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Original Article

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Isolation and Antifungal Susceptibility of *Candida* spp. from Pediatric Patients

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Abstract: Candida species are considered the most common opportunistic human fungal pathogen due to the presence of various virulence factors, including its ability to form a biofilm that aids in oral candidiasis. Pediatric patients are more susceptible to oral candidiasis than healthy pediatric because of the factors that encourage Candida oral carriage. This current study aims to isolate, evaluated the antifungal effect on Candida spp. and participated in oral candidiasis of pediatric patients in Sulaymaniyah and Kirkuk city. The study was performed from September2021toFebruary2022 on two groups of pediatrics which including pediatric patients (n=160) and healthy pediatric (n=50) as a control group. Oral swabs were obtained from 210 participants in the Kurdistan Region of Iraq at the pediatric teaching hospital of the Sulaymaniyah and Kirkuk governorates. To culture the swabs, Sabouraud dextrose agar (SDA) medium was used. HiCrome™ Candida Differential agar used to identify Candida isolated, then depending on the internal transcribed spacer (ITS) region using confirmed polymerase chain reaction. Antifungal sensitivity was done for all Candida albicans (C. albicans) and non-albicans isolates using five common antifungal disks. Among of the 160 sample of pediatric patient 62 (38.8%) positive for Candida spp. which it is including 17 (27.4 %) and 26 (41.9%), 19 (30.6%) breast feeding, bottle feeding and mixing respectively. While within 50 samples of control group 13 (26%) were positive for Candida spp. which including 2(15.4%), 9(69.2%), 2(15.4%) of same respectively feeding types. Regarding to the antifungal susceptibility the results showed that C. albicans had higher resistance rates against itraconazole, ketoconazole, and clotrimazole than the non-albicans Candida species However, highly resistant rate were detected in Itraconazole and Ketoconazole with 23.7% and 54.4% respectively, for all Candida species. The Current study concluded that oral candidiasis was more predominant in pediatric patients in compared to healthy pediatric also, and C. albicans is the most prevalent etiologic agent. However, higher rate of sensitivity was detected between Candida species for nystatin, which may suggest as the main treatment for oral Candida infections.

1. Introduction

Oral candidiasis is one of the most prevalent opportunistic fungal infections of the human. There have been 150 species of this genus isolated from the oral cavity, with *Candida albicans*(*C. albicans*) making up the majority (80%) of them [1]. Some species of *Candida* are present as normal flora in the mouth, vagina, periorificial skin, and gastrointestinal system. However, about 10% of the species have the potential to serve as opportunistic pathogens and cause diseases such as oral candidiasis [2]. Different factors, both local and systemic, influence the transition from commensal to pathogen statuses, such as prolonged antibiotic therapy, malnutrition, cancer, chronic diseases (diabetes mellitus), HIV infection,

xerostomia, pregnancy, an immature immune system in children under the age of 4 low birth weight babies, poor dental hygiene, and the use of prosthetic denture [3,4].

*Candida*species are found in the normal flora of the oral cavity in around 66% of the pediatric population who are carriers [5]. Oral infections are particularly prevalent in older people, newborns, and people with weakened immune systems [4]. *Candida* species colonize new born infants' mouths in the first few hours of life. Theoretically, the first oral *Candida* colonization in infants occurs vertically (mother to baby) in the mother's birth canal during delivery and later horizontally in the hospital setting [6]. Also, some conditions, such as diabetes, corticosteroids, and antibiotic treatment, change the host's defenses and make it possible for yeasts to colonize the nipple of breast-feeding moms at pathological levels, increasing the risk that babies would get oral thrush through breastfeeding. Furthermore, thrush affects newborns who are bottle-fed more frequently than those who are breast-fed, and the lesions may not always spread to the throat and even the esophagus [7].

Amphotericin B, itraconazole, fluconazole, ketoconazole, econazole, and nystatin are only a few effective and common antifungal agents that work well against specific *Candida* strains. Some of these agents (fluconazole, amphotericin B, ketoconazole, econazole, itraconazole) are systemically used to treat *Candida* spp. [8]. Some reports have demonstrated that antifungal fluconazole has been effective and best treatment for short-term eradication of oral Candidiasis [9]. On the other hand, several researchers have reported that the *Candida* species' susceptibility degree to the drugs used to treat *Candida* species are varies[10], for example, *C. krusei*and *C. glabrata* are less susceptible and resistant to fluconazole, respectively [9]. Because of medications side effects, higher costs, and the long time it takes to cure infections, it is preferable to undertake a diagnosis before administering an antifungal agent [11]. In vitro antifungal susceptibility testing is a useful tool for determining the optimal treatment for individuals who have previously received antifungal therapies, have relapsing infections, or have candidiasis caused by a species other than *C. albicans*[12]. Therefore, the present study aims to isolate and identify *Candida* species and the antifungal sensitivity involved in oral candidiasis of pediatric patients in Kirkuk, Chamchamal, and Sulaymaniyah city.

2. Materials and Methods

2.1. Sample collection

Oral swabs were taken from 210 participants from September 2021 to February 2022, at the Shahid Peshraw Hospital, Dr. Jamal Ahmad Rashid's Pediatric Teaching Hospital, and the Children's Kirkuk Hospital of the Kirkuk Governorate of the Kurdistan Region of Iraq. Samples were taken using sterile cotton swabs that had been moistened with sterile saline, and all samples were delivered to the microbiology laboratory within 25-30 minutes of collection [13]. The study population was divided into two groups: pediatric patients (n=160) and a healthy pediatric control group (n=50). The samples were taken from a patient's group had conditional problems such as Cancer (n=17), Gastroenteritis (n=40), thalassemia (n=6), renal failure (n=8), Prematurity (n=9), Malnutrition (n=20), Jaundice (n=60). While, the control group are healthy toddlers out of the hospital. The samples included males 78 (48.75%) and females 82 (51.25%) patients, with males 27 (54%), and females 23 (46%) control. The samples were taken from toddler between the ages of 2 days and 3 years, information about type of feeding, associated disease or anomaly, sex, were recorded. Before collecting the samples, ethical approval was obtained from the research protocol ethics committee of the CollegeofMedical and Applied Science, University of Charmo, and informed consent was obtained from all study participant's parents.

2.2. CulturingandIsolatingCandidaSpecies

For isolation of *Candida* spp. oral swabs were cultured on Sabouraud-dextrose agar (SDA) medium [Mumbai, India] with Chloramphenicol then incubated for 48 h at 37 °C. All of the yeast isolates were examined using wet mount. As primary identification, fresh colonies were cultured on HiCrome™ *Candida*differential agar [Mumbai, India] which it is special media used for identification of *Candida* spp. depend on the colony color after 48 to 72 hours of incubation at 37ºC [14].

2.3. MolecularIdentificationofCandidaSpecies

Using universal primers, all of the isolated *Candida* spp. was identified based on the molecular technique (PCR). To amplify the ITS1-5.8S-ITS2 region of the *Candida* gene, the universal primers forward ITS1 (TCC GTA GGTGAA CCT GCG) and Reverse ITS4 (TCC TCC GCT TATTGA TAT GC) were used [15]. A single colony was utilized immediately asa template for PCR without using the extraction kit for obtained of pure DNA (colony PCR). Colonies PCR can assist prevent material waste and the time-consuming process of acquiring genomic DNA. From the overnight culture, one colony was collected and suspended in 40 ul of ddH_2O, the DNA was released after 20-minute incubation at 95°C [16]. The DNA was purified by centrifugation at 12000 rpm for 2 minutes; then, 4µl to 5µl were used as a PCR template. The PCR was done using [Taq Master (2x conc.) / add bio. South Korea] master mix according to manual guideline, then the PCR mixture was placed in PCR machine and the amplification programs were configured as shown in Table1.

Table 1: PCR amplification program for ITS1 and ITS4 regions.

Steps	Temperature	Time	No. of cycles
Initial denaturation	95°C	5 min.	1
Denaturation	95°C	30 sec.	40
Annealing	57°C	30 sec.	
Extension	72°C	40 sec.	
Final extension	72°C	5 min.	1

2.4. DNA Sequencing and Phylogenetic Analysis

The DNASequencing was done by (Sanger sequencing/ ABI 3500, Macrogen Genome Center, Republic of Korea) for 26 samples of both healthy and pediatric patients, based on amplified ITS region using ITS1 (3-5)-Forward (TCC GTA GGTGAA CCT GCG) and ITS4 (3-5)-Reverse (TCC TCC GCT TATTGA TAT GC) primers. The Phylogenetic tree and all analyzes were done using the MEGA X program version 11.0.13.

2.5. Antifungal Sensitivity Test

The antifungal activity test was performed using agar disk diffusion. SDA Agar was used for this test, along with Glucose ND Peptone Agar as a supplement. The inoculums were generated during 24-hour *Candida* plate cultures [17]. The colonies were placed in 5ml of 0.85% saline and the turbidity was regulated and modified to an optical density (OD_{600}). The range received was between 0.11 and 0.14 by spectrophotometer in 600nm which it is equal to 0.5 McFarland standards, to produce a yeast suspension of 1x106 to5x106 cells/m [18,19]. Two sterile swabs were rolled separately on the surface of two sets of plates containing Sabouraud dextrose agar SDA after being immersed in the suspension. The inoculated plates were allowed to dry for 10 minutes at room temperature in a laminar hood. Three antifungal paper disks were laid on each plate using forceps, and the plates were then incubated aerobically at 37°C for 24 hours. Nystatin (50 µg), Itraconazole (50µg), Fluconazole (10 µg), Clotrimazole (10µg), and ketoconazole (10ug) [Mumbai, India] were used. After 24 hrs[17], each antifungal disk's zone diameter was physically measured with a ruler.The interpretation criteria for the disks Fluconazole, Nystatin, Itraconazole and Clotrimazole and ketoconazole10ug, ketoconazole 30ug were listed in Table 2 according to Clinical and laboratory standardinstitute CLSI [20].

Table2: Interpretive Criteria of Resistance and Susceptibility of Used Antifungal Disks (mm) according to [20].

Antifungal agent	Sensitive	Dose dependent	Resistance
Fluconazole	≥ 19	15-18	≤ 14
Nystatin	≥ 25	17-24	< 16
Itraconazole	> 16	10-15	< 9
Clotrimazole	>20	12-19	≤ 11
Ketoconazole 10ug	≥30	27-23	≤ 20

2.6. Statistical Analysis

The data were analyzed using SPSS software (version 25), the Chi-square test was used to determine the differences in the ratio of the categorized variables. Furthermore, P≤ 0.05 was considered as statistically significant.

3. Results and Discussion

Oral mucosa can be colonized and infected by the *Candida* genus, because of the commensally characteristic of *Candida* spp. in the oral fissure, prevalence in healthy persons has been observed from 3 to 70% [21]. Many factors can predispose certain individuals to develop oral candidiasis include cancer, HIV/AIDS, steroid usage, and compromised host immunity. Additionally, an overgrowth of *Candida* can happen when the usual microbiota is disturbed by a variety of host conditions, such as the continuous use of antibiotics. Malnutrition, inadequate iron intake, and poor dental hygiene can all increase the risk of infection colonization[22,23]. In this study the main predisposing factors causes' oral thrush are Jaundice which among 60 Jaundices patient 40 of them infected (46.6%) followed by gastroenteritis among 40 patient 15 of them infected (37.5%).

The results showed that Among 160 sample of pediatric patient 62 (38.8%) positive for Candida spp. which it is including 17 (27.4 %) and 26 (41.9%), 19 (30.6%) breast feeding and bottle feeding and mixing respectively, within50 sample of control group 13 (26%) positive for Candida spp. which including 2 (15.4%), 9(69.2%), 2(15.4%) breast feeding, bottle feeding and mixing respectively, were This frequency is lower than that observed by previous research , which show a prevalence of oral candidiasis in pediatric patient (49.2%) [7], on the other hands, current results are higher than those reported in Kingdom of Saudi Arabia (12.8%) [24]. Significant difference was detected in the percentage of occurrence of *Candida* spp. when ($p \leq 0.05$) between patient and healthy groups, the incidence of *Candida* spp. This difference could be attributed to the sample collection methods, as it is well documented that different collection strategies (culture by imprint, collection all of saliva, oral rinse swab, and biopsy) have variable sensitivities in the identification of *Candida*[2,25].In this present study prevalence of Candida spp. between patient and control are higher in bottle feeding (35%) compare to breast and mix feeding 17 % and 19% respectively, which it is compatible with the study done in Brazil, which stated that bottle feeding is 26%, breast feeding 19% and mix feeding 21% [26]. Also with the results of a study in Mosul, Iraq on the isolation of yeasts in three different groups (bottle feeding, breast feeding and mix feeding) which recorded 23.3%, 15.8% and 15.0 % [7]. Due to the results showed no relationship between breast feeding and oral candidiasis which ($P = 0.521$). Moreover: the results found significant correlation between bottle and mixed feeding and oral candidiasis ($P<0.0001$) and ($P<0.05$) respectively.

Other investigators reported that neither breast nor bottle feeding favored development of oral Candidiasis [27]. Because of the significant disparity in research findings on this subject, studies have not yet come to a conclusive understanding of the relationship between type of feeding and oral candidiasis in pediatric. HiCrome™ *Candida* Differential agar used to identify all isolates, then confirmed with PCR based on the ITS region as shown in table 3 for pediatric patients' group and table 4 for healthy pediatric group.

Table: 3: Identificationanddistributionof*Candida*spp.isolatedintheoralcavityoftheBreast, bottle, mixed feeding between patients' group (pediatric patient).

Candida spp	Color on Hichrom agar	ITS-1- ITS4 primers PCR product	*Candida*spp No. (%)	Breast feeding	Bottle feeding	Mixed
C. albicans	Light green	532bp	39(62.9%)	12(30.7%)	18(46.1%)	9(23.1%)
C. kefyr	Pink	722bp	10(16.1%)	2(20%)	5(50%)	3(30%)
C. lusitaniae	Light pink	400bp	6(9.6%)	2(33.3%)	1(16.7%)	3(50%)
C. tropicalis	blue	540bp	4(6.45 %)	1(25%)	1(25%)	2(50%)
C. parapsilosis	Cream to white	516bp	3(4.8%)	0(0.0%)	1(33.3%)	2(66.6%)
Total	-	-	62(100%)	17(100%)	26(100%)	19(100%)

Table 4: Identificationanddistributionof*Candida*spp.isolatedintheoralcavityoftheBreast, bottle, mixed feeding between healthy-control groups.

*Candida*spp	Color on Hichrom agar	ITS-1- ITS4 primers PCR product	*Candida*spp No. (%)	Breast feeding	Bottle feeding	Mixed
C. albicans	Light green	532bp	8(61.5%)	2(15.3%)	5(38.4%)	1(7.7 %)
C. tropicalis	blue	540bp	2(15.3 %)	0(0.0%)	1(50%)	1(50%)
C. parapsilosis	Cream to white	516bp	2(15.3%)	0(0.0%)	2(100%)	0(0.0%)
C. kefyr	Pink	722bp	1(7.7%)	0(0.0%)	1(100%)	0(0.0%)
C. lusitaniae	Light pink	400bp	0(0.0)	0(0.0%)	0(0.0%)	0(0.0%)
Total	-	-	13(100%)	2(100%)	9(100%)	2(100%)

Using Hichrom agar to identify *Candida* at the species level *C. albicans* has light green colonies , *C. tropicalis* produce blue colonies, and *C. kefyr* has pink colonies, this results are in agreement with Daef*et al.*[28], Mehta and Anupama [29], and Kaup *et al*, [14]. While the color of *C. parapsilosis* that produce white to cream colored colonies was not matched with Mehta and Anupama [29]. Where they found pink colonies color for *C. parapsilosis*, also, Daef*et al.*[28], found same result for 5 isolates of *C. parapsilosis* and white to cream colored colonies only in 1 isolate. None of the above research found *C. lusitaniae* species with a pink colonies appearance on Hichrom agar, those findings showed that this medium can be suggested for identification of only several common species, but not all. To detect and identify fungi from culture colonies, species variations in fragment sizes or sequences of the ITS1 and ITS2 regions have been used [30], The PCR–based method for ITS1-5.8S rDNA-ITS2 regions not dependable, Some species' very identical amplicon sizes made it difficult to distinguish them, such as C. albicans, C. tropicalis , and C. parapsilosis with amplicon size range (500 to 530 bp), these leads to misidentification at the species level using gel electrophoresis [15]. Thus, DNA sequencing of ITS1-5.8S rDNA-ITS2 is needed to confirm PCR results. Figure 1shows PCR amplification product for different *Candida*spp, as shown *C. albicans* (532bp*), C. kefyr* (722bp), *and C. tropicalis* (521bp). *C. parapsilosis* (516bp), *C. lusitaniae* (400bp) were represented by DNA fragments of 532 bp, 722 bp, 521 bp, 516 bp, 400 bp respectively, using ITS1 and ITS4 primers.

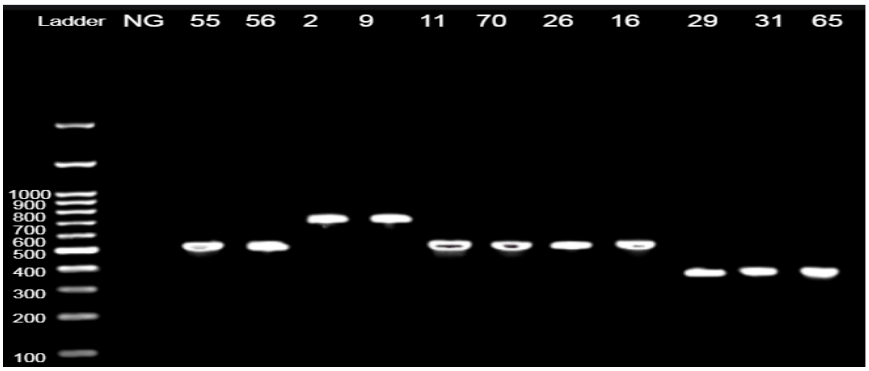
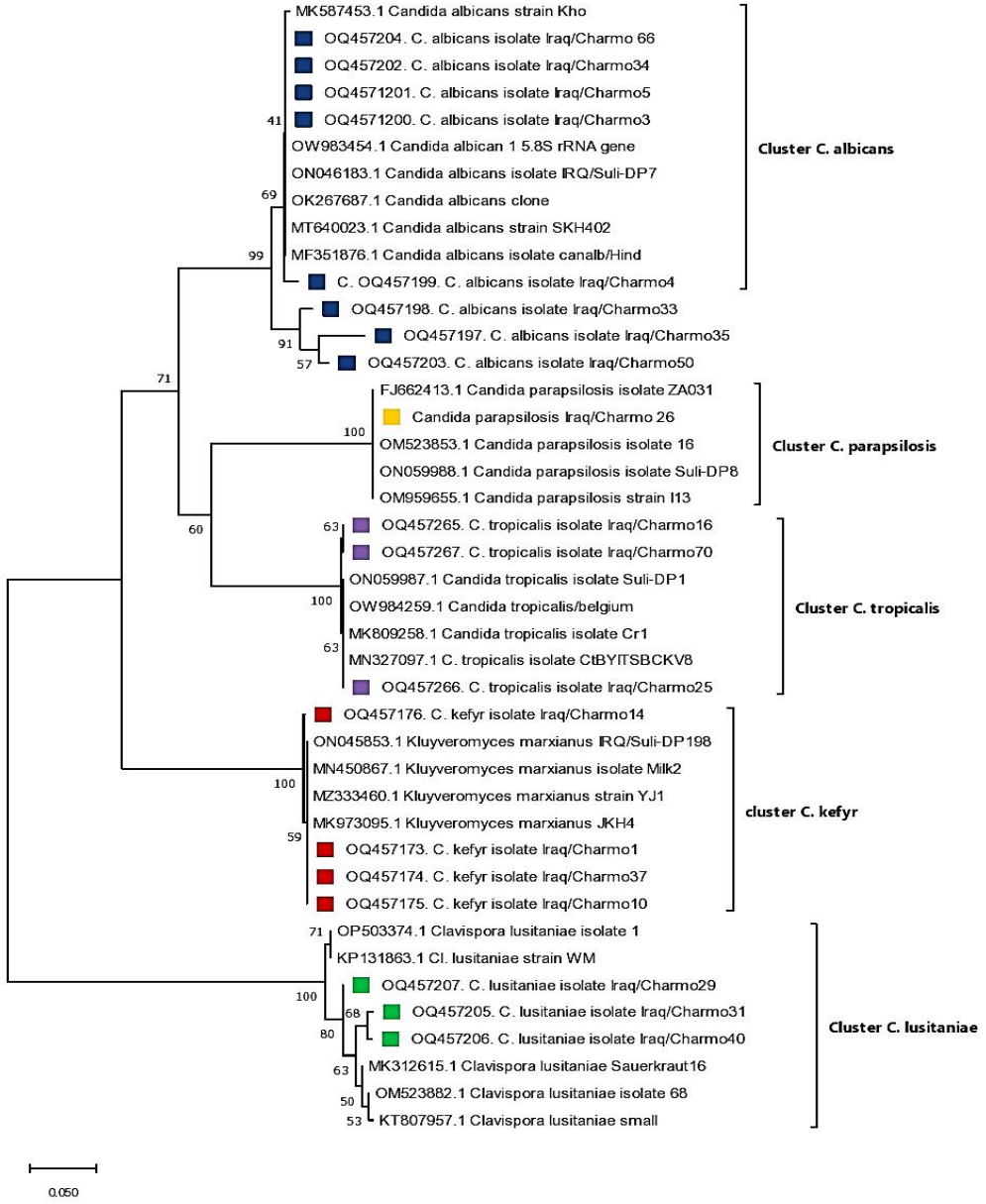


Figure1: *Candida* spp. identification by using ITS1 and ITS4 primers. Showing five species, from left the DNA marker 100bp, (NC) no DNA, (55,56)C. albicans (532bp),(2,9) C. kefyr (722bp), (11,70)C. tropicalis (521bp), (26,16)C. parapsilosis (516bp) and (29,31,65) C. lusitaniae (400bp).

Current study showed that among all isolated species, *C. albicans* is dominant from both the patient group (62.9%) and control group (61.5%). Other none-albicans isolated species were *C. tropicalis* (6.45%, 15.3%), *C. parapsilosis* (4.8%, 15.3%), and *C. Kefyr* (16.1%, 7.7%) from patients and control group, respectively, and one isolate of *C. lusitaniae* (9.6%) was from the patient group only which it was not found in the control group. Many others study reported that, in 60%–80% of cases, *C. albicans* are the most dominant species isolated from the oral cavity in pediatric groups, both healthy and patients. Other species responsible for oral infection have also been identified including *C. krusei*, *C. parapsilosis*, *C. tropicalis*, and *C. kefyr*[7,24].

The PCR products were sequenced using the Sanger sequencing technique. Following that, the findings were aligned with the NCBI GenBank *Candida* spp. reference sequences using

The Clustal W algorithm. Subsequently, the neighbor-joining approach and evolutionary analyses were performed [31,32]. To determine phylogenetic relationships using the Tarmura3-parameter model with 1000 bootstrap replicates [33]. The percentage of trees where the associated taxa clustered together is displayed next to the branches; all *Candida* species of the current study were clustered together in one clade, and except *C. lusitaniae* was located on the different clade of the tree. Within the main clade, *C. parapsilosis* and *C. tropicalis* were grouped together under one subclade, while each of *C. albicans* and *C. kefyr* were grouped under different specific subclades. The evolutionary history of *Candida* species of the current study was closely related to same species of *Candida* from other countries that published in the NCBI GenBank and all details were shown in table5 and figure 2.



Figurer2: Phylogenetic tree generated using ITS region nucleotide sequence information of *Candida* species (The strains assigned with small colored squares belong to the current study).

Table 5: Origins, sources, and accession numbers of DNA sequenced *Candida* isolated in NCBI.

Species name	Origin	Source	GenBank sequence Accession numbers
Candida albicans (Charmo3 Isolate)	*Sulaymaniyah province*	Jaundice patient	OQ457200
Candida albicans(Charmo4 Isolate)	*Sulaymaniyah province*	Jaundices patient	OQ457199
Candida albicans (Charmo5 Isolate)	*Sulaymaniyah province*	Healthy toddler	OQ457201
Candida albicans (Charmo33 Isolate)	*Sulaymaniyah province*	Cancer patient	OQ457198
Candida albicans (Charmo34 Isolate)	*Sulaymaniyah province*	Thalassemia patient	OQ457202
Candida albicans (Charmo35 Isolate)	*Sulaymaniyah province*	Gastroenteritis patient	OQ457197
Candida albicans (Charmo50 Isolate)	*Kirkuk province*	Gastroenteritis patient	OQ457203
Candida albicans (Charmo66 Isolate)	*Kirkuk province*	Renal failure patient	OQ457204
Candida parapsilosis (Charmo26 Isolate)	*Kirkuk province*	Jaundice patient	OQ520002
Candida tropicalis (Charmo16 Isolate)	*Kirkuk province*	Healthy toddler	OQ457265
Candida tropicalis (Charmo70 Isolate)	*Kirkuk province*	Malnutrition patient	OQ457267
Candida tropicalis (Charmo25 Isolate)	*Sulaymaniyah province*	Gastroenteritis patient	OQ457266
Candida tropicalis (Charmo11 Isolate)	*Sulaymaniyah province*	Jaundice patient	OQ457264
Candida Keyfr (Charmo1 Isolate)	*Sulaymaniyah province*	Premature patient	OQ457173
Candida Keyfr (Charmo10 Isolate)	*Sulaymaniyah province*	Gastroenteritis patient	OQ457175
Candida Keyfr (Charmo14 Isolate)	*Kirkuk province*	Jaundice patient	OQ457176
Candida Keyfr (Charmo37 Isolate)	*Kirkuk province*	Healthy toddler	OQ457174
Candida lusitaniae (Charmo29 Isolate)	*Kirkuk province*	Malnutrition patient	OQ457207
Candida lusitaniae (Charmo31 Isolate)	*Kirkuk province*	Cancer patient	OQ457205
Candida lusitaniae (Charmo40 Isolate)	*Sulaymaniyah province*	Jaundice patient	OQ457206

3.1 Susceptibility to Antifungal Agents

The details of susceptibility tested isolates to all used antifungal agents were shown in (Table 6). In total of 75 *Candida* species the most isolated species, *C. albicans* was sensitive to nystatin, itraconazole, ketoconazole, fluconazole, and clotrimazole, with 23.9%, 32.0%, 9.3%, 58.6%, and 24.0% respectively, while 15.9%, 42.6%, and 10.6% were resistance to Itraconazole, ketoconazole, and Clotrimazole, respectively. Between 11 isolated of *C. kefyr*, 10.6% were sensitive to nystatin, 9.3% to itraconazole, 7.9% ketoconazole, 13.3% to fluconazole and 9.3% to clotrimazole, whereas, 2.6%, 2.6%, and 1.3% of *C. kefyr* isolates were resistance to itraconazole, ketoconazole, and clotrimazole. Among the 5 isolates of *C. parapsilosis*, 2.6%, 5.3%, 3.9%, 6.6% and 4.0% were sensitive to nystatin, itraconazole, ketoconazole, fluconazole, and clotrimazole, respectively and 2.6% were resistance to nystatin ,1.3% to ketoconazole. Regarding to *C. tropicalis*, results were 5.3%, 2.6%, 5.3%, 8.0% and 2.6% sensitive to nystatin, itraconazole, ketoconazole, fluconazole, and clotrimazole, respectively with 2.6%, 2.6%, and 1.3% were resistance to itraconazole, ketoconazole, and clotrimazole, respectively. Further, in total of 6 isolates of *C. Lusitania,* 5.3%, 5.3%, 2.6%, 8.0% and 5.3%, were sensitive to nystatin, itraconazole, ketoconazole, fluconazole, and clotrimazole respectively, while 2.6% were resistance to itraconazole and 5.3% were resistance to ketoconazole.

The results showed that *C. albicans* had higher resistance rates against itraconazole, ketoconazole, and clotrimazole than other non *C.albians* species [34], which compatabile with the results of previous study that found high resistance of *C. albicans* to itraconazole and ketoconazole compared to non- albicans species. These results could be attributed to *C. albicans* having point mutations, insertions, and

deletions in the genes encoding target proteins, which are frequently linked to antifungal drug resistance. Additionally, gene overexpression is frequently linked to both antifungal resistance and a rise in the activity of proteins that prevent oxidative damage, for example, the over-expression of the gene for multidrug efflux pumps [35,36]. However, Highly resistant rate were detected in Itraconazole and Ketoconazole with 23.7% and 54.4%,respectivly, for all *Candida* species that confirm previous study results [37,38].

The current study indicated that all isolated *Candida*spp were sensitive for nystatin, except 2.6% of *C.parapsilosis*, which is resistant to this drug. In the current investigation, no fluconazole resistance was found,and in 58.6% of isolates, *C. albicans* had increased fluconazole sensitivity, which is consistent with several other research [39,40]. Therefore, Nystatin generally works by distracting fungal cytoplasmic membrane and interacting with ergosterol. Nystatin makes the holes in cell membrane that becomes a way out for potassium ion and magnesium cellular components. This causes damages in proton gradient of cell membrane that leads to fungal cell death. Nystatin has a high binding capacity to ergosterol and low binding capacity to 3 hydroxy or oxysterol, Therefore, the indications are not as much as the azole group. The incident of nystatin-resistant strains may be largely not considered. Most fungal species are considered susceptible to nystatin. Due to these two antifungals can be suggested to treat *Candida* infection [41,42].

Table 6: Susceptibility of *Candida* spp. isolates to antifungal agents.

Nystatin	***C. albicans***	***C. kefyr***	***C. parapsilosis***	***C. tropicalis***	***C. lusitaniae***	**Total**
Resistance	0(0.0%)	0 (0.0%)	2(2.6%)	0(0.0)	0(0.0)	2(2.6%)
Dose dependent	29(38.7%)	3(3.9%)	1(1.3%)	2(2.6%)	2(2.6%)	37(49.3%)
Sensitive	18(23.9%)	8(10.6%)	2(2.6%)	4 (5.3%)	4(5.3%)	36(47.7%)
Total	47(62.6%)	11(14.6%)	5(6.6%)	6(8.0%)	6(8.0%)	75(100%)
Itraconazole						
Resistance	12(15.9%)	2(2.6%)	0(0.0%)	2(2.6%)	2(2.6%)	18(23.7%)
Dose dependent	11(14.6%)	2(2.6%)	1(1.3%)	2(2.6%)	0(0.0%)	16(21.1%)
Sensitive	24(32.0%)	7(9.3%)	4(5.3%)	2(2.6%)	4(5.3%)	41(54.5%)
Total	47(62.6%)	11(14.6%)	5(6.6%)	6(8.0%)	6(8.0%)	75(100%)
Ketoconazole						
Resistance	32(42.6%)	2(2.6%)	1(1.3%)	2(2.6%)	4(5.3%)	41(54.4%)
Dose dependent	8(10.6%)	3(3.9%)	1(1.3%)	0(0.0%)	0(0.0%)	12(15.9%)
Sensitive	7(9.3%)	6(7.9%)	3(3.9%)	4(5.3%)	2(2.6%)	22(29%)
Total	47(62.6%)	11(14.6%)	5(6.6%)	6(8.0%)	6(8.0%)	75(100%)
Fluconazole						
Resistance	0(0.0)	0(0.0%)	0(0.0%)	0(0.0)	0(0.0)	0(0.0%)
Dose dependent	3(3.9%)	1(1.3%)	0(0.0%)	0(0.0)	0 (0.0)	4(5.3%)
Sensitive	44(58.6%)	10(13.3%)	5(6.6%)	6(8.0%)	6(8.0%)	71(94.5%)
Total	47(62.6%)	11(14.6%)	5(6.6%)	6(8.0%)	6(8.0%)	75(100%)
Clotrimazole						
Resistance	8(10.6%)	1(1.3%)	0(0.0%)	1(1.3%)	0	10(13.2%)
Dose dependent	21(27.9%)	3(4.0%)	2(2.6%)	3(4.0%)	2(2.6%)	31(44.1%)
Sensitive	18(24.0%)	7(9.3%)	3(4.0%)	2(2.6%)	4(5.3%)	34(45.2%)
Total	47(62.6%)	11(14.6%)	5(6.6%)	6(8.0%)	6(8.0%)	75(100%)

4. Conclusions

Current study concluded that oral candidiasis was more predominant in pediatric patients in comparing to healthy pediatrics. Also, the results showed that *C. albicans* is the most common etiologic agent. However, highly rate of sensitivity were detected between *Candida* species for nystatin, which may suggest as main treatment for oral *Candida* infections.

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