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DISTRIBUTION OF PATIENTS INFECTIONS WITH HEMODIALYSIS RENAL FAILURE DISEASE

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ABSTRACT: Dialysis patients are at increased risk of fungal infection mortality compared to the general population. Oropharyngeal candidiasis is one of the almost public, oral mucosal inflammatory. In both healthy and immunocompromised individuals, colonization of the oral cavity by *Candida* spp. is a risk factor for initiation of oral candidiasis. In this study amid to isolation and identification of fungal pathogens associated with hemodialysis patients. The results showed nine species of molds and three species of yeasts and seven species of molds and six species of yeasts are isolated and diagnosed from oral swab samples for hemodialysis patients and control individuals. The highest number of frequency percentage of fungi is *A. flauvs* (12.63%) of blood sample and of yeast is *C. albicans*(41.53%**)**.

KEYWORDS: Fungal infections, Hemodialysis, Bloodstream infections.

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I. INTRODUCTION

Hemodialysis is a process of clean the blood from accumulation toxic substance. It is used to patient with acutely ill patients who need short term dialysis or end stage renal disease who need continual term dialysis. (Kazemi *et al*., 2011). Hemodialysis is the most common method used to treat advanced and permanent kidney failure. In hemodialysis, the blood flows through a special filter to remove waste products and extra fluids. The clean blood is then returned to the body. The aim of this step isto maintain normal blood pressure and keep the proper balance of chemicals in the body like sodium and potassium (Richard *et al*., 2014).

Hemodialysis starts when the patient has symptomatic progressive renal failure but before the development of serious complications, frequently with a plasma creatinine of 600-800 mmol/l (6.8-9.0 mg/dl) (Walker *et al*., 2017). Furthermore these HD as a treatment of irreversible renal failure must be continued intermittently for the patient's lifetime, unless a successful kidney transplant is done (Gerogianni and Babatsikou, 2014)

The most common reasons for contamination of peritoneal fluid with fungi are breaks in sterile technique when connecting peritoneal catheters to dialysate bag, exit site infection, intestinal perforation and transmigration of fungi across the bowel wall into the peritoneum (Prasad *et al*., 2004)

Most fungal infections involve nosocomial or environmentally acquired pathogens such as *Candida*, *Aspergillus*, Zygomycosis (*Mucor*), *Cryptococcus* species and *Pneumocystis carinii*, and the geographically restricted mycoses, presenting as either reactive or newly acquired disease. *Aspergillus*, *Cryptococcus*, and *Candida* are the major causative pathogens (George and Shankar, 2003; Lin *et al*., 2005).

Fungal infections after transplantation appear to occur in two groups. In the initial 4 weeks after transplantation, Candidiasis of the oropharyngeal, vaginal, or intertriginous area may be seen and is related to intravenous lines, bladder catheters. After 4 weeks, net accumulation of immunosuppression allows opportunistic fungal infections such as *Cryptococcus neoformans*, *Aspergillus*, etc., to occur (Abott *et al.*, 2001; Gandhi *et al*., 2005).

Nosocomial BSI is known as culture of a recognized pathogen in bloodstream of a patient who has been hospitalized for >48 hours, so the infection that is absent or incubating when the patient is admitted to the hospital, in contrast to community-acquired BSI (Rupp, 2004).

Candidemia or BSIs caused from yeasts of the *Candida*spp pose a major threat to the patients in hospitals worldwide (Pfaller and Diekema, 2007). In Europe, *Candida*spp occupies ranks 7th to 8th among blood stream causes in hospitalized patients, which represents 4–6% of BSIs (Marchetti*et al*., 2004). *Candida* is the 4th

commonly cause (BSIs) in patients of hospitals, and the major species such *C. albicans*, *C. krusei*, and *C. parapsilosis* (Çerikçiog *et al*., 2010; Sabeeh*et al*., 2013). Candidemia is not only linked with a mortality of about (30 to 40) % but also prolong the period of hospital stay and rising the cost for hospital care (Dabas,2013).Candidemia is an important complication of renal failure and of hemodialysis (Pyrgos *et al*., 2009).

Although renal failure is a recognized risk factor for candidemia, little is known about the risk factors for candidemia in these patients receivinghemodialysis. We therefore studied the epidemiology, microbiology and outcomes of hemodialysis-associated candidemia by retrospectively analyzing a cohort of adult patients with and without infection. In most series, *C. albicans* remains the most frequently isolated species but non- *C. albicans* Candida species are increasing in frequency (Gow *et al*., 2011). The prevalence of infection and relative distribution of the different species is influenced by host and environmental factors including geographic locale, exposure to antimicrobial agents and underlying illness (Yang *et al*., 2014).

II. MATERIALS AND METHOD

Patients: One hundred of renal failure patients with different age groups ranging from (10 to 97 years) were classified into two groups according to the duration of renal failure disease as follows:

1. Group I (G1): the group of patients with disease length of (less than 3 months) was considered the groups with acute kidney injury (AKI) depend on of diagnosis of the doctor.
2. Group II (GII): the group of patients with disease more than 3 months was considered the group with chronic kidney disease (CKD) (Gahlot *et al*., 2014).

Data collection included name, age, gender, chemical examination finding, underlying illness like diabetes mellitus, uremia and hypertension, history and number of previous dialysis, hepatitis, concurrent other infections were recorded.

Sample collection: This study included collection clinical specimens based on standard methods (Roa, 2012; Sabeeh *et al*., 2013). The samples collected one hundred samples collected from the oral cavity by swabs with transport media in patients with acute and chronic renal failure, and one hundred samples collected from venous blood stream of patients with renal failure. As well as control group included 15 blood samples and 15 oral swabs taken from healthy peoples who didn't have renal failure history.

Cultivation of specimens: For blood specimens tow milliliters of blood were collected from each patient, blood injected directly in glass plain tube which contain20 ml of BHI (Brain heart Infusion) broth (Sabeeh *et al.*, 2013). for the purpose of being transferred from the hospital to the laboratory was used cold box to transfer samples. Then incubated blood cultures at 28C^{o} for 7days. Growth sub-cultured on SDA (Sabouraud's dextrose agar) by streaking and incubate at 28-30C^{o} for 24-48h to yeast isolation and 7 days to mold isolates.

While for oral cavity specimens were grow on the SDA medium then grown pouring and streaking methods to get single colonies and the Petri dishes were incubated at 28-30C for 48-72 hour. After the incubation interval, loop full of single colony growth on SDA and then streaking on CHRO Magar and incubated for 24-48 h at 37C^{o}.The isolated colony on CHRO Magar have several colors (green, dark pink, pink, white and purple) (Nadeem *et al*., 2010).

III.RESULTS AND DISCUSSION

Patients and collection of specimens

The history and clinical characteristics of failure renal patients with hemodialysis according to the culture results are shown in table (1). The results are shown percentage rate of positive culture in male 68.51%, while in female 80.43%. Although the highest incidence of hemodialysis patients was the age group 51-70 years was 40cases, however, the highest rate of positive culture in age group 10-30 years. When compered between chronic and acute hemodialysis patients according to the culture results, the highest rate of positive culture was in chronic cases (84.28%). While there is not much difference of positive culture in hemodialysis patients with or without diabetes or hepatitis.

This indicates that the number of males with renal failure is more than female. This result agrees with Powe*et al*. (1999) they studied on hemodialysis patients with total number 4005 was rate of male 52.3% and female 47.7%. In addition other studies were agree with our results of male patients is highest rate compared with female such as (Fasolato*et al.*, 2007; Samani*et al*., 2014) when they studied on bloodstream infection among patients undergoing hemodialysis. Our results not agrees with another source (Gauna*et al*., 2013) when they study 27 male and 32 female of hemodialysis patients with end stage renal disease. Also, Fysaraki*et al*. (2013) mention

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that the number of females is higher than male (53, 49) respectively when they isolated bloodstream pathogens from patients undergoing hemodialysis.

This result agrees with several studies(Fysaraki*et al*., 2013; Gauna*et al.*, 2013) they compared the gender, age, diabetes, recent surgery and other clinical characteristics according to the culture results. The risk factors for infection of patients with renal failure disease include exposure to antifungal agents, extremes in age and illness with immune dysfunction such as diabetes and others (Powe*et al*., 1999; Pyrgos*et al*., 2009).

Table 1: Distribution of History of Hemodialysis Patient According to Culture Results

History of patients N= 100		Positive culture n= 74				Negative culture (%)	Total no.
		Blood sample	Oral swabs	Both	Positive total no. (%)		
Gender	Male	5	13	19	37 (68.51)	17 (31.48)	54
	Female	6	11	20	37 (80.43)	9 (19.56)	46
Age	10-30	3	6	10	19 (86.36)	3 (13.63)	22
	31-50	3	5	9	17 (70.83)	7 (29.16)	24
	51-70	4	10	14	28 (70.0)	12 (30.0)	40
	71-92	1	3	6	10 (71.42)	4 (28.57)	14
Type	Chronic	7	19	33	59 (84.28)	11 (15.71)	70
	Acute	4	5	6	15 (50.0)	15 (50.0)	30
Diabetes	Yes	4	12	10	26 (76.47)	8 (23.52)	34
	No	7	12	29	48 (72.72)	18 (27.27)	66
Hepatitis	Yes	1	6	9	16 (84.21)	3 (15.78)	19
	No	10	18	30	58 (71.60)	23 (28.39)	81

Isolation and identification

Blood specimens: A total number of fungi colonies is 277 isolated from 115 clinical blood samples taken from Hemodialysis patients with renal failure diseases and healthy controls, the number and percentage of fungi species isolated from clinical blood samples were summarized in table (2).

Nine species of molds and three species of yeasts are isolated and diagnosed from blood samples for hemodialysis patients and control individuals. The total number of frequency percentage for mold species is 54.87% (152/277), while The total number of frequency percentage for yeast species is 45.12% (125/277). Figure (1) shows the result of positive and negative culture of molds and yeasts isolates for blood samples.

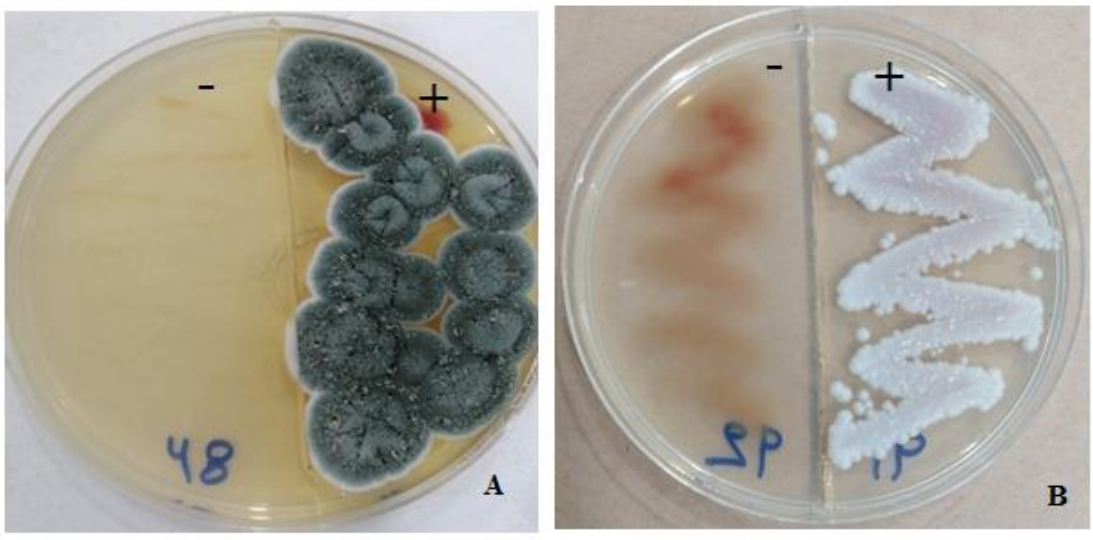

Fig. 1: The result of positive and negative culture of blood samples, A: positive mold culture, B: positive

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When compared between number and percentage of molds and yeasts species isolated from blood samples (table 2). The results have that the distribution of molds species, the highest number of frequency percentage is for *A. flauvs* reached percentage of 12.63% (35/277), followed by *Alternaria* sp. 18.83% (30/277)and *Penicillium*sp.9.38% (26/277),...etc.The invasive renal mycosis occur with increased frequency in renal failure patients and following renal transplantation (Gupta, 2001). The renal zygomycosis is rare and cause acute renal failure (Gupta *et al*., 1999). Our results were agreed with (Mahmoudabadi*et al*., 2009)they isolated fungal species of dialysis filters in patients with kidney failure on hemodialysiswere *Aspergillusniger*, *A. flavus*, *Penicillium* and *Rhizopus*.

while yeast species in our study is 125 colony of only ten samples and three species of *Candida* with highest rate is 18.77% for *C. krusei*, then *C. albicans*15.52%, and *C. glabrata* 10.83%. In Candidaemia studies (Sung *et al*., 2001) they studied on Candidaemia in patients with dialysis of acute renal failure and isolated *C. albicans* with high rate is 75.7% but *C. tropicalis* and *C. parapsilosis* with 16.5% and 8.1% respectively. Fungal species is serious risk factores of peritoneal dialysis patients especially *C. albicans* (25%) and other *Candida* species (44%) (Miles *et al*., 2009). While Gauna*et al*. (2013) they isolated 9.2% of *Candida* spp. as *C. parapsilosis*, *C. Guilliermondii*, and *C. albicans* respectively.

Table 2: Distribution of Molds and Yeasts Species in Clinical Blood Samples of Renal Failure Patients and Control.

Molds species	No. of sample	No. of colonies (%)	Yeasts species	No. of sample	No. of colonies (%)
***Alternaria*sp.**	3	30 (10.83)	***Candida albicanes***	3	43 (15.52)
Aspergilluscandidus	1	2 (0.72)	***C. glabrata***	3	30 (10.83)
A. flauvs	12	35 (12.63)	***C. krusei***	4	52 (18.77)
A. fumegatus	1	2 (0.72)			
A. niger	6	6 (2.16)			
A. terreus	7	10 (3.61)			
Cladosporiumherbarum	5	17 (6.13)			
C. sphaerospermum	6	23 (8.30)			
***Penicillium*sp.**	5	26 (9.38)			
White mycelia	1	1 (0.36)			
Total no.	47	152 (54.87)		10	125 (45.12)
Colonies total no.	**277 (99.99)**				

Oral cavity swabs samples

A total number of fungi colonies is 2215 isolated from 115 clinical oral swab samples taken from Hemodialysis patients with renal failure diseases and healthy controls, the number and percentage of fungi species isolated from clinical blood samples were summarized in table (3).

Seven species of molds and six species of yeasts are isolated and diagnosed from oral swab samples for hemodialysis patients and control individuals. The total number of frequency percentage for mold species is 3.74% (83/2215), while The total number of frequency percentage for yeast species is 96.25% (2132/2215). Figure (2) shows the result of positive and negative culture of molds and yeasts isolates for oral swab samples.

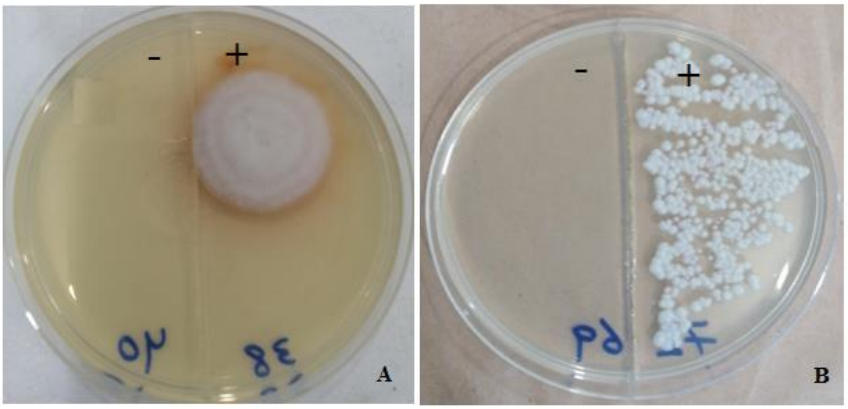

Fig. 2: The Result of Positive and Negative Culture of Oral Swabs Samples, A: Positive Mold Culture, B: Positive Yeast Culture.

When compared between number and percentage of molds and yeasts species isolated from oral swab samples (table 4-7). The results have that the distribution of molds species, the highest percentage appeared in *C. sphaerospermum* 1.03% (23/2215), followed by *A. flauvs*1.00% (22/2215), and *C. herbarum* 0.9% (20/2215). Aspergillosis is one uncommon oral deep fungal infections especially with immunocompromised patients (Grover *et al*., 2013). Pire-Goncalves*et al*. (2008) they isolated fungi from water used at hemodialysis center were 50 isolates of rooms hemodialysis water and 41 isolates of machines water especially *Fusarium* sp., *C. parapsilosis*, *Trichoderma* sp., *Aspergillus*sp. and *Penicillium* sp.

While the results of yeast species in our study shows highest number of colonies that 2132 in 32 samples with highest rate is 41.53% for *C. albicans*, then *C. glabrata* 24.83%, *C. krusei* 18.05%, *C. parapsilosis* 11.28%, *C. tropicalis* 0.10% and *R. mucilaginosa* is 0.45%. This result agrees with Silva *et al.* (2017) when isolated oral yeast in dialysis patients were *C. albicans*, *C. glabrata* and *C. carpophila* respectively. Also, Pyrgos*et al*. (2009) they isolated *C. glabrata* is 26%, and all of *C. albicans* and *C. parapsilosis* are 23%. The altered oral pH may have an impact on *Candida* growth, given that oral *Candida*isolates have been shown to be more adapted to acidicconditions, in addition,changes in the oral pH may be the major ecological factor that alters the oral commensal microbiome, leading to shifts in its natural diversity (Mayer *et al*., 2013).

Table 3: Distribution of Molds and Yeasts Species in Clinical Oral Cavity Samples of Renal Failure Patients and Control

Molds species	**No. of sample**	**No. of colonies (%)**	**Yeasts species**	**No. of sample**	**No. of colonies (%)**
A. flauvs	6	22 (1.00)	***Candida albicanes***	13	920 (41.53)
A. niger	5	11 (0.50)	***C. glabrata***	7	550 (24.83)
A. parasiticus	1	2 (0.10)	***C. krusei***	5	400 (18.05)
Cladosporiumherbarum	9	20 (0.90)	***C. parapsilosis***	3	250 (11.28)
C. sphaerospermum	12	23 (1.03)	***C. tropicalis***	1	2 (0.10)
***Fusarium*sp.**	1	2 (0.10)	***R. mucilaginosa***	3	10 (0.45)
***Rhizopus*sp.**	1	1 (0.05)			
White mycelia	2	2 (0.10)			
Total no.	37	83 (3.74)		32	2132 (96.25)
Colonies total no.	**2215 (99.99)**				

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