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Impact Evaluation of Gender and Age on Percentage Distribution of Candidiasis Across Settings in Port Harcourt Metropolis in Nigeria

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Abstract

Gender and age could be important factors determining prevalence distribution of candidiasis in community and hospital settings. The ability of an individual to defend itself against invasion by pathogens (bacteria, fungi, viruses, etc.) to a large extent determines his/her vulnerability to *Candida* infections. *Candida* infections occurring either in the community or hospital set-up, can be clinically observed as localized infections of the mouth, throat, skin, scalp, vagina, fingers, nails, bronchi, lungs, or gastro-intestinal tract or become systemic. Therefore, the identification of *Candida* species is very important in the diagnostic laboratory, because such identification shows prognostic and therapeutic significance, allowing early and correct antifungal therapy. However, this study tries to assess the possibilities involved in the clinical distribution of *Candida* species along Gender and age divides. Also, it seeks to discuss the possible ways at which incidence of *Candida* infections can be halted. Furthermore, samples used in this study were obtained from routine laboratory sample at the University of Port Harcourt teaching hospital and processed. The inocula were prepared by growing the various *Candida* isolates on separate Saboraud dextrose agar plates for purity which is then used for normal saline microscopy, germ tube test and carbohydrate assimilation tests to confirm *Candida* specie. Therefore, this study showed an indifferent distribution of *Candida* species among the various age groups for community settings while hospital settings occurrence of *Candida* isolates among age group 21- 30 (18.6%) was the highest followed by 31–40 (17.9%). The result generally showed a decreasing trend as you move left or right of peak group 21 – 30 (the *Candida* species highest percentage occurring group). On the other hand, it was observed that age group 40 – 50 (15.8%) had the highest frequency followed by age group $\leq$ 10 (13.6%) had within the community setting. Nevertheless, from this present study, we can advance that; emphasis should be placed on public education and advocacy to enhance behavioral and attitudinal change. Similarly, the adoption of sustained and consistent good hygienic practices as a routine day to day life style should form part of the advocacy.

Keywords: *Candida*, Sex, Age Group, Port Harcourt, Settings.

Introduction

Gender and age, could be advanced as possible factors in community and hospital acquired infections (Inweregbu *et al*., 2005). The ability of an individual to defend itself against invasion by pathogens (bacteria, fungi, viruses, etc.) to a large extent determines his/her vulnerability (Playfair and Chain, 2001) to candidiasis within any set-up. Candidiasis is caused by the genus *Candida*, a member of the class Blastomycetes and order Saccharomycotina, which could manifest clinically as acute, subacute, chronic or episodic (Chong *et al*.,2003: Abbey, 1995). *Candida* infections could be clinically observed as localized infections of the mouth, throat, skin, scalp, vagina, fingers, nails, bronchi, lungs, or gastro-intestinal tract or become systemic (Chong *et al*., 2003). *Candida* attaches to human cells with a binding protein and sticks to human tissue to invade the entire body. *Candida* most often sticks to damaged tissues, penetrate and multiply to cause a infection (Dahl, 1993), which may be systemic or cutenouos or sub-cutenousor superficial (Abbey, 1995). This may present in form of itching, discharge, painful micturition or urinary frequency and in extreme cases as low abdominal pain and waist pain. It can be observed among healthy patients with impaired epithelial barriers and immuno-suppressed individuals. Also, it can affect persons of any age group (CDC, 2010). *Candida* infections can be acquired from the community as well as from health care related environment (Inweregbu *et al*., 2005). Also, the life style of an individual or a group of people within a given community can primarily be a risk factor (Aaron *et al*., 2017). Similarly, the Mosby's dictionary (2009) defined community acquired infection as one contracted outside a hospital or health care related settings or an infection present in a patient on admission into a hospital or healthcare facility. This definition is critically clear as to the criteria for categorization of an infection as a community acquired infection. Hence, the center for disease control and prevention in 2014 described hospital acquired infections as an infection whose development is favored by a hospital environment, such as one acquired by a patient during a hospital visit or one developing among hospital staff. Therefore, the identification of *Candida* species could be very important in the diagnostic laboratory, as such identification may show prognostic and therapeutical significance, allowing for early and correct antifungal therapy (Mannarelli, and Kurtzman, 1998). This study is intended for the evaluation of the distribution of *Candida species* isolated from hospital and community settings in Port Harcourt metropolis in the Niger delta of Nigeria, along gender and age divides.

Material and Method

This study was carried out at the University of Port Harcourt teaching hospital in Rivers State, a tertiary hospital facility that accommodates referrals and out patients from all parts of the Rivers State and south-south geopolitical zone of Nigeria called the Niger Delta which consist of six states including Akwa Ibom, Cross Rivers State, Delta State, Edo state, Bayelsa State and Rivers State. It is situated at Alakahia, a sub-burb of the metropolitan city of Port Harcourt, the Rivers State capital. According to census data released in 2006, the State has a population of 5,185,400 persons,

making it the sixth-most populous state in Nigeria. It is located 4°45′N 6°50′ E / 4.750°N 6.833° / E. The inland part of Rivers State consists of tropical rainforest; towards the coast the typical Niger Delta environment, features many mangrove swamps. The capital of Rivers State, Port Harcourt, is the largest city and it is economically significant as the centre of Nigeria's oil industry. Thus, accommodates a proportion of persons from every tribe and state of the Niger Delta and Nigeria at large; making it a good area for research (Azuonwu *et al*., 2004). Samples used in this study were obtained from routine laboratory samples at the medical microbiology laboratory, University of Port Harcourt teaching hospital, Port Harcourt. Samples were randomly collected from male and female gender of any age group. These samples included sputum, urine, blood, cerebrospinal fluid, vaginal swab and stool. All samples were processed by culturing each sample on Saboraud dextrose agar plate and chocolate agar plate using a non-toxic absorbent cotton wool swab, under aseptic conditions and incubated at 37^{o}C for 24 hours. Thereafter, the plates were observed for growth and then, all *Candida* isolates were sub-cultured onto a Saboraud dextrose agar plate to obtain a pure culture. The inocula were prepared by growing the various *Candida* isolates on separate Saboraud dextrose agar plates for purity which was then used for normal saline microscopy and germ tube test were carried out. The pure cultures were individually inoculated onto separate test tubes containing freshly prepared human plasma and labeled against the *Candida* isolate, mixed and the test tubes were incubated at 37^{o}C for 4 hours. Thereafter, a drop of the mixture from each test tube was dropped on a separate clean grease free slide and a cover slip applied on it. It was viewed under the microscope using X10 and X40 objective lens. A slender protruding tube without constrictions was identified as germ tube and used to categorize the isolates into *Candida albicans.* However, those *Candida* isolates that did not produce germ tube were classified into Non-albicans Candida.

Results

For community settings, male samples showed that urine had 1 *Candida albicans*, stool samples had 2 *Candida albicans*, sputum had 1 *Candida albicans,* and cerebrospinal fluid and blood samples had no isolate. While female samples showed urine (15 *Candida albicans* and 2 Non-albicans Candida), stool (2 *Candida albicans* and Non-albicans *Candida*), CSF had no isolates, sputum (1 *Candida albicans*), vaginal swab (6 *Candida albicans*), and blood (1 *Candida albican*). Therefore, collectively, this study demonstrates the presence of 29 *Candida albicans* (90.6%) and 4 Non-albicans *Candida* (9.4%) from the community while hospital settings produced 23 *Candida albicans* (85.2%) and 4 Non-albicans Candida (14.8%). All these are described. However, age distribution of hospital settings isolates (Fig. 1) shows that 5 (56.4%) of the were between the age group$\leq$10 years, 4(10.3%) were between 11 – 20 years, 18.6% were between 21- 30 years, 17.9% between the age group 31– 40 years, while age group 41-50years had 9.4% while 4.5% was seen among group 51 and above. Similarly, age distribution of community settings isolates (Fig. 2) showed that age groups $\leq$10 had 13.6%, 21-30 years 12.2%, 31-40 years 13.3%, 41-50 years 15.8% and 51 and above shows that 10% had *Candida* species. Nevertheless, sex distribution of *Candida* isolates from all community samples showed that out of the

70 female samples assessed in this study, 17 were *Candida* were from female samples while 1 male sample was positive for *Candida* growth. Two stool samples produced by males were positive for *Candida* growth and one males sputum sample was also positive for *Candida* growth and was also positive for *Candida* growth making a total of 4 *Candida* isolates gotten from male samples whereas the female samples also produced 3 *Candida* isolates from isolates from stool, 1 *Candida* isolate from sputum, 7 isolates from vaginal swab, 1 isolates from blood, making a total of 24 *Candida albicans* and three Non-albicans Candida. However, the sample distribution of *Candida* isolates among community setting samples showed a frequency distribution of 26% for sputum samples, 11% for stool, 2% for sputum samples, 20% for vaginal swab samples, 0% for cerebrospinal fluid samples, and 3% for blood samples. The cumulative percentage of *Candida* isolation among community samples was 12.8% (see Table 1). Similarly, sex distribution of hospital samples showed that urine sample produced 11 *Candida* isolates (all from females), sputum produced 1 *Candida* isolate from a male sample while vaginal swab produced 8 *Candida* making up a total of 27 *Candida* isolates with *Candida albicans* having 23 while non-albicans *Candida* 4 isolates. In the same vein, the sample distribution of *Candida* isolates among the hospital settings showed that urine had 21.6%, stool 5%, sputum 3%, vaginal swab 27%, cerebrospinal fluid 0% and blood samples showed 7% of *Candida* growth among the entire samples used for this study while the study percentage frequency for hospital settings samples was 10.7% (see Table 2).

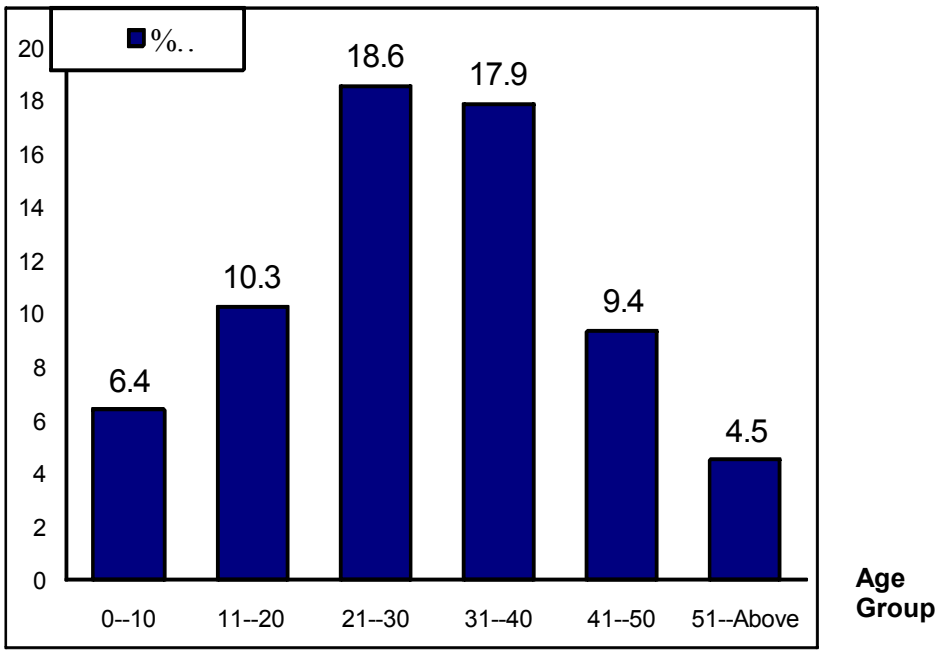

Fig. 1: Age Distribution of Candida Isolates from Hospital Settings

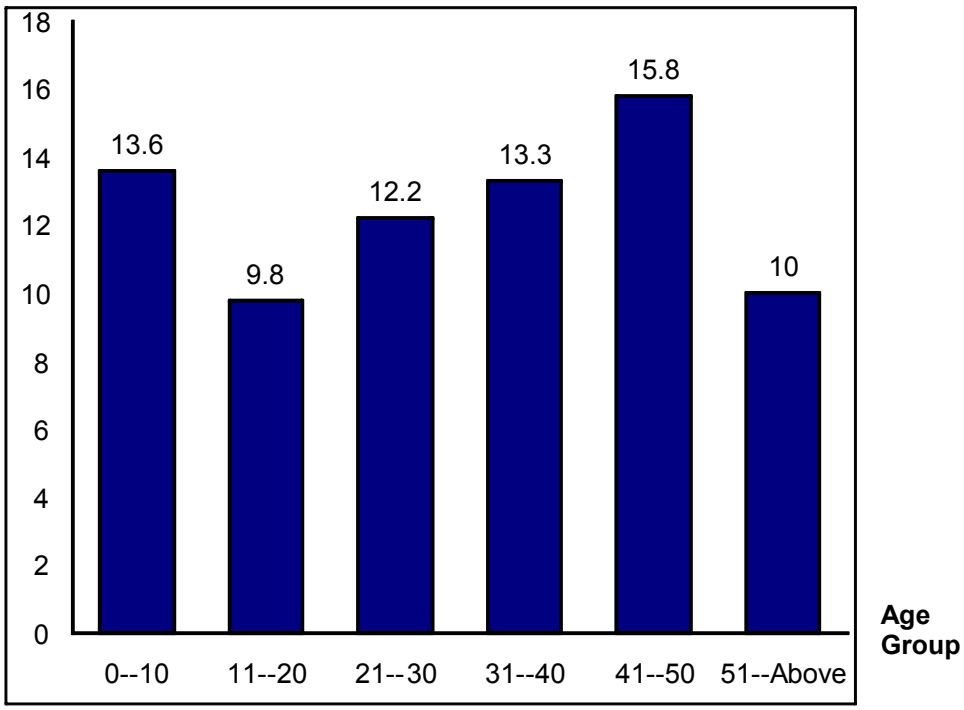

Fig. 2: Age Distribution of Candida Isolates from Community Settings

Table 1: Sex Distribution of Candida Species Obtained From Community Settings

Table 1: Sex Distribution of *Candida* Species Obtained From Community Settings

Clinical Specimen	Community Settings				Total	% Frequency
	Male		Female			
	Pos	Neg	Pos	Neg		
Urine	1	18	17	34	70	26
Stool	2	19	3	20	44	11
Sputum	1	15	0	20	36	2
Vaginal Swab	-	-	6	24	30	20
Csf	0	12	0	18	30	0
Blood	0	16	1	23	40	3
TOTAL	4	80	28	139	250	12.8

Note: Table 1 shows the distribution of *Candida* growth (pos) and no growth (neg) from various clinical samples gotten from different individuals across sex groups (male and female) in community setting.

Table 2: Sex Distribution of *Candida* Species Obtained From Hospital Settings

Clinical Specimen	Hospital Settings				Total	% Frequency
	Male		Female			
	Pos	Neg	Pos	Neg		
Urine	0	21	11	19	51	21.6
Stool	0	16	2	22	40	5
Sputum	1	21	0	19	41	3
Vaginal Swab	-	-	9	24	33	27
Csf	0	17	0	14	31	0
Blood	2	26	2	26	56	7
TOTAL	3	100	24	124	252	10.7

Note: Table 2 shows the distribution of *Candida* growth (pos) and no growth (neg) from various clinical samples isolates gotten from across sex groups (male and female) in community setting.

Discussion

Comparatively, the outcome of *Candida* species percentage occurrence from this study, indicated that, the distribution of *Candida* species among the various age groups for community settings was of no particular order while hospital settings data occurrence of *Candida* isolates was peak among age group 21- 30 (18.6%) followed by 31– 40 (17.9%) and then showed a decreasing trend as you move left or right of group 21 – 30 (the highest percentage occurring group). On the other hand, it was observed that age group 40 – 50 (15.8%) followed by age group $\leq$ 10 (13.6%) had the highest percentage of *Candida* species isolated from the community settings. This implies that, for the hospital settings, there was a trend of *Candida* infections centered on the sexually active youthful age group and it was consistent with the findings of Al-akeel *et al.*, (2012) and Akinbiyi *et al.,*(2008). While the community settings percentage occurrence of *Candida* species was centered on people with declining immunity or poorly developed immunity or immuno-suppressed age groups 40–50 with ≤ 10. This is however inconsistent with the research findings of Akinbiyi *et al.*,(2008) and Al-akeel, (2013). However, the impact of sex and age has been a subject of scientific debate in recent times. A school of thought advanced it as a factor in community and hospital acquired candidiasis because, the near zero rate of urogenital colonization by *Candida* spp. among females less than 10 years old and the significantly high prevalence of candidiasis among the most frequently sexually active female age group in this study, directly or indirectly associates it with the risk of acquiring the candidiasis. According to Ringahi *et al*.,(2010), at least 75% of all adult women would experience an episode of symptomatic urogenital candidiasis in their life time which usually occur whenever *Candida* spp. have grown beyond a certain threshold in the genital region. Although, many researchers still reason that, the high incidence of candidiasis among sexually active age range, could further strengthen their belief that, sexual activity may be contributing to a large extent, to the spread of the *Candida* species in community settings the same way the use of iatrogenic materials or hospital staff hands in hospital settings (Jombo *et al*., 2010; Ononge *et al.*, 2005). The prevalence of vaginal candidiasis from this study agrees with exceptionally high prevalence of commercial sex workers reported by some researchers which further predicts the impact of unsafe sexual activity on the burden of the candidiasis in our society (Aboud *et al*., 2008). In contrast, male percentage frequency distribution of *Candida* isolates from this study corroborates with the notion that women are more predisposed to acquiring *Candida* infections than men whose genital anatomy structural model gives them better protection than females who have an open, receptive and fragile genital structure; making them more vulnerable to acquiring infections(Jombo *et al*., 2010). Similarly, the sexually active age group as seen in this study, having a higher incidence of *Candida* infections, may be attributed to the fact that, they are more predisposed to acquiring sexually transmitted diseases and most likely would engage in self medication with antibiotics due to the fear of being stigmatized. The adolescent population is the most culprits. The frequent use of antibiotics could lead to the depletion of the normal flora of the vagina, which will result to *Candida* overgrowth, causing symptomatic infections (Jombo *et al*., 2010). Also, *Candida* overgrowth could result from the intake of anti-

biotics and anti-malaria drugs during stress, misdiagnosed to be malaria and typhoid fever due to the fact that their signs and symptoms are nonspecific and knowing that we live in a malaria endemic society. Importantly too, most of this conditions may have arise as a result of empiric therapy without laboratory evidence of an infection with Bacteria and *Plasmodium*. However, most of these cases are not reported (Mulu *et al*., 2013). *Candida* over growth could be disturbing, irritating and discomforting; stealing man-hours and attention that would have been put into productive ventures (Aaron *et al*., 2017).

Conclusion

The sex of a subject in a research is of immense statistical and scientific significance as it has usually been used in many baseline studies as a basis for classification, categorization and for drawing inferential conclusions. *Candida* species poses a serious risk to our health as an opportunistic microorganism. On top of that, *Candida* is the fourth most common cause of hospital-acquired infection globally. However, this study tried to assess the clinical distribution of *Candida* species along sex groups and to discuss the possible causes of this incidence of *Candida* infections and ways it can be halted. Nevertheless, it was shown in this study that, females were more predisposed to infections with *Candida* species which was attributed mainly to their differences in genital anatomy structures. Also, the study showed that, the youthful age groups acquired more *Candida* infections within the hospital settings while the community settings data showed high incidence among the age groups with poorly developed and declining immunity, than any other age groups. Therefore, going by this study result, it is important to carry out an intensive sex education with target on our teenage population in the Niger Delta considering their high level of vulnerability to infections with bacteria that would require the intake of antibiotics. Most of the antibiotics are administered by themselves and on the recommendation of their pairs. This is because, they are most times not freely disposed to disclosing their health challenges to their parents who may likely be angry or abusive nor change their parents regard for them as it is often regarded as a sign of waywardness. This may not be unconnected with cultural and religious believes as it forms the fulcrum of traditional Nigerian family norms and views of life. Also, considering the social unrest in the Niger Delta and the stress of day to day life as a result of the prevailing hardship experienced in the country, the need for everybody in the family to contribute to the income of the family, including our teenage population, the need to manage the very scarce resources to meet the many needs in the family; then, physical exhaustion, emotional, mental and psychological stress is inevitable, depressing the immune system and promoting the proliferation of *Candida* species at different body sites where they have comparative advantage.

This study had shown the importance to highlight the need for adequate and proper diagnosis of candidiasis, to be carried out each time a patient presents with symptoms relating to *Candida* infection. This is to enable the patients receive appropriate therapy and will assist in the advocacy for the adoption of sustained and consistent good hygienic practices which is critical to the control of infections. In the same vein, advocacy on the use of condoms and behavioural change in the abuse of antibiotics could be strategic in arresting this trend of *Candida* infection in across

age divides. However, proper sex education to teenagers, adolescents and young adults could be useful in the control of candidiasis, even though the exclusive sexual transmission of *Candida* infections is yet to be universally accepted. Also, health practitioners and related personnel working in health facilities or health policy implementation and formulation agencies should be proactive in monitoring planned programs for the youthful population and make appropriate budgetary provisions to ensure that such programs when started do not end without reaching its goal. Finally, there should be capacity building for medical mycologists and microscopists, to strengthen diagnostics and enhance treatment monitoring in hospitals. This is because; there are limited expertise in this field of medicine in Nigeria and especially Port Harcourt, Rivers state. However, a medical mycology reference laboratory should be built and equipped to accommodate referrals across the state and provide diagnostic, epidemiologic and expert opinion on current trends in fungal infections in the state at large.

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