

Detection of some *Candida albicans* virulence factors isolated from renal failure patients

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Abstract

Chronic kidney failure, is linked to a poor prognosis and a high mortality rate. The goal of this study was to look at the possibility of finding any virulence factors in *Candida albicans*. 45 patients with chronic kidney disease are included. Whose ages were between 17-75 years. The mean age of cases group was 47.87 ± 13.029 mostly in the age range of 41–52 years (44.4%), and that of 51–60 years (59.9%) (healthy controls 45) was 43.91 ± 12.137 years old mostly at the age group of 29-40 years (37.8%) without significant mean differences among them ($t = -1.490$, $df = 88$, $P = 0.140$), and no significant differences were identified regarding age groups of study samples ($P > 0.05$) and they admitted to dialysis unit of Kirkuk General Hospital. The study included 15 *Candida albicans* were isolated from their urine sample (33.33%) and most of positive *Candida* cases were found to have a positive germ tube productivity test (100%), and most of positive *Candida* cases were found have non-biofilm producer test ($OD \leq ODc$) (7; 46.67%), whereas five cases (33.33%) were found to test a poor biofilm maker ($ODc < OD \leq 2 \times ODc$), and two cases (13.33%) were found to have a medium biofilm producer test ($2 \times ODc < OD \leq 4 \times ODc$), and only one case (6.67%) was found to have an excellent biofilm producer test ($4 \times ODc < OD$).

Keywords: *Candida albicans*, Biofilm, germ tube.

INTRODUCTION

The kidneys receive a plentiful blood supply that they use to assess and modify the organ systems' functioning condition. They are an important blood filter organ and the main organ in charge of maintaining both blood pressure and the balance of water in the body as a whole. Along with clearing our bodies of toxins, drugs, and metabolic waste [1].

Chronic renal disease is one of the primary causes of death and suffering in the twenty-first century (CKD)[2].

The development of a biofilm by *Candida albicans* on the surface of the host or on abiotic surfaces is linked to high morbidity and mortality (implants)[3], Due to its ability to morphologically switch from yeast to hyphae, *Candida albicans* can produce a biofilm that is a complex structure made up of several morphological shapes.. [4].

Candida albicans :

The most prevalent opportunistic pathogenic fungus in humans, *Candida albicans* is thought to be the cause of 60% of mucosal infections and 40% of cases of candidiasis [5].

Virulence factors :

A variety of microbiological processes, such as biofilm development and The production of hydrolytic enzymes is largely responsible for *Candida albicans*' pathogenicity (including phospholipase, proteinase). *C. albicans* benefits from biofilm formation by producing pseudohyphae and becoming resistant to antifungals.

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How to cite this article: Muthna N. Abdullah, Mohammed H. Mushrif, Hayfaa M. Fahad, Detection of some *Candida albicans* virulence factors isolated from renal failure patients, J PHARM NEGATIVE RESULTS 2022;13: 831-834.

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DOI:
10.47750/pnr.2022.13.04.112

The hydrolytic enzymes make it easier for Candida infections to spread by allowing C. albicans hyphae to enter the epithelium. The host cell membranes' phospholipids are broken down by the phospholipase enzyme, resulting in the membranes' disintegration and opening up for cell invasion and penetration. By dissolving elastin, C.albicans proteinases aid the organism's invasion of the host tissue [6].

In the majority of C. albicans infections, the growth of a biofilm on the surface of the host or on abiotic surfaces results in severe morbidity and death. (implants), The biofilm of C. albicans is a complicated structure of several morphological shapes since this organism can morphologically change from yeast to hyphae. The biofilm goes through a number of successive developmental phases [3].

Materials and methods

Between November 2021 and March 2022, we collected samples from 240 patients with chronic renal illness (168 men and 72 women), whose ages ranged from 17 to 75, and who had been admitted to the Kirkuk General Hospital's dialysis unit. (45) healthy control people made formed the control group that was matched to the patients. The following variables were covered in an interview with these patients using a questionnaire form created by the researcher: Age, sex, place of residence, and underlying

illness variables: residence, underlying disease. Sabouraud Dextrose Agar was used to culture the urine samples and CHROMagar Candida .

Germ tubs formation :

Candida albicans can be identified using a germ tube test. Horse serum was used to vaccinate the isolated colonies, which were subsequently cultured at 37 °C. After 2-3 hours of incubation, a wet mount made from inoculated horse serum was prepared and examined microscopically for the development of germ tubes. [7].

Biofilm formation test:

According to the following formula, the optical density cut-off value (ODc) was determined to be three standard deviations (SD) above the optical density (OD) of the negative control's mean value. ODc is calculated as follows: $ODa = ODb + (3SD \text{ of } a)b$. The outcomes were categorized into four groups based on their optical densities as follows:: Figure 1).

- 3) Effective biofilm producer ($4 \times ODc < OD$).
- (2) A medium-level developer of biofilms ($2 \times ODc < OD \leq 4 \times ODc$).
- (1) Weak producer of biofilms ($ODc < OD \leq 2 \times ODc$).
- ($OD > ODc$) generator of non-biofilm zero.

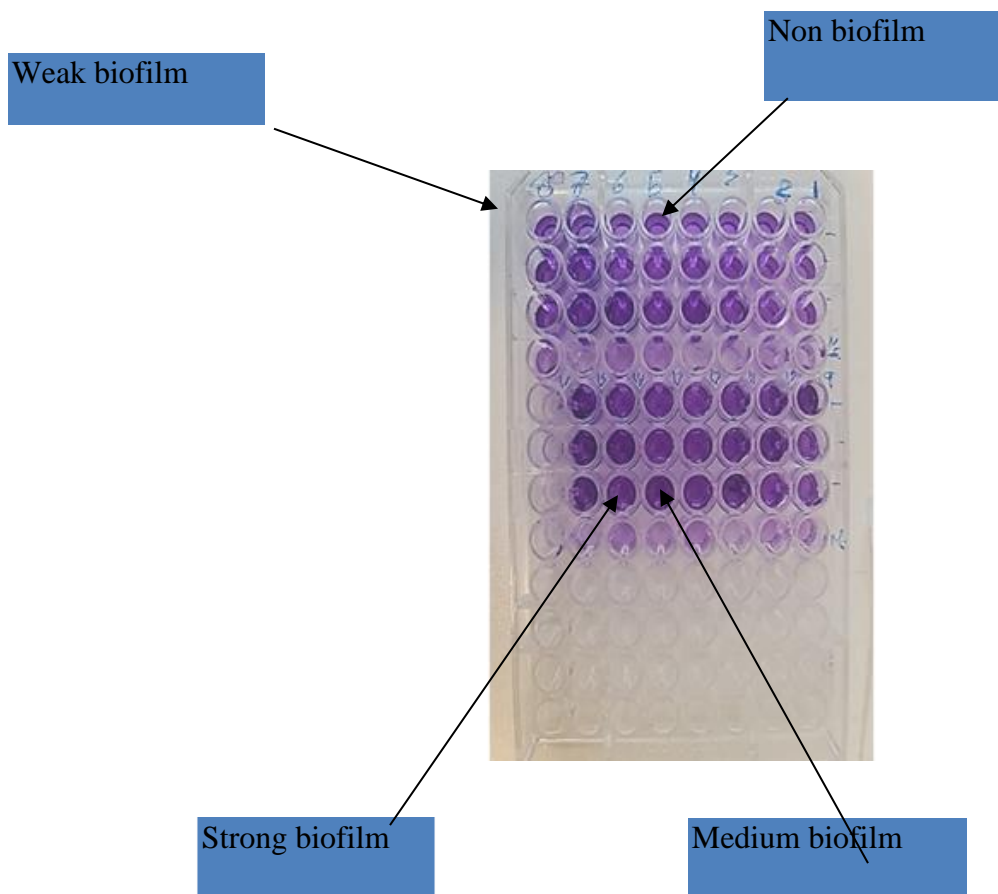


Figure 1 Biofilm production.

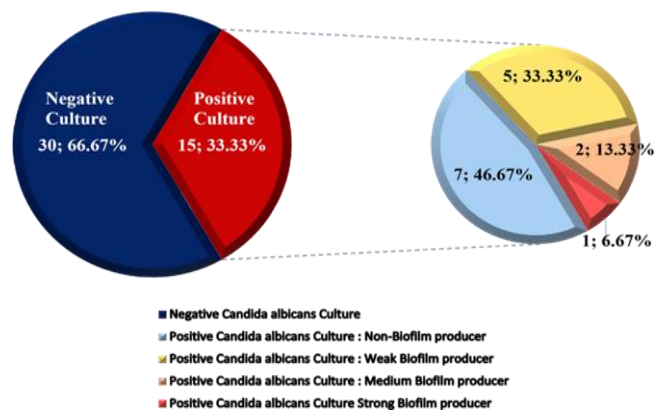
Statistical analysis in methods

Both STATISTICA version 12 and the Statistical Package of Social Science (SPSS) version 26 were used to enter and analyze the data. For quantitative data, mean, standard deviation, and range were used; for qualitative data, frequency distribution tables, number, and percentage were employed.

Results:

Germ tube and Biofilm productivity tests :

Regarding virulence factors of isolated Candida among cases group, the entire overall 15 positive-Candida-cultures were found to have a positive germ tube productivity test (100%), and according to optical density (OD) and optical density cutoff value (ODc), most of positive Candida cases were found to have non-biofilm producer test ($OD \leq ODc$) (7; 46.67%), whereas five cases (33.33%) had a poor biofilm producer test result. ($ODc < OD \leq 2 \times ODc$), and two cases (13.33%) were found to have a medium biofilm producer test ($2 \times ODc < OD \leq 4 \times ODc$), and only one case (6.67%) was found to have an excellent biofilm producer test ($4 \times ODc < OD$). (Figure 2).



Discussion:

Incidence of fungal infection especially Candida albicans among patients with renal failure and haemodialysis patients in the recent decades.

Virulence factors of isolated Candida albicans among cases group, In the current study, we found that (100 %) of positive-Candida-cultures had positive germ tube productivity test.

In this study, we closely examined the human serum germ

tube test as a crucial technique for identifying Candida species, particularly C. albicans. Also, iterate its possible cost-benefit aspect.

In agreement with this result, [8]. Rapid identification of this organism in the clinical laboratory is crucial and relevant because C. albicans is the It is a major issue for worldwide public health, the top cause of death in seriously ill individuals, and a unique risk factor for invasive candidiasis. In agreement with this result, [9] . 146 of 150 (97.6%) isolates grown in foetal bovine serum were germ tube positive. It was determined that this was C. albicans.

The study shows that according to optical density (OD) and optical density cutoff value (ODc), most of positive Candida cases were found to have non-biofilm producer test ($OD \leq ODc$) (7; 46.67%), whereas five cases (33.33%) were discovered to have a test for a subpar developer of biofilm ($ODc < OD \leq 2 \times ODc$), and two cases (13.33%) were found to have a medium biofilm producer test ($2 \times ODc < OD \leq 4 \times ODc$), and only one case (6.67%) was found to have an excellent biofilm producer test. ($4 \times ODc < OD$).

In agreement with current results, [10] The difference between 46% of positive biofilm and 54% of detrimental biofilm was not statistically significant. However, only 21.73% of the positive Candida biofilm produced strong biofilm, while the remaining 78.27% produced weak biofilm.

Conclusion:

In this study we investigation, some of Candida albicans virulence factors isolated from renal failure patients.

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