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COMPARATIVE STUDY OF CADIDA ALBICANS IN IRAQ

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Abstract:
Candida species are the most common opportunistic pathogens in debilitated or immunocompromised hosts and cause systemic candidiasis, which has high rates of morbidity and mortality. The study aims to compare the incidence of Candidiasis among the cities of Iraq and its prevalence and the most affected cities, as well as the comparison of the results of the injury with the neighboring countries and the rates of injury.

Keywords: Cadida, Albicans, Comparative Study

1. INTRODUCTION

Candida species are the most common opportunistic pathogens in debilitated or immunocompromised hosts and cause systemic candidiasis, which has high rates of morbidity and mortality. Over the past two decades, Candida species have become the leading pathogens responsible for nosocomial bloodstream infections and C. albicans, the pathogen that correspond to more than 50% of these infections, is a normal commensal of the human gut microflora that can cause invasive superficial and disseminated infections in immunologically susceptible hosts [1].Most of these infections are nosocomial and raise the issue of their prevention. The process of subtyping C. albicans is epidemiologically important for recognizing outbreaks of infection, detecting cross-transmission, determining the source of the infection, recognizing particularly virulent strains if any, or detecting the emergence of drug resistant strains [2] Molecular typing methods for Candida species currently used include sequence analysis of the internal transcribed spacer region (ITS), and multilocus sequence typing (MLST) targeting a consensus sequence that consists of seven housekeeping genes. Overall, antifungal drug resistance (ADR) and fungal virulence characteristics such as biofilm formation are critical issues for the host-pathogen relationship in candidiasis. However, very little is known about the relationship between drug resistance and virulence of C. albicans. [3] In this study, we aim to collect isolates labeled as C.albicans and Candida non-albicans by the hospital and compare the accuracy of hospital phenotypic identification to that of molecular typing. As such, 109 samples were collected from two major hospitals between June and Octobor 2011.

Identification methods used were API, germ tube, CHROMagar, and ITS typing.Furthermore, antifungal susceptibility testing against 4 antifungal drugs was performed, and the isolates were also tested for biofilm formation, followed by MLST typing for selected isolates to determine the epidemiological relatedness of the strains.

2. LITERATURE REVIEW

2.1 Overview of *Candida albicans*

Candida infections have increased enormously, especially in immuno-compromised patients [4]. *C. albicans* is the leading pathogen responsible for most of the *Candida* infections [5]. It is dimorphic commensal yeast that is part of the normal flora of healthy individuals [6]. It mainly resides in the mucosal surfaces of the oral cavities and the gastrointestinal surfaces [7]. Among the fungal pathogens, *C. albicans* is the most commonly isolated from patients accounting for 70-80% of total fungal bloodstream infections [8]. Having an unknown sexual cycle, and unknown distinguishable character in morphology and phenotype, *Candida* is reported in literature as a "taxonomic pit". *C. albicans*, the imperfect yeast, in particular, is the leading pathogen in this category and thought to be associated with warm-blooded animals only [9]. It is a polymorphic, diploid pathogen having eight chromosomes containing 16-Mb genome [10]. Controversy exists whether it is aerobic, anaerobic or facultative anaerobe [11].

C. albicans infections, particularly hospital acquired, have two reservoirs, the patient normal flora and the environment, that interact together and make it hard to block the transmission of the pathogen between patients [12]. These infections range from superficial, infecting the skin, mouth, and vagina, to systemic infection that is considered a major issue and associated with high morbidity and mortality rates especially in immunosuppressed individuals (HIV, chemotherapeutic, and organ transplant patients) [13]. The virulence of *C. albicans* can be attributed to several factors such as phenotypic switching, transition between hyphae and yeast, and secretion of some proteases and phospholipases [14]. Treatment of

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Candida infections in general and *C. albicans* in particular, is limited as far as classes and number of antifungal drugs available compared to antibiotics for example due to the presence of homologue to the targets of the antifungal drug in humans.

Only five major classes of antifungal drugs are currently available including the most commonly used azloes, polyenes, fluoropyrimidines and the newly generated echinocandins. The latter is used as an alternative for isolates showing resistance to the former antifungal drugs [15].

2.2 Occurrence

It is estimated that 30-70% of healthy individuals carry this pathogen as normal flora of the skin, the mucosa of the gastrointestinal tract and the genital areas. Weakening of the immune system at any given time would result in a shift in the immunity balance, giving the opportunity for the dissemination of *Candida* leading to serious infections [16]. The infections can be fatal in immunosuppressed patients if not identified and treated [17]. In Taiwan, *Candida* is rated as the primary pathogen accounting for blood stream infections since 1993 and is also considered as a major predictor of mortality for ICU patients [18].In the UK, between 1997 and 2002, *Candida* infections were one of the principal pathogens for nosocomial blood stream infections and it was estimated that 3/100 000 were *candida* infected patients with candidemia with prolonged hospitalization period and high mortality rates. The result of a case-control study conducted in the USA gave similar results as far as prolonged hospitalization period [19] and the mortality rate with a percentage of 26.4 % [20]. According to the Centers for Disease Control and Prevention (CDC), *C. albicans* was responsible for 52% and 45% of the *candida* infections between two different time intervals from 1992 to 1993, and from 1998 till 2000 respectively [21].

2.3 Pathogenesis of *Candida albicans*

active penetration using the Sap proteins and secreted aspartic proteases degrade the host cells. The third virulence factor is biofilm formation,

2.4 Biofilm formation:

Biofilm formation is considered one of the most important aspects of pathogenesis of *C. albicans*. This phenomenon allows *Candida* to adhere to mucosal cells and to plastic surfaces of medical devices such as catheters and dentures leading to device associated infections and eventually spreading nosocomial infections. Biofilm forming cells are phenotypically different from floating cells in that they are embedded in a three-dimensional structure, can proliferate in healthy individuals surviving within the immune system of the host and having an increased resistance to antifungal drugs. The formation of biofilm is introduced through medical devices or denatured [27].The initiation of this phenomenon can be summarized in four steps: 1. adherence of the yeast budding cells to the surface of host cells or plastic surfaces, 2. budding of the cells yielding more yeast cells and the formation of pseudohyphae inintially and true hyphae later on, 3. production of the matrix in which a set of hyphae and pseudohyphae cells are embedded forming a three-dimensional structure that is well protected from the immune system and masking most of the targets of the antifungal drugs, 4. Spreading of new yeast cells and disseminating these cells to new site[28]. This phenomenon leads to persistent drug resistant infections that make it very hard to treat [29]. A recent study done by Zhou et al [30]. showed that aspirin, one of the oldest anti-inflammatory drugs used, inhibits the maturation of the biofilm by inhibiting the formation of the three-dimensional structure and decreasing the dispersal of the yeast cells dramatically. Implying that combined therapy between aspirin and antifungal drug could be used to increase the efficiency of the antifungal drugs.

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3.1. RESULTS

Table (1) candida albicance Rates in Iraq Table

Repeat rate candida albicanc	Number of isolates	sample	The city	Years
38%	46	Vaginal	babylon	2016
37.5%	9	Vaginal		
51.6%	16	Oral samples	qadisiyah	
50%	14	Urine		
29.66	75	Vaginal	basrah	
45.16%	42	Skin	Dhi Qar	
11.32%	-------	fingernails		
45%	------	Vaginal	Baghdad	2017
47%	------	Oral samples		
4.7%	20	Vaginal	Kirkuk	
76.4%	46	Urine	Ramadi	
36.5%	73	Vaginal	Najaf	2018
30%	12	Vaginal	Dohuk	

3.2. Discussion

3.2.1. Discussion

isolation and diagnosis of candida albicans from oral samples and vaginal specimens and blood from the Ramadi predicted injury in each of the province of Babylon, Qadissiya, Basra and Thi Qar in 2016, where the Qadisiyah the highest rates of infection took oral samples and the rate of infection was 16% out of 16 isolation and also taken Adar samples were the incidence rate. . Of the 14 isolates, in Babylon, 38% of the 46 isolates were vaginal and 9 vaginal samples were taken for the same governorate. The incidence of Candida albicans was 29.66% out of 75 vaginal samples. Of the 62 samples of the skin name of the nail sample was the rate of infection in the d 3 11, the proportion of candida albicans in Baghdad, Kirkuk and Ramadi for 2017, where the proportion of infection in Baghdad 45 of the samples of vaginal either in oral samples, the proportion of infection was 41%. Asa in the province of Kirkuk was the rate of infection 4. 7 out of 20 vaginal isolation and in Ramadi the percentage of guardianship was 6%. 4 of 46 in. Finally, the study showed that the percentage of infection in 2018 in the province of Najaf 365% of 23 In Dahuk, the rate of infection candida albicance was 30% out of 12 vaginal sample

Table (2) candida alliance Rates in Other Countries

Repeat rate candida albicanc	Number of isolates	Sample	Country	years	ت
65%	-------	Oral samples	Bahrain	2016	1
31.6%	-------	Vaginal	A lgeria		

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83.02%	-------	Vaginal	Emirates		
53.5%	91	Urine	Turkey		
40%	22	Vaginal	Jordan	2017	2
67.7%	-----	Vaginal	Iran		
50%	26	Vaginal	Libya		
36.4%	16	Vaginal	Egypt	2018	3
6%	16	Oral samples	Yemen		

3. 2.2. Discussion

The study revealed that the isolation and diagnosis of candida albicans for 2016 in patients expected to be infected in the State of Bahrain, where the incidence rate was 95% In Algeria and the UAE took vaginal samples was the rate of infection 31. 6 and 52 83 respectively, while in Turkey the samples were samples Abrar where the incidence rate was 53%. 5 out of 91 samples. It is worth mentioning that the UAE was one of the countries with the highest incidence of Candida albicans in 2016. In 2017, the infection was diagnosed in Jordan from vaginal specimens. The study showed that 40% In Iran, the vaginal eye was infected with Candida albicans this year by 17% and 7%. Finally, the percentage of infection was 20% of the 20 samples in Libya of vaginal specimens and in 2018 included the isolation and diagnosis of candida albicans in Egypt and Yemen where they were In Egypt vaginal specimens were 36%. Four of the 16 isolates were in Yemen. Oral samples were taken and the infection rate was 19 out of 16 isolates

Table (3) shows the comparison of frequency in Iraq and neighboring countries.

Sample	Repeat rate candida albicanc	Country	years	no
Vaginal	31.6%	Algeria	2016	1
Oral samples	65%	Bahrain		
Urine	53.5%	Turkey		
Vaginal	83.02%	Emirates		
Vaginal	37.6%	Iraq		
Vaginal	50%	Libya	2017	2
Vaginal	40%	Jordan		
Vaginal	67.6%	Iran		

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Vaginal	43.27%	Iraq		
Oral samples	6%	Yemen	2018	3
Vaginal	36.4%	Egypt		
Vaginal	33.25	Iraq		

3.2.3. Discussion

The incidence of Candida albicans was different in each country. The incidence of Candida was 2019 in Algeria (31.9%), Bahrain (65%), Turkey (2.5%) and the UAE (83.02%). The highest rate of infection was found in the UAE, followed by Bahrain, Turkey, Iraq and Algeria. In 2017, the rate of infection varied among countries, with the highest rate of infection in Iran (17.7%) followed by Libya, (50%), Iraq (43%, 27%), and Jordan (40%). In 2018, Egypt occupied the highest percentage of infection Alkandida was (36. 4%) followed by Iraq (33.25) and then the lowest percentage appeared in Yemen. (6%) The highest incidence of Candida was found in 2016 from sampleVaginal and the lowest in a year2018

This study recommendation the following:

1 - attention to personal care because this type of fungi is frequently found in the reproductive system of women in large. And are associated with urinary tract infections.

2 - The study recommends conducting other studies on Candida mushroom in relation to its correlation and the extent of its disease and its effect on other aspects in women and men, such as infertility and other pathological cases.

3 - Conduct comparative studies in Iraq and other countries and know the reasons for the incidence of recurrence or decrease Appropriate solutions to prevent the spread of fungal diseases. Conclusions

CONCLUSIONS

1 - The highest rate of infection in Iraq was recorded in 2016 in Basrah province, where the rate of infection was 75% of vaginal and oral testicular samples.

2 - the highest rate of infection in Iraq for the year 2017 in the province of Ramadi, where the percentage of infection. Of urine samples.

3 - recorded the highest percentage of the year 2018 in Iraq in Najaf province, where the rate of infection was 73% of urine samples.

4 - The study compared the results with other countries where the highest rate of infection in the United States - for the year 2016, where the percentage was 8302 samples Vaginal.

5- The study compared the results of the year 2017 with Iraq and other countries where the language of the highest infection rate in Iraq was 11. 9 of vaginal specimens.

6. The study compared the results for 2018 in Iraq and other countries with the highest rate of infection in Egypt where it was 63.40% of vaginal specimens.

REFERENCE

1- Ahmad, S., Khan, Z., Asadzadeh, M., Theyyathel, A., & Chandy, R. (2012). Performance comparison of phenotypic and molecular methods for detection and differentiation of *Candida albicans* and *Candida dubliniensis*. *BMC Infectious Diseases*, *12*(1), 230.

2- Angiolella, L., Stringaro, A.R., Bernardis, F.D., Posteraro, B., Bonito, M., Toccacieli, L., … & Palamara, A.T. (2008). Increase of virulence and its phenotypic traits in drug-resistant strains of *Candida albicans*. *Antimicrobial Agents and Chemotherapy*, *52*(3), 927-936.

3- Arendrup, M.C., Perlin, D.S., Jensen, R.H., Howard, S.J., Goodwin, J., & Hope, W. (2012). Differential *in vivo* activities of anidulafungin, caspofungin, and micafungin against *Candida glabrata* isolates with and without FKS resistance mutations. *Antimicrobial Agents and Chemotherapy*, *56*(5), 2435-2442.

4- Barada,B., Basma, R., & Khalaf, R.A. (2008). Microsatellite DNA identification and genotyping of *Candida albicans* from Lebanese clinical isolates. *Mycopathologia*, *165*(3), 115-125.

5- Barry, A., & Brown, S. (1996). Fluconazole disk diffusion procedure for determining susceptibility of *Candida* species. *Journal of Clinical Microbiology*, *34*(9), 2154-2157.

6- Bartelli, T.B., Ferreira, R.C., Colombo, A.L., & Briones, M.R.S. (2013). Intraspecific comparative genomics of *Candida*

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-9, April 2022
ISSN: 2749-3644

albicans mitochondria reveals non-coding regions under neutral evolution. *Infection, Genetics and Evolution*, *14*, 302-312.

7- Basma, R., Barada, G., Ojaimi, N., & Khalaf, R.A. (2008). Susceptibility of *Candida albicans* to common and novel antifungal drugs, and relationship between the mating type locus and resistance, in Lebanese hospital isolates. *Mycoses*, *52*(2), 141-148.

8- Baumgartner, C., Freydiere, A.M., & Gille, Y. (1996). Direct identification and recognition of yeast species from clinical material by using *albicans* ID and CHROMagar Candida plates. *Journal of Clinical Microbiology*, *34*(2), 454-456.

9- Bernal, S., Mazuelos, E.M., Chavez, M., Coronilla, J., & Valverde, A. (1998). Evaluation of the new API Candida system for identification of the most clinically important yeast species. *Diagnostic Microbiology and Infectious Disease*, *32*(3), 217-221.

10- Biswas,S.K., & Chaffin, W.L. (2005). Anaerobic growth of *Candida albicans* does not support biofilm formation under conditions used for aerobic biofilm. *Current Microbiology*, *51*(2), 100-104.

11- Brajtburg,J.,Powderly, W.G.,Kobayashi,G.S.,& Medoff,G.(1990).

12- Amphotericin B: Current understanding of mechanisms of action.

13- *Antimicrob Agents Chemother*, *34*(2), 183-188.

14- Campbell, C.K., Davey, K.G., Holmes, A.D., Szekely, A., & Warnock, D.W. (1999). Comparison of the API Candida System with the AUXACOLOR system for identification of common yeast pathogens. *Journal of Clinical Microbiology*, *37*(3), 821-823.

15- Chen, K.W., Lo, H.J., Lin, Y.H., & Li, S.Y. (2005). Comparison of four molecular typing methods to assess genetic relatedness of *Candida albicans* clinical isolates in Taiwan. *Journal of Medical Microbiology*, *54*(3), 249-258.

16- Chen, K.W., Chen, Y.C., Lo, H.J., Odds, F.C., Wang, T.H., Lin, C.Y., … Li, S.Y. (2006). Multilocus sequence typing for analysis of clonality of *Candida albicans* strains in Taiwan. *Journal of Clinical Microbiology*, *44*(6), 2172-2178.

17- Cliff, P.R., Sandoe, J.A.T., Heritage, J., & Barton, R.C. (2008). Use of multilocus sequence typing fpr the investigation of colonization by *Candida albicans* in intensive care unit patients. *Journal of Hospital Infection*, *69*, 24-32.

18- Eraso, E., Moragues, M., Villar-Vidal, M., Sahand, I.H., Gonzalez-Gomez, N., Ponton, J., … Quindos, G. (2006). Evaluation of the new chromogenic medium Candida ID 2 for isolation and identification of *Candida albicans* and other medically important *Candida* species. *Journal of Clinical Microbiology*, *44*(9), 3340-3345.

19- Francois, I., Cammue, B., Borgers, M., Ausma, J., Dispersyn, G.D., & Thevissen, K. (2006). Azoles: Mode of antifungal action and resistance development. Effect of miconazole on edndogenous reactive oxygen species production in *Candida albicans. Anti-Infective Agents in Medicinal Chemistry*, *5*, 3-13.

20- Garcia-Hermoso, D., MacCallum, D., Lott, T.J., Sampaio, P., Serna, M.J., Grenouillet, F., ... & Bretagne, S. (2010). Multicenter collaborative study for standardization of *Candida albicans* genotyping using a polymorphic microsatellite marker. *Journal of Clinical Microbiology*, *48*(7), 2578-2581.

21- Garner, C.D., Starr, J.K., McDonough, P.L., & Altier, C. (2010). Molecular identification of veterinary yeast isolates by use of sequence-based analysis of the D1/D2 region of the large ribosomal subunit. *Journal of Clinical Microbiology*, *48*(6), 2140-2146.
Gow, N.A., van de Veerdonk, F.L., Brown, A.J., & Netea, M.G. (2011). *Candida albicans* morphogenesis and host defense: Discriminating invasion from colonization. *Nature Reviews Microbiology*, *10*, 112-122.

22- Heo, S.M., Sung, R.S., Scannapieco, F.A., & Haase, E.M. (2011). Genetic relationships between *Candida albicans* strains isolated from dental plaque, trachea, and bronchoalveolar lavage fluid from mechanically ventilated intensive care unit patients. *Journal of Oral Microbiology*,

23- Isibor, J.J., Eghubare, A.E., & Omoregie, R. (2005). Germ tube formation in *Candida albicans*: Evaluation of human and animal sera and incubation atmosphere. *Shiraz E-Medical Journal*, *6*, 1-2.

24- Leaw, S.N., Chang, H.C., Sun, H.F., Barton, R., Bouchara, J.P., & Chang, T.C. (2006). Identification of medically important yeast species by sequence analysis of the internal transcribed spacer regions. *Journal of Clinical Microbiology*, *44*(3), 693-699.

25- Liguori, G., Di Onofrio, V., Galle, F., Lucariello, A., Albano, L., Catania, M.R.,

26- Guida, M. (2010). *Candida albicans* identification: Comparison among nine phenotypic systems and a multiplex PCR.

World Bulletin of Public Health (WBPH)
Available Online at: https://www.scholarexpress.net
Volume-9, April 2022
ISSN: 2749-3644

Journal of Preventive Medicine and Hygiene, *51*(3), 121-124.

27- Lin, C.Y., Chen, Y.C., Lo, H.J., Chen, K.W., & Li, S.Y. (2007). Assessment of *Candida glabrata* strain relatedness by pulsed-field gel electrophoresis and multilocus tequence typing. *Journal of Clinical Microbiology*, *45*, 2452-2459.

28- Lin, C.Y., Chen, Y.C., Lo, H.J., Chen, K.W., & Li, S.Y. (2007). Assessment of *Candida glabrata* strain relatedness by pulsed-field gel electrophoresis and multilocus tequence typing. *Journal of Clinical Microbiology*, *45*, 2452-2459.

29- L'Ollivier, C., Labruere, C., Jebrane, A., Bougnoux, M.E., d'Enfert, C., Bonnin, A., … Dalle, F. (2012). Using a multi-locus microsatellite typing method improved phylogenetic distribution of *Candida albicans* isolates but failed to demonstrate association of some genotype with the commensal or clinical origin of the isolates. *Infection, Genetics and Evolution*, *12*(8), 1949–1957.

30- G.M., Karatela, S., Sunay, S., & Adiri, Y. (2010). Antifungal susceptibility testing of *Candida* isolates from *Candida* surveillance study. *Journal of Clinical Microbiology*, *48*, 1270-1275.

31- Mayer, F.L., Wilson, D., & Hube, B. (2013). *Candida albicans* pathogenicity mechanisms. *Virulence*, *4*(2), 1-10.

32- McCullough, M.J., Ross, B.C., & Reade, P.C. (1996). *Candida albicans*: A review of its history, taxonomy, epidemiology, virulence attributes, and methods of strain differentiation. *International Journal of Oral & Maxillofacial Surgery*, *25*(2), 136-144