



CANDIDA SCORE PREDICTING INVASIVE CANDIDA INFECTION

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ABSTRACT **INTRODUCTION:** Invasive Fungal Infection (IFI) is a critical event in clinical scenario, and Invasive Candidiasis is chief among them, accounting for 70-90% of all IFIs. In 2006, Candida score was developed to predict this life-threatening infection. This study makes a similar attempt to identify invasive candidiasis and measure the candida score in the present scenario of a tertiary care hospital, as well as to detect the prevalence of *Candida albicans* and non-*albicans* species. **MATERIALS AND METHODS:** This study was undertaken on patients admitted in Intensive care unit of an Apex medical care institution. Specimens obtained from different sites were taken to laboratory to culture in Blood agar media. If there was growth in Blood agar – Gram staining was done and if *Candida* was found, it was sub-cultured in Chromogenic agar plates to identify species. **RESULT:** Out of 129 samples, 11 were positive for *Candida* (8.49%). Out of 11 *Candida* isolates, only one was *Candida albicans*, others being non-*albicans* *Candida*. Most of them were *Candida krusei*. **DISCUSSION:** A *Candida* score of 2.5 is a predictor of invasive candidiasis. In this study none of the cases showed that score. This was a great finding and was in stark contrast with findings from many institutions. However, our findings also collaborated with them in that maximum clinical isolates were non-*albicans* type. But here maximum isolates were *C. krusei*, although most clinical isolates are reported to be *C. tropicalis* from Asian subcontinents including India, and *C. glabrata* from Western countries.

KEYWORDS : *Candida* Score, Invasive Candidiasis, Speciation

Ability to predict a critical event is one of the most important skills of critical care management. Invasive fungal infections (IFI) is one such critical event. Invasive Candidiasis stands as the fourth most common cause of nosocomial septicaemia and leading cause amongst invasive mycosis in non-neutropenic critically ill patients. [1] Whatever limited data is available of IFIs in Asian Countries – an exceedingly high incidence is predicted. Invasive Candidiasis, which accounts for 70-90% of all IFIs, is associated with higher mortality rates, estimates varying from 38-80%. However unfortunately enough, early diagnosis remains a challenge and criteria for starting empirical antifungal therapy in ICU patients are poorly defined.

In 2006, a Spanish group using database of a candidiasis project identified four predictors of proven invasive candidiasis based on which Leon et al developed the 'Candida score'. It was a cohort study of 1699 critically ill ICU patients. Authors reported a sensitivity of 81% and specificity of 74% with a cut off value 2.5. [2] This study makes a similar attempt to identify invasive candidiasis and measure the candida score in the present scenario of a tertiary care hospital, as well as to detect the prevalence of *Candida albicans* and non-*Candida albicans* species. Thus it may be used to guide the clinicians to differentiate patients who shall really benefit from early antifungal therapy and ensure its judicious use to prevent inadvertent high cost and in future emergence of resistance in a developing country like ours.

MATERIALS AND METHODS

Type of study: Descriptive observational type of epidemiological study.

Study design: Cross sectional study.

Duration of study: 2 months.

Study population: 40 ICU admitted patients during the study.

Choice of subjects: By randomly sampling those who fulfilled the inclusion criteria.

Selection of control: No control as it will be a descriptive study.

Procedure:

Samples were collected from the non-neutropenic patients with minimum 7 days of hospital stay. Specimens were obtained from urine, tracheal aspirate, skin, oral mucosa, wounds, and drains from surgical sites. Urine was collected in a sterile wide mouthed container

with screw cap tops, tracheal aspirates were taken from intubated patients with the help of sucker and for the other samples sterile swabs were used. Samples were then taken to laboratory to culture in Blood agar media following standard techniques. Plates were incubated overnight at 37 degree Celsius. If there is growth in Blood agar – Gram staining was done and if *Candida* was found, it was sub-cultured in Chromogenic agar plates (HiCrome *Candida* Differential Agar Media, M1297A) and incubated for 48 hours to identify species. The species identification was done by the different colours produced by the different *Candida* species, according to the HIMEDIA recommendations which are following:

CANDIDA SPECIES	COLOUR OF COLONY
<i>C. albicans</i>	Light green
<i>C. glabrata</i>	Cream to White
<i>C. krusei</i>	Purple
<i>C. tropicalis</i>	Blue

Then *Candida* score was determined.

Ethical Issues: The required permission to conduct the study was given by the Institutional Ethics Committee. RESULTS

Table 1: Number of *Candida* positive cultures isolated from the samples collected from different sites:

SAMPLES	NO. OF SAMPLES	CANDIDA POSITIVITY
Urine	38	8
Oral swabs	40	3
Skin swabs	39	0
Tracheal aspirate	7	0
Wound swabs	1	0
Surgical drain	4	0

Comment: Out of 129 samples collected from 40 patients, 11 samples are positive for *Candida* (8.52%). Most of the samples yielding to *Candida* production are urine samples, rest being oral swabs.

Table 2: Number of *Candida albicans* & non-*albicans* species isolated from the samples:

CANDIDA SPECIES TYPE	FINDINGS	
	NO.	%
<i>Albicans</i>	1	9.09
Non- <i>Albicans</i>	10	90.90
Total	11	100

Comment: Non-*albicans* comprise of >90% of total *Candida* isolated.

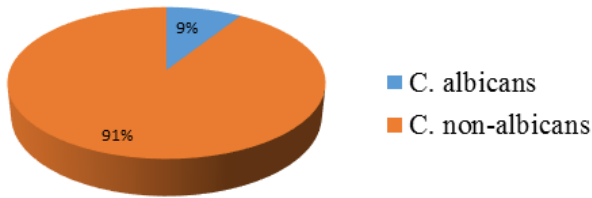


Chart 1: Pie chart showing distribution of *Candida albicans* and *Candida non-albicans* species isolated from different samples.

Table 3: Number of different *Candida* species isolated from the samples collected from different sites:

SAMPLES	CANDIDA ALBICANS	CANDIDA TROPICALIS	CANDIDA KRUSEI	CANDIDA GLABRATA
Urine	1	2	4	1
Oral swabs	0	0	3	0
Skin swabs	0	0	0	0
Tracheal aspirate	0	0	0	0
Wound swabs	0	0	0	0
Surgical drain	0	0	0	0

Comment: Among the non-*albicans* *Candida* isolated, *Candida krusei* amounts for most, followed by *Candida tropicalis* and *Candida glabrata*, the last one being same in number as *Candida albicans*.

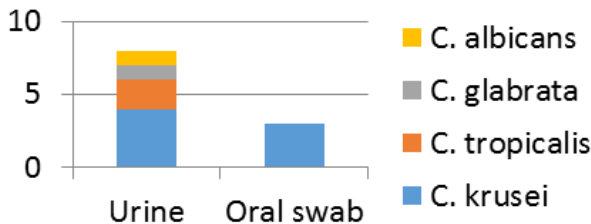


Chart 2: Species of *Candida* isolated from different specimens:

The height of the bars indicate the number of samples tested positive for a particular site.

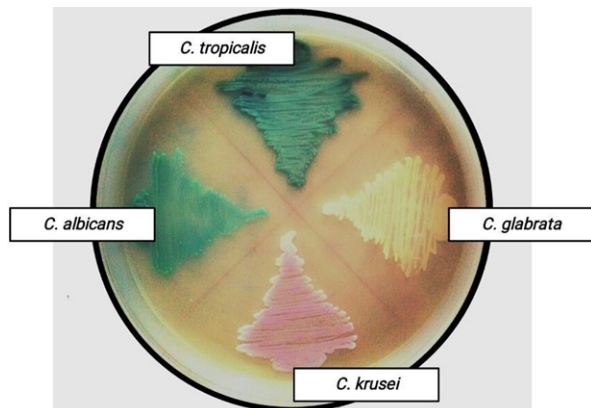


Figure 1: Different *Candida* species identified in *Candida* Chrome Agar.

DISCUSSION

Two main factors predispose to infections with *Candida spp.*: colonization of skin and mucous membrane with *Candida*, and alteration of natural host barriers (wounds, surgery, and insertion of indwelling intravascular and urinary catheters). Colonization with *Candida* is also induced by profound alteration of the endogenous flora resulting from prolonged broad-spectrum antibiotic therapy. Other risk factors include loss of integrity of skin and mucosal barriers – surgery (especially of the abdominal compartment), total parenteral nutrition, acute renal failure, haemodialysis and treatment with immunosuppressive agents.[3] In the past, researchers have tried to predict infections by measuring the *Candida* colonization of distinct body sites (upper respiratory or stomach samples, urine and

wound swabs) divided by the number of sites tested, which became known as the colonization index (CI). Although the negative predictive value was 100%, the positive predictive value for candidemia was relatively low (66%) and could only be improved if the CI was corrected by quantitative culture. [4] In 2006, 'Candida Score' was developed for predicting *Candida* infection in non-neutropenic critically ill patients. External validation of this study has been done independently. Leonetal in 2009 assessed the usefulness of Candida Score in 1107 non neutropenic adult ICU patients in multi centre study conducted in Spain, France and Argentina. For identifying high risk group for invasive Candidiasis, a cut off value of >3 was taken. They reported an area under curve (AUC) of 0.774, positive predictive value of 13.8% and negative predictive value of 97.7%.[5]

This study was conducted in an apex institute where the patient admission flow is massive (including CCU) as the institute itself ranks among one of the topmost in the country. In this era of worldwide threat known as HAI (Health care associated infections), the findings here are no less a reason to bear pride. Invasive candidiasis as we know is of very high incidence among HAI and is a life threatening condition. Here, in this study, none of the cases crossed that dangerous mark, indicating this institution to set an exemplary milestone for other hospitals in controlling HAI. Thus our findings stand in stark contrast against that of the world wide scenario. Magnitude of the problem of candidemia is such that it possesses an international threat. International data at a glance is as follows: in USA rate of candidemia amounts to 0.8/1000 discharges in Europe 0.2 – 0.5/1000 discharges and in Australia 0.09-0.36/1000 admissions , whereas Indian data indicates a 20-30 times higher rate compared to developed world : 1-12/1000 admissions . [6,7,8] Thus, incidences of candidiasis have been found to range from 0.39/1000 to 14.2/1000 on discharge or admission. [9,10] Not only that, among ICU patients, the incidence were higher, around 2.2/1000 to 41/1000 on discharge or admission. [11]

It is to be noted that there has been a shift towards non-*albicans* *Candida* infections in HAI in past two decades. [12] This is where our study comes out with similar findings. *Candida glabrata* remains the most common isolated species in Western countries whereas in Asia, *Candida glabrata* remains low (11% or less) & *Candida tropicalis* is the most common *Candida non-albicans* species in Hong-Kong, Singapore, India. [13] However, in spite of getting majority growth as non-*albicans* *Candida*, our commonest findings was *Candida krusei*.

This study was of a descriptive (observational) nature. If there were any positive findings, it would have been followed up with an analytical type of study, the scope of which is null & void in this case. The study duration was restricted to 2 months, thus limiting samples collection from only 40 patients who fulfilled all the inclusion criteria. In future, this study should be carried out in all the ICUs of major and minor hospitals for sufficient period to evaluate the actual scenario if one wants to keep invasive Candidiasis at bay.

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