EVALUATION OF VITEK 2 SYSTEM AND CHROMAGAR FOR IDENTIFICATION OF YEASTS IN CLINICAL LABORATORY

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ABSTRACT

BACKGROUND

Successfully identifying the species of *Candida* is important in the treatment and management of disease as resistance acquired by some species of *Candida* may avoid prescription of antifungal drugs that may not be available to species.

AIM

We evaluated the performance of VITEK 2 system and CHROMagar in identification of *Candida* species against the conventional culture method.

SETTINGS AND DESIGN

The study was conducted in a tertiary care hospital of Gujarat.

METHODS AND MATERIAL

The study was conducted over a period of 14 months. *Candida* species isolated from various clinical specimen were identified by conventional method as well as by VITEK 2 system and CHROMagar. The sensitivity and specificity of VITEK 2 system and CHROMagar was determined keeping conventional method as a gold standard method.

RESULTS

A total of 48 *Candida* species were identified by conventional method. *Candida tropicalis* (n=26) and *Candida albicans* (n=10) were most common isolates. VITEK 2 system was able to identify 36 (75%) isolates whereas CHROMagar was able to identify 45 (93.75%) isolates of *Candida* to species level. The sensitivity and specificity of CHROMagar for most common *Candida* species i.e. *Candida albicans* was 100% and 97.3% respectively whereas for *Candida tropicalis* was 100% and 95% respectively. The sensitivity and specificity of VITEK 2 system for *Candida albicans* was 100% whereas for *Candida tropicalis* was 76.92% and 100% respectively.

CONCLUSIONS

We concluded that CHROMagar could be routinely used for identification of commonly isolated *Candida* species whereas VITEK 2 system could be used for determining MICs of antifungal agents.

KEYWORDS

Candida, VITEK 2 System, CHROMagar, Sensitivity, Specificity.

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INTRODUCTION

Candida species among various yeasts are common human commensals that cause a wide variety of diseases both in immunocompromised and immunocompetent individuals.^{1,2} Identification of yeast by conventional method is labour intensive and time consuming.³ To overcome this, chromogenic media (CHROMagar) and commercial automated identification systems like VITEK 2 are available.^{3,4} Each of these methods has their own advantages. Comparative studies have given variable results. This study aims to evaluate the performance of a commercially available CHROMagar and VITEK 2 automated system for the identification of clinically important yeasts against the conventional culture method.

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SUBJECTS AND METHODS

This prospective comparative study was conducted from June 2013 to September 2014 in microbiology laboratory of a tertiary care hospital in rural part of Gujarat after approval by institutional ethics committee. Consecutive strains of *Candida* isolated from various clinical specimens were included. The comparison was made between conventional method, VITEK 2 automated system, and CHROMagar in terms of its species identification of *Candida* isolates. Conventional method was considered to be the gold standard.

Conventional isolation and identification of yeast was performed by inoculating clinical specimen on Sabouraud Dextrose Agar (SDA). The plates were examined after 24 hours for the growth of colonies. These colonies were further followed by performing germ tube test, morphology on corn meal agar, sugar fermentation, and assimilation test for identification of *Candida* species through conventional method. The average time taken for identification of *Candida* species by conventional method was 72-96 hours. The colonies from 24 hours growth on SDA were used for VITEK 2 automated system. Species identification was provided by VITEK 2 automated system after 24 hours of incubation. The average time taken for identification of *Candida* species by

VITEK 2 automated system was 48 hours. Simultaneously, the specimen was inoculated on CHROMagar and species were identified after 24 hours based on their characteristics colony colours as per the manufactures instructions.⁵

The sensitivity and specificity of CHROMagar and VITEK 2 automated system was calculated in comparison to conventional method.

RESULTS

Out of 50 isolates of *Candida* species that were isolated from the clinical specimens, 48 were identified to species level by conventional methods and were included further in the study. Of these, *C. tropicalis* was the most common i.e. 54.16% (n=26) followed by *C. albicans* 20.8% (n=10), *C. glabrata* 10.41% (n=5), *C. parapsilosis* 12.5% (n=6), and *C. krusei* 2.08% (n=1). All 10 isolates of *C. albicans* were positive for germ tube test whereas the remaining 40 isolates including the two isolates that were not identified by conventional method were negative for germ tube test. When compared with conventional method, VITEK 2 system was able to identify 36 (75%) isolates whereas CHROMagar was able to identify 45 (93.75%) isolates. Comparison of various species isolated by all three methods is shown in figure 1 and sensitivity and specificity for each species by these methods has been calculated as shown in Table 1.

Candida Species	CHROMagar		VITEK 2 system	
	Sensitivity (%)	Specificity (%)	Sensitivity (%)	Specificity (%)
<i>Candida albicans</i>	100	97.3	100	100
<i>Candida tropicalis</i>	100	95	76.9	100
<i>Candida parapsilosis</i>	66.6	100	66.6	100
<i>Candida glabrata</i>	80	100	40	100
<i>Candida krusei</i>	100	93.8	100	100
Table 1: Sensitivity and Specificity of Different Methods in Identifying Candida Species (n=48)				

DISCUSSION

Invasive candidiasis is one of the major causes of morbidity and mortality in both immunocompromised and immune-competent patients, the crude and attributable mortality being as high as 20% and 40% respectively.^{6,7}

Accurate species identification of *Candida* is important for timely and effective treatment of the infections as the non-*albicans* species continue to be increasingly isolated and their response to the antifungal therapy is highly variable. Most of the fluconazole-resistant species recovered from clinical specimens particularly blood have been non-*albicans*.⁸

In present study, *Candida non-albicans* formed major group of isolates (80.2%) where *C. tropicalis* accounted for 54.1% (n=26) of all isolates. Jain et al. also reported *Candida non-albicans* as major group of all isolates (86%) with *C. tropicalis* accounting for 64% of all isolates. The reason for emergence of non-*albicans* species as human pathogen could be attributed to a higher amount of resistance to antifungal agents in non-*albicans* spp. when compared to *C. albicans* thus giving a selective advantage to these species.⁹

In our study, 48 *Candida* species were identified by conventional method. VITEK 2 system was able to identify 34 (Sensitivity = 71%) of these isolates, nine isolates (19%) were falsely identified and five isolates (10%) were not identified. In contrast, 45 isolates (sensitivity = 94%) were accurately identified by CHROMagar and three isolates (6%) were incorrectly identified.

As seen in the Table 1, sensitivity and specificity of VITEK 2 with respect to conventional method for *C. krusei* and *C. albicans* was 100%. CHROMagar was found to give 100% sensitivity for *C. albicans*, *C. tropicalis*, and *C. krusei* with a specificity of 97.3%, 95%, and 93.87% respectively. VITEK 2 gave lowest sensitivity in identification of *C. glabrata* i.e. 40%, but with 100% specificity. *C. parapsilosis* was identified with low sensitivity of 66.66% by both VITEK 2 and CHROMagar with 100% specificity.

Thus, we found CHROMagar to be more sensitive in comparison to VITEK 2 i.e. 94% vs 71%. This is in contrast to the finding by Agarwal et al who found VITEK 2 system more sensitive (97% vs 86%) in comparison to CHROMagar. Sensitivity of identification by CHROMagar in their study was 100% for *C. rugosa* followed by 89%, 80%, and 77% for *C. albicans*, *C. tropicalis*, and *C. parapsilosis* respectively.¹⁰ Baradkar et al found CHROMagar sensitivity and specificity of 60-100% and 88-100% respectively for various *Candida* species, which is similar to our findings. They also reported 100% sensitivity and specificity in identification of *C. tropicalis*. For other species, it was *C. albicans* (96.55 and 96.42%); *C. parapsilosis* (80 and 98.03%); *C. glabrata* (90.90 and 88.23%); and *C. dubliniensis* (60 and 96.55%) respectively.¹¹

In a study by Sood et al, VITEK system and conventional method were found to have an agreement of 68% with respect to identification of *Candida* species. Moreover, VITEK 2 system identified 14 *Candida* species where conventional method had failed.¹² In a study by Jain et al, VITEK 2 had lower sensitivity compared to CHROMagar with agreement of 49%, 39%, and 31% for *C. tropicalis*, *C. albicans*, and *C. parapsilosis* respectively, but this was 100% for *C. rugosa*.¹³ We had a low sensitivity of 40% for *C. glabrata* by VITEK.

Thus, CHROMagar and VITEK 2 system have given variable sensitivity and specificity. CHROMagar was able to identify majority of common isolates i.e. *C. albicans*, *C. tropicalis*, *C. glabrata*, and *C. krusei* in the present study. VITEK 2 system could identify two out of three *Candida* species where CHROMagar failed. Hence, CHROMagar supported by VITEK 2 system could be effectively used in identification of *Candida*.

Identification of *Candida* species by conventional method may take up to 72 hours or more, which is possible within 24-48 hours by CHROMagar with a high sensitivity and is recommended as a method of identification from clinical specimens. VITEK 2 system in contrast has a lower sensitivity compared to CHROMagar, but has an advantage of giving minimum inhibitory concentrations of antifungal agents, which currently is required for management of patients as drug resistance is becoming increasingly common amongst various *Candida* isolates. Moreover, VITEK 2 system is an automated system requiring an electrical backup and other accessories for processing of an isolate. The system utilizes special cards for identification of *Candida* species and for determining their antimicrobial susceptibility patterns. Apart from this, it requires a proper quality control procedure to

ensure that the results provided by the system are accurate thus making VITEK 2 system a costly affair. However, a major advantage of using this system is its ability to provide minimum inhibitory concentrations of various antifungal agents. On the other hand, CHROMagar is a cheaper alternative for identification of *Candida* species and does not require extensive technology and skill to identify the isolate. However, CHROMagar could only be used for rapid identification of isolate and does not provide a benefit of determining antifungal susceptibility as with VITEK 2 system. An early identification of *Candida* species done by CHROMagar, however, could be of great help in clinical decision making and patient's outcome.

Based on the findings of the present study and pros and cons of both the identification systems, it was concluded that CHROMagar could be routinely used as a medium for rapid identification of *Candida* species whereas VITEK 2 system could be used in support to CHROMagar and for determining minimum inhibitory concentrations of antifungal agents. A limitation of the study was that the number of isolates used for comparison of the two methods was fairly low owing to a smaller number of clinical specimens being received for fungal culture. However, the authors would recommend performing a similar kind of study with large number of isolates to validate the results of the present study.

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