samples were placed within airtight plastic tubing. Prior to clearing the ear canals of excess, purulent exudates with suction or cleaning, samples were always obtained. Separate samples were taken from ears that discharged from both sides. The swabs were injected into MacConkey agar plates and allowed to grow for 48 hours. Following 24 and 48 hours, the agar plates were inspected. The 48-hour growth-free plates were noted as negative cultures. Using morphological, cultural, and biochemical traits, it was possible to identify bacteria that were growing using conventional methods. With the help of the traditional disc diffusion technique, antimicrobial sensitivities were tested.











Proteus mirabilis

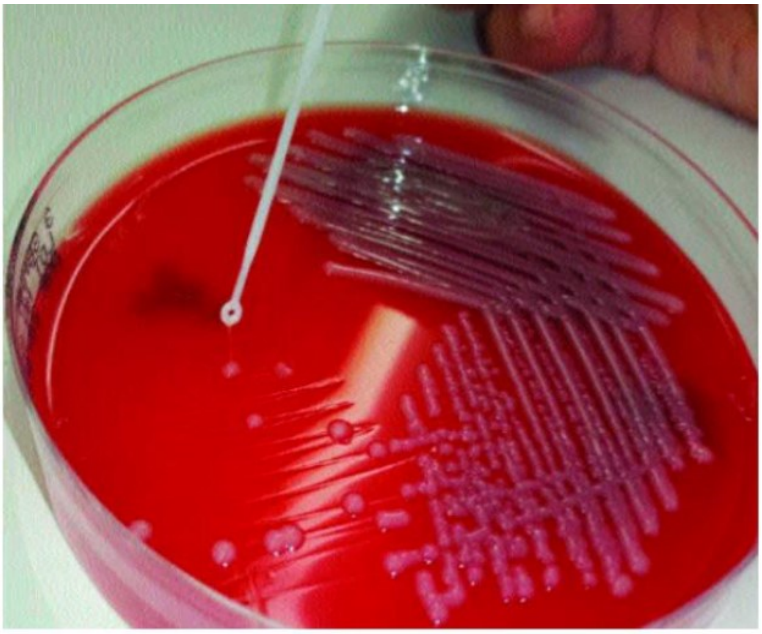


Figure: Klebsiella Pneumoniae on blood agar Plate showing shiny, mucoid, cream

Results

The following study was conducted in the endocrinology and otology departments of the JNMCH, AMU, Aligarh beginning in JULY 2017. The trial included a total of 100 patients.

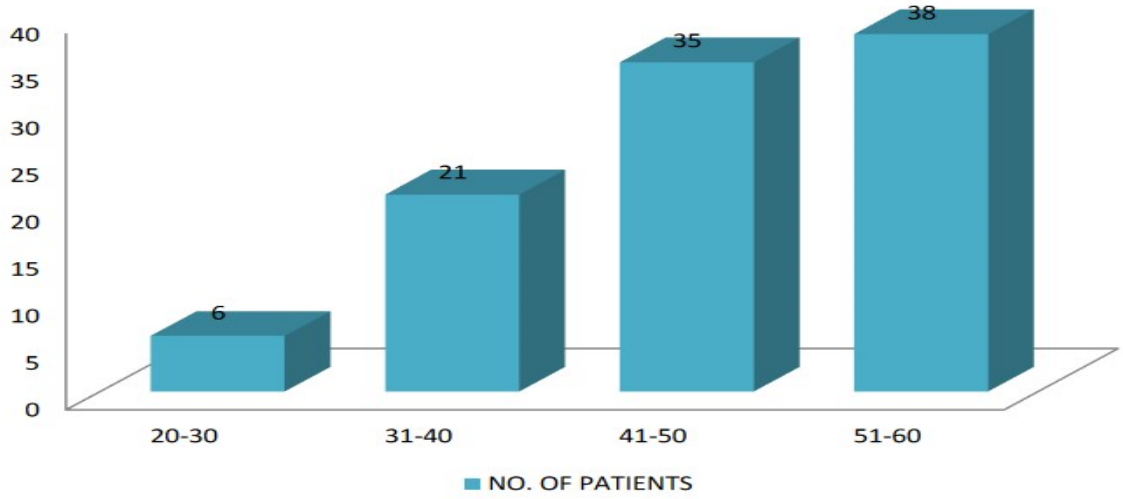


Figure 1: Age wise distribution

According to the chart above, out of 100 diabetic ear patients included in the study, the youngest patient was 20 years old and the oldest patient was 60 years old. The age groups with the highest percentage of patients were 51–60 years (38%) and 41–50 years (35%) respectively. The age groups with the lowest percentage of patients were 20–30 years (6%), but this difference was statistically significant (p0.05).

Table 1: Sex wise distribution

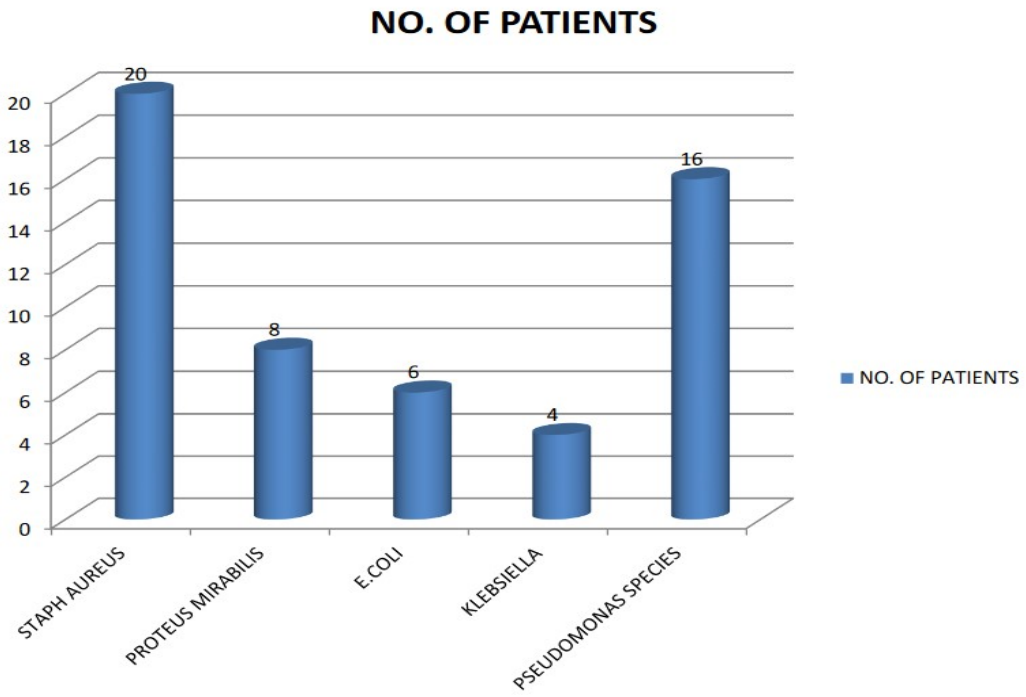
SEX	No. Of patients	%	Chi. Square test	P value	Significance
FEMALE	46	46%	0.64	0.4237	Not
MALE	54	**54%**			significant

Out of 100 patients, the data above indicates that 54 were men and 46 were women, although this difference was statistically insignificant (p=0.4237).

Table 2: Pus culture finding

Organism	No. of patients	%	Chi. Square test	P value	Significance
STAPH AUREUS	20	37.00%			
PROTEUS MIRABILIS	8	15.00%			
E. COLI	6	11.00%			
KLEBSIELLA	4	7.00%	17.841	1.15x10^-3	Significant
PSEUDOMONAS SPECIES	16	30.00%			
Total	54	100.00%			

The ear discharge from diabetic patients is shown in the above table along with the organisms that were detected through pus culture. The majority of the patients had staphylococcus aureus (37%) and pseudomonas species (30%), while some patients also had proteus mirabilis (15%), E. coli (11%), and klebsiella species (4%). Statistics showed that this was significant (p 0.05).



Discussion:

In our analysis, the majority of patients (38%) were between the ages of 51 and 60, closely followed by those between 41 and 50 (35%) and 20 to 30 (6%), but this difference was statistically significant ($p<0.05$).

This is in line with Jankar DS et al's [7] research on the prevalence of diabetic ear in people between the ages of 41 and 50 (40.28%).

Out of 100 participants in our study, 54 (54%) were men and 46 (46%) were women. Manche According to Santoshi Kumari et al., 34.5% of diabetic patients were female and 65.5% were male, with a greater male preponderance for otological expression [8].

In our investigation, staphylococcus aureus was discovered to be present in the majority of patients with ear discharge (37%) followed by pseudomonas species (30%), and some individuals also had proteus mirabilis (15%), E. coli (11%), and klebsiella species (4%). The statistical significance of this was 0.05.

Pus swabs from discharge-producing ears were taken, processed, and tested for sensitivity to aerobic bacteria. 296 (80.4%) of the 368 pus swab samples evaluated in total tested positive for cultures. 7 (2.4%) were yeast cells while 289 (97.6%) were bacteria. Males were more likely than females to have an ear infection (92.7%) (P = 0.014). Under the age of 21, ear infections occurred 65.2% of the time. Pseudomonas aeruginosa (29.7% of the isolates) outnumbered Staphylococcus aureus (26.3%) and Proteus spp. (21.9%). Amoxicillin/clavulanic acid, ampicillin, and penicillin all had high antimicrobial resistance rates, although ciprofloxacin, ceftriaxone, chloramphenicol, cotrimoxazole, gentamicin, and amikacin were found to be effective against isolated bacteria. A significant public health issue in the research area is ampicillin and amoxicillin/ clavulanic acid- and ampicillin-resistant aerobic

bacterial otitis media. Additionally, a high incidence of oxacillin-resistant S. aureus points to the spread of methicillin-resistant S. aureus in the neighbourhood. Antibiotic susceptibility testing of isolates is therefore required to direct the management of otitis media in the research region. [5] (Derese Hailu et al., 2016).

Pseudomonas, Staphylococcus, Proteus spp., and Klebsiella are the most prevalent bacteria connected to CSOM, according to the majority of investigations on the microbiology of CSOM. Other research revealed Staphylococcus aureus to be the most prevalent bacterium, particularly in cases when cholesteatoma was present. The pattern of bacterial antibiotic sensitivity and dominance changes throughout time. Therefore, understanding the local pattern of infection is crucial for effective therapy of this illness. Most specialists would start with a wide-spectrum antibiotic on an empiric basis and request cultures if drug resistance is suspected because topical antibiotic treatment is frequently successful and rarely dangerous. (2014) Raakhee T* and Sreenivasa Rao Unguturu [6]

The ear discharge from 234 patients was examined for organism culture.The most frequent bacteria species to cause ear discharge were Pseudomonas species (29.5%), staphylococcus (20.5%), and coliform (16.7%) species. The most prevalent of the discovered fungi was candida. In 23.1% of the cultures, no microbiological agent was found. A past history of trauma to the afflicted ear was present in 18 individuals (8%) and diabetes mellitus was identified in 51 patients (21.8%). Dayasena RP and others [9]

Conclusion

The most frequent bacteria found in ear discharge pus cultures were staphylococcus aureus and pseudomonas species. The most common gram-positive strain was methicillin-resistant coagulase-negative staphylococcus. The study investigated and compiled the sensitivity and resistance patterns of the different infections that were isolated.

References

1. Powers AC. Diabetes Mellitus: Diagnosis, Classification, and Pathophysiology. In: Kasper DL, Fauci AS, Hauser SL, Longo DL, Jameson JL, Loscalzo J, editors. Harrison′s principles of internal medicine. 19th ed. US: Mc Graw Hill Education; 2015; 1299.
2. Ogurtsova K, da Rocha Fernandes JD, Huang Y, Linnenkamp U, Guariguata L, Cho NH, Cavan D, Shaw JE, Makaroff LE. Diabetes Res Clin Pract. 2017 Jun; 128:40-50.
3. Zhang, Z., F. Werner, H.-M. Cho, G. Wind, S.E. Platnick, A.S. Ackerman, L. Di Girolamo, A. Marshak, and K. Meyer, 2017.
4. Kasahun Gorems, 1 Getenet Beyene, 1 Melkamu Berhane, 2 and Zeleke Mekonnen: 1 Antimicrobial susceptibility patterns of bacteria isolated from patients with ear discharge in Jimma Town, Southwest, Ethiopia. BMC Ear Nose Throat Disord. 2018; 18: 17.
5. DereseHailu, DanielMekonnen, AwokeDerbie, Wondemagegn Mulu, and Bayeh Abera; Pathogenic bacteria profile and antimicrobial susceptibility patterns of ear infection at Bahir Dar Regional Health Research Laboratory Center, Ethiopia; 2016; 5: 466.
6. Raakhee T, Sreenivasa Rao Unguturu; Bacteriological study of discharging ear in patients attending a tertiary care hospital; International Journal of Research in Medical Sciences Raakhee T et al. Int J Res Med Sci. 2014 May; 2(2):602-606 www.msjonline.org
7. Jankar DS, Bodhe CD, Bhutada TB, A study of hearing loss in type II diabetics, international journal of medical research and health science aug 2013.
8. Manche Santoshi Kumari, Koralla Raja Meganadh, Jangala Madhavi and Akka Jyothy Prevalence of Otological Disorders in Diabetic Cases with Hearing Loss.
9. Dayasena RP, Dayasiri MBKC, Jayasuriya C, Perera DSC; Aetiological agents in chronic suppurative otitis media; Australasian Medical Journal AMJ. 2011; 4(2):101-4.