

FORMITES IN FUNGAL TRANSMISSION IN COLLEGE OF HEALTH SCIENCE, NNEWI CAMPUS

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ABSTRACT

Background: Contamination of classroom environments and surfaces of classroom chairs by *candida species* is a common phenomenon. The hand borne transmission through contact with contaminated chair surfaces is one of the most common routes of transmission of candida. **Aim/Objective:** To determine the prevalence of candida on hands and classroom chairs of students of faculty of health science and technology, Nnamdi azikiwe university, Nnewi Campus. **Methodology:** A total of 100 samples collected from chairs and palms of students of College of Health Science and Technology, Nnewi campus. The samples were collected aseptically by swabbing classroom chairs and hands of students. This was taken to the laboratory within 1hour and cultured on Sabouraud Dextrose Agar (SDA) supplemented with chloroamphenicol at 0.05mg/per ml and incubated at room temperature for 24hours. Obtained data was analysed using Chi-square. **Result:** The study showed that the most isolated organism was *Candida specie* which has the highest occurrence 30 (30.0%), followed by *Cladosporium* with the frequency 25(25.0%). The least organism isolated was *Aspergillus flavus* 6(6.0%), while the highest occurring *Aspergillus* spp was *Aspergillus nievus* 10 (10.0%). From the students' palms, a total of 23 organisms were isolated with the highest occurring organism being *Candida spp* with 30.4% of the entire population of this group. Also, a total of 24 organisms were isolated from chairs and tables, and the most isolated organism being *Cladosporium* with 41.7% of the entire population of this group. **Conclusion:** The study revealed that the indoor environment of the classrooms in this Campus is to a considerable extent contaminated with fungal spores and yeast (*candida spp*) infection.

KEYWORDS: *Cladosporium*, *Aspergillus flavus*, *Aspergillus nievus*.

INTRODUCTION

Contamination of classroom chairs and hands is a common phenomenon in many campuses. Students have the tendency to pick up microorganisms from classroom objects like chairs and the hand has shown to play a role in transmission of microorganisms.^[1] Classroom chairs are localized in campuses and departmental classrooms. The surfaces of chairs are usually contaminated with pathogenic and non pathogenic microorganisms (fungi, candida).^[2] The is due to contact by many users. Candida are eukaryotic single celled organisms classified as members of the fungus kingdom. As the classroom sits are used by many users. Users are likely to pick up these pathogens which can cause disease like candida oesophagitis, vaginitis, candidiasis to such individual. candidiasis remains the most prevalent, with *Candida albicans* causing more invasive infections than any other fungus.^[3] Candidiasis or thrush is a fungal infection

(mycosis) of any of the *Candida* species, of which *C. albicans* is the most common, also referred to as yeast infection. Candidiasis is also technically known as candidosis, moniliasis and oidiomycosis.^[4] *Candida* spp. are the most common cause of fungal infections leading to a range of life-threatening invasive to non-life-threatening mucocutaneous diseases.^[5]

However good hygiene has been found to be effective method of preventing transmission of candida through formites such as classroom chairs.

MATERIALS AND METHODS

Study design

These was a cross sectional study designed to determine the distribution of candida in hands and classroom chairs in College of Health Science, Nnewi Campus, Nnamdi Azikiwe University. The study is also designed to

determine the antifungal sensitivity profile of the isolated candida. The research was carried out over a period of 3 months spanning from April to June 2021.

Study area

Hands and classroom chairs in different classrooms of College of Health Science, Nnewi Campus, Nnamdi Azikiwe University, were used in this study.

Inclusion and exclusion criteria

The inclusion criteria used for this research was only classroom chairs sited in College of Health Science, Nnewi Campus, Nnamdi Azikiwe University.

The exclusion criteria used for the research study are Classroom chairs not sited at College of Health Science, Nnewi Campus, Nnamdi Azikiwe University.

Ethical consideration

Ethical approval was sought from the ethics committee of College of Health Science, Nnewi Campus, Nnamdi Azikiwe University before the commencement of the study.

Informed consent

Informed consent was sought from Dean of Faculty of Health Science and Technology.

Sample collection and processing

The samples were collected aseptically by swabbing classroom chairs and hands of students. This was taken to the laboratory within 1hour and cultured on Sabouraud agar supplemented with chloroamphenicol at 0.05mg/per ml and incubated at room temperature for 24hours.

Statistical analysis

Data collected was subjected to statistical analysis using the statistical package for the social science (SPSS)

RESULTS

Table1 above shows the frequency distribution of the isolates. This table reveals the total number of the isolates isolated from all the location during the course of this study. From the table it was revealed that the most

isolated organism was *Candida specie* which has the highest occurrence 30(30.0%), followed by *Cladosporium* with the frequency 25(25.0%). The least organism isolated was *Aspergillusflavus* 6(6.0%), while the highest occurring *Aspergillus spp* was *Aspergillusnievus* 10(10.0%). The standard deviation was generated which was observe to be 1.997 and the mean and standard error mean were also generated which were 4.99 and .200 respectively. The chi-square value and the p-value was also generated and it was observed to be 53.8 and .000 respectively. The alpha level was set at 0.05. Hence the p-value obtained was significant as it is lower than the alpha value 0.05.

Table 2 shows the prevalence of the isolates based on the location. From the table it was revealed that in FHST chairs there were total number of 26 isolates with highest occurring organism being *Candida spp* which was 30.8% of the total population in this group. The least isolate in this group was seen to be *Aspergillus niger* which was just 3.8% of the general population of this group. The p-value was also observed to be insignificant as it was higher than the set alpha value 0.05.

Table 3 above shows the isolates from the palm of the faculty of health sciences and technology students. From the palms of the FHST student, a total of 25 organisms were isolated, the highest occurring was seen to be *Candida spp* which was 40.0% of the entire population of this group. The least isolated organism was seen to be *Aspergillus flavus* which belong to the *Aspergillus specie* occupying just 4% of the entire population of this group. The p-value was observed to be significant as its lower than the set alpha value 0.05. the mean, S.E mean and standard deviation was all represented. The chi-square value was also shown.

Table 4 show the isolates from the chairs of basic medical department. From the tale above, it was observed that, a total of 24 organisms were isolated and the most isolated organism being *Cladosporium* with 41.7% of the entire population of this group. The least was *Aspergillus neivus*. And the p-value was also significant .012 as it is lower than the alpha value.

Table 1: Frequency and percentage distribution of the total isolated organisms.

Organisms	Frequency / %	STD	Mean ± S.E	X ²	p
<i>Aspergillus fumigatus</i>	8(8.0%)	1.997	4.99 ± 0.200	53.8	.000*
<i>Aspergillus niger</i>	7(7.0%)				
<i>Aspergillus flavus</i>	6(6.0%)				
<i>Aspergillus nievus</i>	10(10.0%)				
<i>Cladosporium spp</i>	25(25.0%)				
<i>Candida spp</i>	30(30.0%)				
<i>Penicillium spp</i>	12(12.0%)				
No isolates	2(2.0%)				
Total	100(100%)				

P<0.05 was considered as significant.

Table 2: Showing prevalence of isolates from the chairs of Faculty of Health Science (FHST) and Technology.

Organisms	Frequency / %	STD	Mean ± S.E	X ²	P
FHST CHAIRS					
<i>Aspergillus fumigatus</i>	2(7.7%)	1.969	5.04 ± .386	9.0	.174
<i>Aspergillus niger</i>	1(3.8%)				
<i>Aspergillus flavus</i>	2(7.7%)				
<i>Aspergillus nievus</i>	4(15.4%)				
<i>Cladosporium</i>	5(19.2%)				
<i>Candida spp</i>	8(30.8%)				
<i>Penicillium spp</i>	4(15.4%)				
No isolates	0(0.0%)				
Total	26(100%)				

P<0.05 was considered as significant.

Table 3: Showing prevalence of isolates in the palms of the Faculty of Health Science Students.

Organisms	Frequency / %	STD	Mean ± S.E	X ²	P
FHST STUDENTS PALMS					
<i>Aspergillus fumigatus</i>	2(8%)	1.968	5.04 ± .394	16.2	.013*
<i>Aspergillus niger</i>	2(8%)				
<i>Aspergillus flavus</i>	1(4%)				
<i>aspergillus nievus</i>	2(8%)				
<i>Cladosporium</i>	5(20)				
<i>candida albican</i>	10(40%)				
<i>Penicillium spp</i>	3(12%)				
No isolates	0(0.0%)				
Total	25(100%)				

P<0.05 was considered as significant

Table 4: showing prevalence of isolates in the chairs of Faculty Basic Medical Sciences.

Organisms	Frequency / %	STD	Mean ± S.E	X ²	P
BASIC MEDICAL DEPARTMENT CHAIRS					
<i>Aspergillus fumigatus</i>	2(8.3%)	1.865	4.54 ± .381	16.3	.012*
<i>Aspergillus niger</i>	2(8.3%)				
<i>Aspergillus flavus</i>	3(12.5%)				
<i>Aspergillus nievus</i>	1(4.2%)				
<i>Cladosporium spp</i>	10(41.7%)				
<i>Candida spp</i>	4(16.7%)				
<i>Penicillium spp</i>	2(8.3%)				
No isolates	0(0.0%)				
Total	24 (100%)				

P<0.05 was considered as significant

DISCUSSION

There is plenty of evidence supporting the role of opportunistic fungi as important agents of hospital acquired infection. During the period 1980 to 1990 candida species emerged as the sixth most common nosocomial pathogens.^[6] The frequency distribution of the isolates and the study revealed that most the most organism isolated was *candida spp* which has the highest occurrence 30(30.0%) followed by *Cladosporium spp* with the frequency 25%. The least organism isolated from the study was *Aspergillus flavus* 6(6%) while the highest *Aspergillus specie* isolated was *Aspergillus nievus* the p-value obtained was significant as it is lower than the alpha value 0.05 (p<0.05). It is also in contrast to a study by Adwan et al^[7] in which *Cladosporium spp* (30.9%)

was the most frequently isolated. The difference have been due to contrasting geographical factors as both studies were conducted in Malaysia and Iran respectively. Both countries have different environmental conditions from Nigeria.

Total of 26 isolates was isolated from chairs of Faculty of Health Science and technology, the study revealed that *candida spp* was the highest occurring organism with the prevalence 8(30.8%) of the total population in that group, *Aspergillus niger* 1(3.8%), *Aspergillus flavus* 2(7.7%), *Aspergillus nievus* 4(15.4%), *Cladosporium spp* 5(19.2%), *Penicillium spp* 4(15.4%) *Cladosporium spp* 5(19.2%) *penicillium spp* 4(15.4%) The least isolate from this group was seen to be *Aspergillus niger* with 1(3.8%).

Fungi isolated from chairs of Faculty of Basic medical sciences revealed *Cladosporium spp* to be the most isolated organism with 41.7% of the entire population of group. The least was *Aspergillus niger* (4.2%) and *candida spp* was found to be 16.7%. The p-value was also significant 0.012.

A total of 25 organism was isolated from palms of students of Faculty of Health Science and Technology. The highest occurring organism was seen to be *Candida spp* which was 40.0% of the entire population of the group, *Aspergillus fumigatus* 2(8%), *Aspergillus niger* 2(8%), *Aspergillus flavus* 1(4%), *Aspergillus niger* 2(8%), *Cladosporium* 5(20%), *penicillium spp* 3(12%) prevalence of isolates in the palms of the students of health science with p-value lower than the alpha value 0.05. The least organism isolated from the population was found to be *Aspergillus flavus*.

Prevalence of isolates in the palms of students of faculty of basic medical sciences revealed that 23 organisms were isolated from the palms of the Basic Medical Department students with the highest occurring organism being *Candida spp* with 30.4% of the entire population of the group.

Most of the isolates were present in the environment which means that the student might have acquired the infection from contacts with chairs in the classrooms and these also means that the student from these Faculties have been exposed to these yeast (*candida*) and spores from *Apergillus spp*.

The result obtained from this study showed a high level of fungal contamination among the palms and chairs from Faculty of Health science and technology and faculty of Basic medical sciences okofia. This might have been affected by the temperature and relative humidity of the two classrooms. The Faculty of health science and technology showed higher contamination and this might be due to the fact that most of these classroom do not have workable ceiling fan and most of the windows are spoilt, but for basic medical students there class room windows and ceiling fan are in good condition which affects the indoor temperature as well as the humidity.

Another reason for high occurrence of organism among faculty of health science might be because of high frequency of visitors/students activities in these classrooms for health science are higher than those that use the classroom for faculty of Basic medical sciences. Also poor/low frequent sweeping of these classroom had a significant effect, however since none of these class room was renovated within last 3-5 years these might be the reason for the fungal contamination. Moisture problem has been proven to contribute to presence of fungal contamination in indoor environment.^[8]

The organisms isolated was subjected to urea test. The showing the isolated organisms to urea test, it was revealed that all the organism tested positive for urea except for *candida albican*. showing the germ tube reaction for the candida specie and the chrom-agr of the specie. From the table it was observed that *candida albican* showed a reaction, that is came out positive while *Candida krusei* show no reaction hence came out negative. From the table it was also discovered that the *Candida albican* colonies colours were green while that of *candida krusei* was pink.

CONCLUSIONS

This study has revealed that the indoor environment of the classrooms in the Faculty of Health Sciences and technology and Faculty of Basic Medical Science Nnamdi Azikiwe University Nnewi Campus is to a considerable extent contaminated with fungal spores and yeast (*candida spp*) infection. There are some environmental factors, human activities as well as poor ventilation system which can contribute to these infections. Again, most of the students might have been infected or exposed to some of these organisms(fungi), which is a real concern to the health and welfare of the university community.

In the light of this, there is need therefore for thorough handwashing, disinfection and conscientious contact control procedures to control the spread of these fungi.

REFERENCES

1. Vacher, S., Hernandez, C., Bartschi, C., Poussereau, N. (2010). Impact of paint and wall-paper on mould growth on plasterboards and aluminum. *Building and Environment*, 45(4): 916–921.
2. Mbajiuka, C. S. (2015). Isolation and identification of microorganisms with the use of classroom chairs in Michael Okpara University of Agriculture Umudike (MOUAI) and its environs. *World journal of Pharmaceutical research*, 4: 85–99.
3. Elizabeth MJ (2009). Rare and Emerging *Candida* Species. *Current Fungal Infection Reports*, 3: 152–159.
4. William DJ, Timothy BG (2006). *Andrews' Diseases of the Skin: clinical Dermatology*. Saunders. Elsevier, 308–311.
5. Achkar J.M, Fries B.C (2010). *Candida* Infections of the Genitourinary Tract. *Clinical Microbiology Reviews*, 4: 253–273.
6. Almirante, B., Rodri'guez, D., Park, B. J., Cuenca-Estrella, M., Planes, A. M., Almela, M., Mensa, J., Sanchez, F., Ayats, J. & other authors (2005). Epidemiology and predictors of mortality in cases of *Candida* bloodstream infection: results from population-based surveillance, Barcelona, Spain, from 2002 to 2003. *Journal of Clinical Microbiology*, 43: 1829–1835.
7. Adwan, G., Salama, Y., & Hasan, A. N. (2016). Microbial contamination of Environmental surfaces

- in An-Najah National University setting. *Journal of Scientific Research and Reports*, 10(2): 1-9.
8. World Health Organisation (2014). Fact sheets on Environmental Sanitation. accessed on 20 March 2013.