

## Determination of Fungal species Prevalent in the Oral Cavity of University Students

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**Abstract:** Fungal species inhabit the oral cavity and they are critical components of health and diseases. Studies on fungal species prevalent in oral cavity of some University students in Presco Campus, Ebonyi State University (ESU) was carried out in July, 2014. The aim of the study was to determine the most preponderant fungal species in oral cavity of healthy students. 20 samples of oral cavity swabs were collected and culture in potato dextrose agar (PDA) with chloramphenicol, incubated at 27 °C for 72 hours, fungi organisms were isolated and identified. Seven oral mucosal fungi species were identified; *Histoplasma*, *Rhizopus*, *Sporothrix*, *Blastomyces*, *Fusarium*, *Aspergillus* and *Candida* in increasing order of dominance. *Candida* species dominated non *Candida* species. However *Candida* spp. and *Aspergillus* spp. were the most dominant oral mucosal fungi found among healthy University students.

**Keywords:** Fungi, oral cavity, diseases, health, students

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### I. Introduction

Fungi are important players of the microbiome which inhabit different parts of the body either as a cofactor in disease or as potential pathogens (Oever and Netea, 2014). Studies have shown dominant presence of fungal species in oral cavity (Florida *et al.*, 2012). The human oral cavity contains different habitats such as; teeth, gingival sulcus, tongue, cheeks, hard and soft palates, and tonsils, which are colonized by fungal microbiomes (Floyd *et al.*, 2010). The microbiomes are important for proper functioning of the immune system, including the defense mechanisms and metabolic processes.

Some fungal mycobiota could be benign contributing to health, some contribute to destruction of tissues within the oral cavity and upper respiratory infections (Dupuny *et al.*, 2014). Microbiomes aggregate are formed on mucosal surfaces, in the salivary fluid, via specific cell to cell adhesion events (Kolenbrander *et al.*, 2010). This facilitates interactions among microbial cells (England *et al.*, 2004). Majority of oral fungal infection have been reported to be due to *Candida albicans*, other fungal species associated with oral cavity diseases are becoming common. Most studies have characterized oral bacterial microbiota, the fungi aspects have received few attention (Dupuny *et al.*, 2014). Over 700 bacterial species have been identified in the oral cavity of human (Aas *et al.*, 2005). Research on bacterial–fungal inter-kingdom communication have shown that bacteria and fungal communities interfere and support themselves (Jenkinson and Douglas, 2002).

*Candida* belong to healthy microbiome, but under certain circumstances, could cause life-threatening systemic infections, they also cause oral candidiasis and some significant human infections (Oever and Netea, 2014). Some species are less susceptible to commonly used antifungal drugs and this poses significant difficulties for effective treatment (Coleman *et al.*, 2010). Reported prevalence of *Candida* species was between 15–75%, up to 80% in elderly, especially denture wearers (Ghannoum *et al.*, 2010). The use of antibiotics, malnutrition, premature birth and old age were discovered among the most common predisposing factors for opportunistic fungal infections (Pfaller and Diekema, 2010).

The oral cavity is the only major passage to the internal human body, food passes through the oral cavity to the digestive system, air also passes through the nostrils and oral cavity to the respiratory tract. This creates a continuous channel and could cause microorganisms colonizing one area of the oral cavity to have a significant probability of spreading on other neighboring sites. Presence of *Candida* and *Saccharomyces* species have been found to correlate with severity of hepatitis, pneumonia, cardiovascular diseases and other systemic diseases (Floyd *et al.*, 2010). The aim of the study was to determine the most prevalent fungal species in oral cavity of healthy University students in Presco Campus, Ebonyi State University, Abakaliki, Nigeria.

### II. Materials and Methods

#### Sample Collection

Written informed consent was obtained from all participants (students) in this study. Recruitment of study participants was performed according to Human Subjects Institutional Review Board (IRB) of Ebonyi State University, Abakaliki, Ebonyi, Nigeria. Swab sticks were used to obtain samples from 20 healthy University students. Samples were preserved in the refrigerator prior to experiment. Media were prepared using

potato dextrose agar (PDA) and poured aseptically into petri dishes. The content of the swab sticks were dissolved with 2 ml of distilled water, homogenized and inoculated onto petri dishes, They were incubated at 27 °C for 72 hours. Thin smears of the organism were made on microscope slides, two drops of lactophenol cotton blue stain were dropped on the slide, covered with cover slip and viewed using light microscope at x40 magnification.

### III. Result and discussion

Seven oral mucosal fungal species were identified from the oral cavity of 20 students, in decreasing order of dominance; *Candida* (65 %), *Aspergillus* (11.1 %), *Rhizopus* (6.0 %), *Histoplasma* (5.5 %), *Sporothrix* (5.4 %), *Blastomyces* (5.0 %), and *Fusarium* (2.0 %) (Fig. 1). More students harbored *Candida* spp than other oral mucosal fungi. Research has reported several *Candida* species in oral cavity, but the most prevalent is *C. albicans*. *C. albicans* accounts for over 80 % of all oral yeast isolates (Raju and Rajappa, 2011). In the present work, fungal species isolated were not diverse, compared to isolated 74 culturable fungi genera in the oral cavity by Ghannoum *et al.*(2010).

The bacterial component of oral communities has been extensively characterized, the role of the fungi microbiota in the oral cavity is largely unknown. The present work found preponderant of *Candida* among the subject. Ghannoum *et al.* (2010) also found *Candida* as the most prevalent fungi in oral cavity of healthy individuals. This work further confirms the views of Diaz *et al.* (2014), who stated that oral candidiasis are present in the oral cavities of approximately 50 % of healthy individuals. Costa *et al.* (2013) noted that *Candida* expresses virulence factors and can cause different manifestations of oral candidiasis, hence the treatment of mucosal infections caused by *Candida* and the elucidation of the disease process have proven challenging. Diaz (2014), found *Candida albicans* as the most virulent and prevalent species, followed by the non-*albicans* species; *C. tropicalis*, *C. glabrata*, *C. parapsilosis*, *C. krusei*, *C. dubliniensis*, and others. *C. albicans* colonizes the oral surface and can cause damage through the expression of its virulence factors, including adherence to host cells, morphological transition, hydrophobicity and secretion of hydrolytic enzymes (Diaz 2014). *Candida* species could establish in the oral cavity as commensals but may become virulent, causing mucosal lesions, under certain conditions (Lalla *et al.*, 2013).

The colony forming units varied among students and predominated by brown and black colours. Some patients harboured more than one organism. *Aspergillus* and *Rhizopus* spp. were next to *Candida* in total abundance. Deepa *et al.* (2014), also identified them as the majority of opportunistic oral mucosal fungal species. Their clinical presentations were found to include pseudo-membranes, abscesses, ulcers, pustules and extensive tissue necrosis involving bone (Deepa *et al.*,2014). *Candida*, *Aspergillus* and *Rhizopus* could be normally avirulent in healthy people, but can cause disseminated fatal infections in patients with suppressed immunity.

*Aspergillus* species are universally found in humid areas, damp soil, jams, grain, food stuffs and organic decaying or decomposing matter. Aspergillosis (a fungal infection by an organism of the *Aspergillus* species) of the oral cavity is an uncommon condition which most frequently occurs in immunocompromised patients, such as those with haematological malignancies (Cho *et al.*, 2010) *Aspergillus fumigatus* is the most familiar pathogen of the species. Human infections are also caused by less common *Aspergillus* species, such as *Aspergillus flavus*, *Aspergillus glaucus*, *Aspergillus terreus*, *Aspergillus parasiticus*, *Aspergillus repens*, *Aspergillus nidulans*, *Aspergillus niger* and *Aspergillus tubingensis* (Bathorn *et al.*, 2013).

*Histoplasma*, *Sporothrix*, *Blastomyces* and *Fusarium* were recorded very low; 5.5 %, 5.4 %, 5.0 % and 2.0 % respectively, they could be uncommon pathogen in the oral cavity. *Histoplasma capsulatum* cause histoplasmosis, a deep mycosis. Ge *et al.* (2010) found that the majority of cases histoplasmosis present as a mild to moderate flu-like disease requiring only supportive therapy.

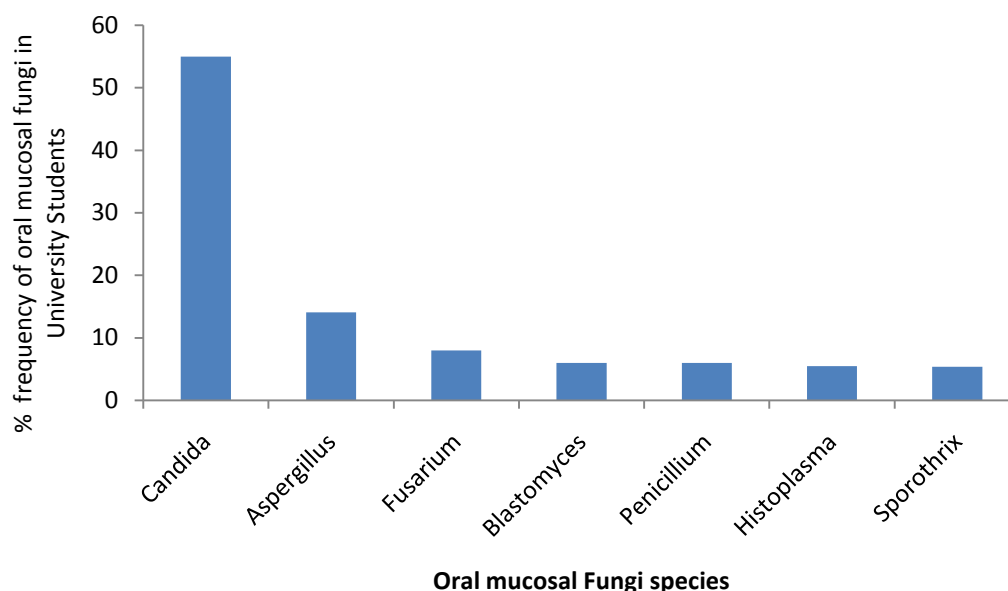
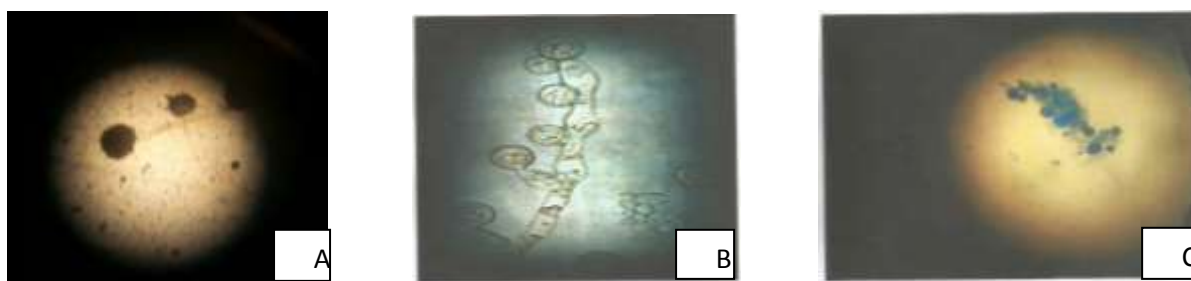


Fig 1: Prevalence of oral mucosal fungi species in University students



Photomicrographs of some identified mucosal fungal species: A, *Aspergillus*. B, *Candida*. C, *Histoplasma*

#### IV. Conclusion

The present work found dominance of *Candida*, *Aspergillus* and *Rhizopus* in oral cavity of healthy University students. Their clinical relevance could be a step towards predisposing the host to opportunistic infections. future research on relationships between different fungal species as well as between fungi and other members of the oral microbiome will shed light on the pathogenicity of oral microbiomes.

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