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Opportunistic Oral Infections in Immunocompromised Patients.

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ABSTRACT

The aim of our study is to isolate and identify oral pathogens (bacteria and fungi) from immunocompromised patients. There are increasing number of opportunistic oral infections in immunocompromised patients in our locality during the recent years. Despite the role of oral cavity, as a reservoir of the opportunistic pathogens for infections in patients following immunocompromised state, oral hygiene has been largely neglected. Hence opportunistic oral pathogens like bacteria & fungi were isolated and identified from 30 immunocompromised patients using routine diagnostic technique. The rapid detection of causative oral pathogens and providing appropriate treatment as early in immunocompromised patients will be helpful to eliminate the spread of infection.

Keywords: Oral Candidiasis; Antibiotic sensitivity; Immunocompromised; Salivary specimen; Bacterial and fungal culture.

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INTRODUCTION

In a host with a weak immune system, normal flora residing in the body take an opportunity to cause infection is known as opportunistic infection. The possible conditions where the microbes can cause infections are seriously debilitated, lowered resistance to infection, penetrating injury or a lack of immunity from normal commensals.

Patients with HIV, Uncontrolled Diabetes, Cancer, Rheumatoid arthritis & patients under steroids have their immune system, which lost its ability to fight against infectious microbes and hence are called as immunocompromised individuals.

Immunocompromised conditions may be

1. Innate: some people are born with intrinsic defects such as age, birth weight, underlying disease and their immune status.
2. Acquired: due to extrinsic factors such as nutrition, drugs, steroids that affect the patient's immune system.

Oral microbial flora contributes to health and condition & their disruption may influence the course of oral opportunistic infections. Oral complications and infections are related to the type and severity of immunocompromised condition. These opportunistic oral infections are also the markers of immunocompromised state.

Oral opportunistic bacterial infections are seen in the conditions of Actinomycosis, Cellulitis, Leprosy, Linear gingival erythema, Mucositis, Necrotizing ulcerative gingivitis, Necrotizing ulcerative periodontitis, Necrotizing ulcerative stomatitis, Oral syphilis, Osteomyelitis, Osteonecrosis and some of the oral opportunistic fungal infections are Aspergillosis, Blastomycosis, Candidiasis, Cryptococcosis, Histoplasmosis, Mucormycosis, Paracoccidiomycosis, Sporotrichosis.

The viruses and parasites are not included in our study because isolation of such microbes is very difficult in routine diagnostic laboratory. The number of opportunistic oral infections in immunocompromised patients has increased in our locality during recent years. The isolation of microbes and their identification, form a very significant procedure in early diagnosis & management. The diagnosis of such pathogens present in the oral cavity at the very early stage helps to decrease the progression of opportunistic oral infections in immunocompromised patients.

MATERIALS AND METHODS

Our study was conducted at The Christian Mission Hospital, Madurai during June-July, 2019. 30 samples were collected from immunocompromised patients such as Uncontrolled Diabetes mellitus, Rheumatoid Arthritis patients, patients on steroids, Cancer patients. The salivary swab specimen from buccal cavity or a lesion in the oral cavity or from pus discharge in the mouth was collected and processed for the isolation of bacteria and fungi using the routine diagnostic procedures.

Inclusion criteria:

- Uncontrolled Diabetes Mellitus.
- Rheumatoid Arthritis.
- Cancer patients.
- Patients on steroids.

Exclusion criteria:

- Tuberculosis patients.
- HIV infected patients.

Processing

For Bacterial Culture

The salivary swab specimens were streaked in the Nutrient agar plates and were incubated at 37˚C for 18-24 hours. The colonies of bacterial species were identified based on their morphological characters. Further analysis by Gram staining and Biochemical test assays for bacterial identification were done. Antibiogram for bacteria by Kirby-Baeur disc diffusion method were carried out to find bacterial sensitivity against antibiotics.

For Fungal Culture

The salivary swab specimens were inoculated onto SDA agar plates and were incubated at 25˚C & 37˚C for 18-24 hours for the growth of mould and yeast forms respectively. The identification of fungi was based on their morphological characters and Lactophenol cotton blue mount. Further,

Germ tube test was done for yeast colonies for the confirmation of Candida albicans.

RESULTS

A total of 30 salivary swab specimens were collected from the oral cavity of immunocompromised patients.

Collection of specimen

The specimens collected were salivary swab from buccal cavity (20), lesion from mouth (8) and pus from mouth ulcers (2)

Out of which 14 specimens were from male and 16 specimens were from female (Table 1).

Depending on the immunocompromised conditions, they were categorized as 17 samples from Uncontrolled Diabetes Mellitus, 4 samples from patients on steroid therapy, 2 samples from Rheumatoid Arthritis patients, 7 from cancer patient (Table 2).

The bacterial colony growth was observed from all the types of specimen such as salivary swab, lesion in mouth, pus from mouth ulcers of 30 immunocompromised patients.

When the salivary swab specimen was taken from the oral cavity of immunocompromised patients 12 specimens showed fungal growth and 8 showed no growth. In case of lesion from mouth there was 6 fungal growth and 2 no growth. Sometimes pus from mouth ulcers showed 2 fungal growths.

The isolates of bacteria includes Staphylococcus aureus 40% (Image1), Klebsiella species 30% (Klebsiella oxytoca, Klebsiella pneumonia) and Coagulase Negative Staphylococci 30% (Chart1)

Among 30 specimens collected, 9 specimens showed fungal species of Candida albicans (Image3), 11 specimens showed species of Candida non-albicans and 10 specimens showed no fungal growth.

Antibiogram for various bacteria:

Staphylococcus aureus was most sensitive to Amoxicillin (100%), Ampicillin(41.67%), Amikacin (75%), Cotrimoxazole(100%), Piperacillin/Tazobactam(50%), least sensitive to Cefuroxime(25%) Cephalexin(33.33%) resistant to Ofloxacin(75%), Ciprofloxacin(75%).

Coagulase Negative Staphylococci was most sensitive to Ampicillin (100%), Amoxicillin / Clavulanic acid (66.67%), Piperacillin / Tazobactam (66.67%), Amikacin (100%), Cotrimoxazole (77.78%), Cefuroxime and resistant to Ofloxacin (100%), Ciprofloxacin(100%).

Klebsiella pneumoniae was 100% sensitive to Amikacin, Piperacillin/Tazobactam, Cefuroxime and 100% resistant to Cefuroxime, Cefixime, Cefidinir, Norfloxacin, Ofloxacin, ciprofloxacin.(Image2)

Klebsiella oxytoca was sensitive to Amikacin(100%), Ciprofloxacin(71.43%), Cefotaxime, Ceftriaxone, Ceftazidime, Ofloxacin(71.43%), Piperacillin/Tazobactam(85.7%), and resistant to Cefuroxime, Aztreonam, Norfloxacin , Cefidinir, Cefixime.(Table3)

DISCUSSION

In our study of 30 immunocompromised patients, majority of them were between an age group of 40-60 years with no sex predilection.

In the present study, 57% patients suffered from Uncontrolled Diabetes Mellitus, 13% patients were on steroid therapy, 23% patients had cancer and 6% patients had Rheumatoid Arthritis. Our study correlates well with the study conducted by Estella Whimby et al, 1987[25]. They evaluated 55 immunocompromised patients of which 34 patients were male &21 patients were female and categorized them under hematologic neoplasm (29), solid tumours (21) and AIDS (4) and found that the mortality rate was 56.52% from Staphylococcus bacteraemia.

40% of Staphylococcus aureus were reported as the most common oral opportunistic bacterial pathogens, followed by Klebsiella species (30%) [includes Klebsiella oxytoca, Klebsiella pneumoniae] and Coagulase Negative Streptococci(30%) species isolated from immunocompromised patients. Similarly, Sarah E Whitmore et al, 2014 [6] isolated bacterial pathogens such as Helicobacter pylori and Porphyromonas gingivalis from over 400 cases and controls.

The bacterial isolates such as Staphylococcus aureus, Klebsiella oxytoca, Klebsiella pneumoniae and Coagulase negative streptococci were isolated in our study, Furthermore W.Kruger et al, 2019[14] isolated Streptococci, Actinobacteria, Fusobacterium, Veilonella, Prevotella from the oral cavity.

The isolated Staphylococcus aureus was most sensitive to Amoxicillin clavulanic acid and cotrimoxazole, and resistant to Cefuroxime, Ofloxacin. In the antibiotic susceptibility test by Biemer J ,2014[20] Staphylococcus aureus was most sensitive to penicillin and cephalosporin by Kirby-Beur disc diffusion method. The isolated Coagulase Negative Streptococci was sensitive to Ampicillin, Amikacin and resistant to Ofloxacin ,Ciprofloxacin whereas Klebsiella species was sensitive to Amikacin , Piperacillin and resistant to Cotrimoxazole, Cephalexin.

Out of 30 isolates from oral lesions, 9 isolates were Candida albicans and 11 isolates were non-albicans candida species and 10 showed no growth in SDA culture using routine laboratory technique. Oral Candidiasis was reported as the most common opportunistic fungal infection in the oral cavity and commonest cause of life threatening illness in Tamil Nadu. The same kind of results were reported from the study of A.G. Deepa et al, 2014[10] attributed much about the growing number of immunocompromised patients in those with AIDS, Cancer, advanced age, longstanding Diabetes Mellitus, blood and bone marrow transplantation, immunosuppressive therapy. They used CHROMagar-PAL, Multiplex PCR, Micronaut-Candida, API ID32C, Rapid yeast plus system, Auxocolour and more recent advanced techniques and identified C. albicans, C. krusei, *C.* glabrata, C. parapsilosis, C. dublieniesis, C. tropicalis, C. kefyr and C. guilliermondii.

CONCLUSION

The prevalence of oral opportunistic infections was increasing in our locality. Hence, the isolation and identification of pathogens present in the oral cavity at the very early stage helps to decrease the rate of progression of opportunistic oral infections in immunocompromised patients. Boosting the immunosuppressive state might eliminate the pathogen which causes oral infection. This study also helps to choose the appropriate antibiotic for a particular oral infections thus prevent the spread of infections.

Table 1: Male-Female Ratio

GENDER	NO.OF SPECIMEN
MALE	14
FEMALE	16
TOTAL NO.	30

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Table 2: Types Of Immunocompromised Patient.

TYPES OF IMMUNOCOMPROMISED PATIENT	NO.OF PATIENT
Uncontrolled Diabetes Mellitus	17
Under Steroid therapy	4
Rheumatoid Arthritis	2
Cancer	7
TOTAL NO.	**30**

Chart 1: Different Types Of Bacteria

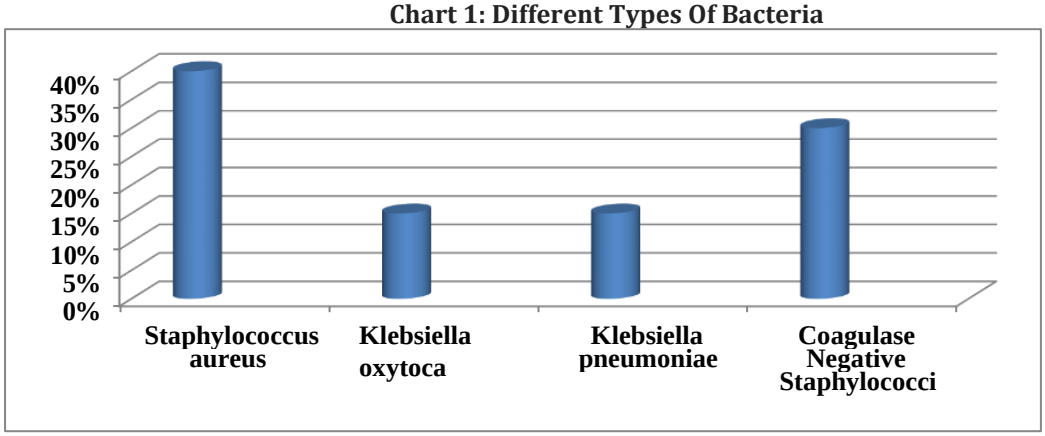
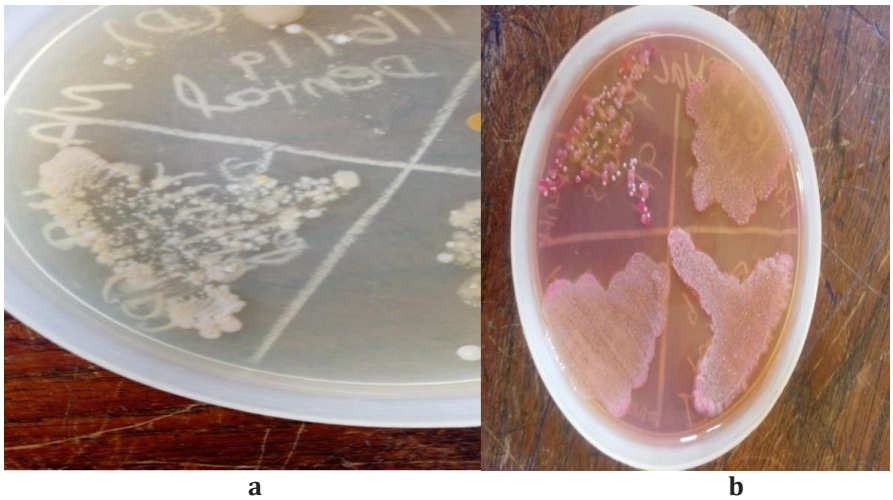


Table 3: Antibiogram For Various Bacteria.

BACTERIA	AMP		AMC		AK		COT		XM		PIT		CFX		OF		CL	
	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R	S	R
S.aureus(12)	5	7	12	-	9	3	12	-	3	9	6	6	4	8	3	9	3	9
CONS(9)	9	-	6	3	9	-	7	2	5	4	6	3	5	4	-	9	-	9
K.oxytoca(7)	3	4	4	3	7	-	2	5	3	4	6	1	4	3	5	2	5	2
K.pneumoniae(2)	2	-	2	-	2	-	1	1	2	-	2	-	2	-	1	1	1	1

[AMP-Ampicillin; AMC-Amoxicillin-Clavulanic acid; AK- Amikacin; COT- Co-trimoxazole; XM-Cefuroxime; PIT-Piperacillin/Tazobactam; CFX-Cephalexin; OF-Ofloxacin; CL-Ciprofloxacin S:Sensitive; R:Resistant]

Image 1: Shows the growth of bacteria isolated from oral lesions in a.) Nutrient agar b.) MacConkey agar



a **b**

Image 2: Shows the antibiogram of Klebsiella species in Mueller Hinton agar.

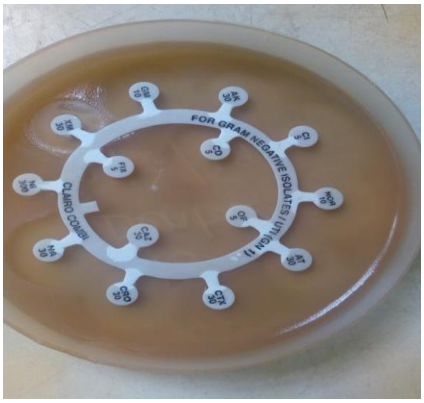


Image 3: Shows the growth of fungus isolated from oral lesions in Sabouraud Dextrose agar.

REFERENCES

[1] JJ S. SAGE Journal 1996;10(1);69-72.
[2] Hoch S. Opportunistic candidiasis: An epidemic of 1980's 1995;21(4):897904.
[3] Sedghizadeh P, Allen C. Dental clinics of North America 2019;61(2):389-400.
[4] Tata W, Thepbundit V, Kunasuvan C, Preechasuth K. J Assoc Med Sci 2018;52(1):1-7.
[5] Westhaisen A, Preipe F, Bergman F. J oral pathol med 2019;29(7):336-341.
[6] SE W, RJ L. PlOs Pathog Available from: https://doi.org/10.1371/journal.ppat.1003933.
[7] Badiee P, Hashemizadeh Z. IJMR 2014;(139):195-204.
[8] W Bauer et al. Analysis of Technique and Results 1959;104(2):208-216.
[9] J.F M, & Wilkens W. Biochemical Tests for Identification of Medical Bacteria. 2000;3.
[10] Deepa A, Nair B, Joseph A. Journal of Oral and Maxillofacial Pathology 2014;18(2):235-243.
[11] Eyler E. Available from: https://doi.org/10.1016/B978-0-12-4200678.00001-5.
[12] Periti, P. and Mazzei, T. Infections in immunocompromised patients II Established therapy and its limitations. 1985;8(1):100-117.
[13] Jun S, Si F, Pugatch R, Scott M. Fundamental Principles in Bacterial Physiology - History, Recent progress, and the Future with Focus on Cell Size Control: A Review. HHS Author Manuscripts. 2018;81(5).
[14] Kruger W, Vielreicher S, Kapitan M. Pathogens 2019;8(2).
[15] Kilado K, Toledo A, Oho T. Int J Dental Hyg 2009;7(2):121-125.
[16] Radentz W. J American Acad Dermatol 1989;20(6):989-1003.
[17] Sahly H, Podschun R, Ullmann U. The Biology and Pathology of Innate Immunity Mechanisms 2002;237-249.
[18] Archer G. Staphylococcus aureus: A Well-Armed pathogen. Reviews of Infectious Diseases. 1998;26(5):1179-1181.
[19] Dreizen S. The American journal of medicine. 1984;77(4D):28-33.

[20] Biemer J. Annals of Clinical & Laboratory Science. 1973;3(2):135-140.
[21] Holding A, Collee J. Methods in Microbiol 1971;6:1-32
[22] Mayer F, Wilson D, Hube B. Virulence 2013;4(2):119-128.
[23] Mahon J, Stiller C. The Immunocompromised Patient 1987;33:349-359.
[24] Bodey G, Mardani M. American J Med 2002;112(5):380-385.
[25] Whimbey E, Kiehn TE, Brannon P, Benezra D, Armstrong D. Clinical significance of colony counts in immunocompromised patients with Staphylococcus aureus bacteremia. 1987;155(6):1328-1330.
[26] California Dent Ass J 2013;41(4):257-258.