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Isolation and Identification of Airborne Pathogenic Fungi from the Hospitals at Dhamar Governorate, Yemen

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Abstract: The air in many indoor environments also contains spores; however, the hospital indoors environments may lead to spread the pathogenic fungi spores among hospitalized patients. The aim of this study was to isolate and identify the airborne pathogenic fungi from the Hospitals environment at Dhamar governorate, Yemen. The study was conducted in four hospitals of government, which was included; Hospital A, Hospital B, Hospital C and Hospital D. A total of 48 air samples was collected from different departments of these Hospitals. By using sterile petri dishes contains sabouraud dextrose agar (SDA) media with 50µg/L of Cychlohexamide as anti- microbial, to prevent growth of saprophytic fungi and some bacteria. These petri dishes were left open for 6 hours. All samples labeled properly and brought to a laboratory for examination and processing according to standard microbiological techniques. The results had revealed that, 34 pathogenic and opportunistic fungi were isolated from Four Hospitals at Dhamar governorate. These isolates were distributed in Hospital A 35% (12/34), Hospital 21% (7/34) B, Hospital 18% (6/34) C and Hospital D 26% (9/34). These airborne pathogenic fungi included 8 fungal genera: Trichophyton, Cladosporium, Chryosporium, Mortierella, Paecilomyces, Aspergillus Rhizopus and Penicillinum spp.. Overall the result, only 6 (18%) isolates were identified as pathogenic fungi at all Dhamar Hospital while the rest 28 isolates were identified as opportunistic fungi at all Dhamar governorates hospitals. In conclusion, more hygienic practices and continuous checking of nosocomial pathogen should be taken under consideration.

Keywords: Airborne Fungi, Dhamar, Hospitals, Isolation, Identification and Yemen

1. Introduction

The Hospitals environment is highlighted as potential reservoir for many air-born pathogens which include bacteria and Fungi. Fungi and bacteria are the major types of microorganisms presents in the Hospitals environment. The main sources of the Hospitals contaminations are: air, dust, visitors, patients and weather (Beggs, 2003). The free living fungi cause many dreadful diseases through dissemination of fungal spores which will enter into the host by inhalation or injury. Some fungi cause diseases by secreting fungal toxins also called Mycotoxins (Barron, 1968). The Mycoses are generally chronic diseases because fungi grow slowly. Mycotic diseases (Mycoses) are classified into five groups according to the degree of tissue involvement and mode of entry into 5 groups: superficial, cutaneous, sub-cutaneous, systemic and opportunistic Mycoses (Tortora et al., 2007). Fungi are very close to human and animals because all are eukaryotic organisms, and its structures and metabolism look like its hosts. Consequently, drugs that affect on fungal cells may also affect on its host human and animal cells. This fact makes fungal infections of human and other animals often difficult to treat. The damage of these fungi is due to their products of toxins and enzymes which are leads to invasion the tissues causing hypersensitivity (Cauwenbergh, 1985). Dermatophytes sometimes also called keratinophilic fungi, those fungi which has ability to destroy the keratin layer of the skin of human and animals by enzymatic products

(Prescott et al., 1993). The aims of the present study were to isolate and identify the air borne pathogenic fungi from the Hospitalsenvironment of Thamar province- Yemen.

2. Materials and Methods

2.1. Sample Collection

Four different Hospitals of government and private sector, in Thamar governorate were chosen for this study include: Hospital A, Hospital B, Hospital C and Hospital D. Forty eight air samples were collected from different departments of these hospitals by using sterile petri dishes contains sabouraud dextrose agar (SDA) media with 50µg/L of each of cycloheximide and Chloramphenicol as anti- microbial, to prevent growth of saprophytic fungi and bacteria, according to (Fathi and Al-Samarai, 1997, Singh and Beena, 2003). Or one drop of Ammonium hydroxide 30% was added on the solid media to prevent growth of saprophytic fungi and bacteria (Aubaid, 1997). These petri dishes were left open for 6 hours (Koneman et al., 1978). All samples were labeled properly and brought to a laboratory for examination and processing according to the techniques described by (Miranda and Silva, 2005, Chaya and Pande, 2007)

2.2. Culture Media

Sabouraud Dextrose Agar (SDA) (Oxoid) were prepared and used as described by (Zomorodian et al., 2002).

2.3. Incubation, Isolation and Identification of Fungi

The petri dishes were incubated at 27°C for 3-10 days. The isolation and identification was performed in the laboratory of veterinary medicine department; College of veterinary medicine, the fungal identification was based on the phenotypic characters or morphological characters and staining according the techniques described by (Kwon-Chung and Bennett, 1992, Weitzman and Summerbell, 1995).

2.4. Statistical Analysis

The descriptive analysis was used for statistical assessment by using SPSS® V22 according to (Daniel, 1987).

3. Results and Discussion

A total of 34 fungal isolates of pathogenic and opportunistic fungi were isolated from Four Hospitals in Dhamar province. A significant differences at ($P<0.05$) were observed among fungal isolates and hospitals. While as depicted in Figure 1: These fungal isolates distributed as: Hospital A, Hospital B, Hospital C and Hospital D, represent 12 (35%), 7 (21%), 6 (18%) and 9 (26%), respectively. The results revealeda highest number 12 (35%) of isolates was isolated from Hospital A; whereasthe lower 6 (18%) from Hospital (Jaffal et al., 1997, WHO, 2002).

The percentage of pathogenic fungi in each Hospital: HospitalA, Hospital B, Hospital C and Hospital D, represent 3 (9%), 1 (3%), 0 (0%) and 2 (6%) respectively. The percentage of Opportunistic fungi in each Hospital: Hospital A, Hospital B, Hospital C and Hospital D, represent 3 (9%), 1 (3%), 0 (0%), 2 (6%). respectively. The highest distripution of the number and types of pathogenic fungi in all departments showed in Hospital A, 2 (33%) of *T. mentagrophytes and Cl. Carroni* was isolated from Slumber section (SL) and Hospital D the same percentage 2 (33%) of *Ch. trophicum* ands *M. wolfii* was isolated from tracks (TR); whereas the lower 0 (0%) no detected pathogenic fungal isolates in most of the other Hospital departments, especially, Hospital C.

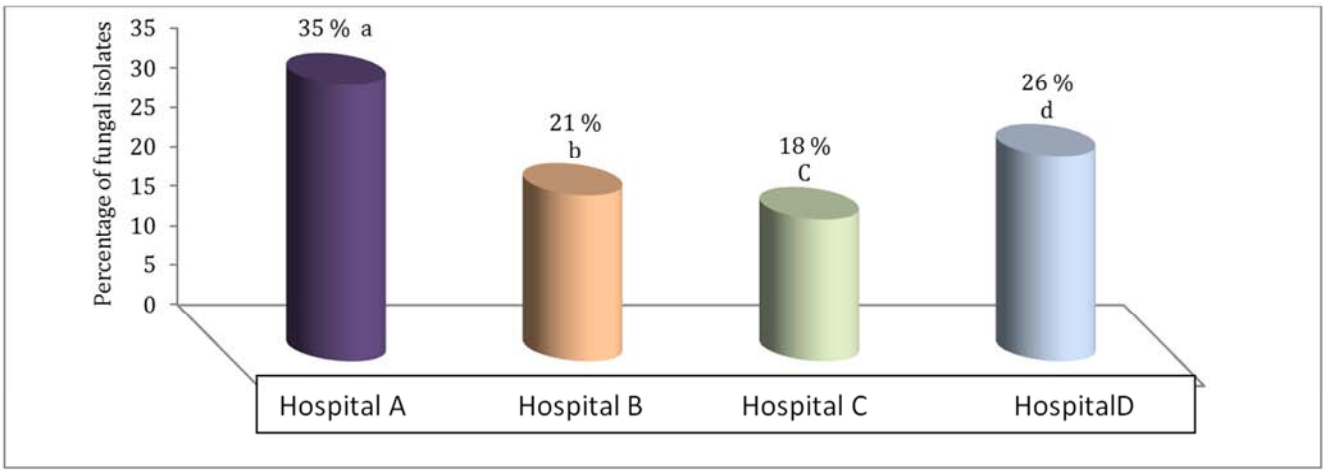

Figure 1. *Percentage of pathogenic and opportunistic fungal species in each Hospitals. The percentage with different letter notification are significant differences at P< 0.05, (P- value = 0.003).*

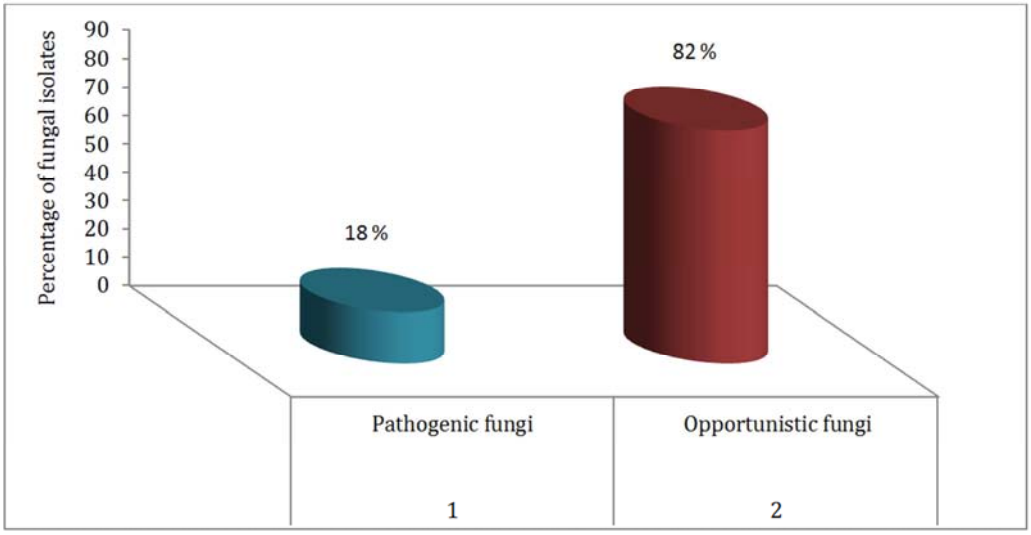

Figure 2. *Percentage of pathogenic and opportunistic fungal species in all Hospitals. The percentage showed No significant differences at (P<0.05) were observed,(P-value =0. 478).*

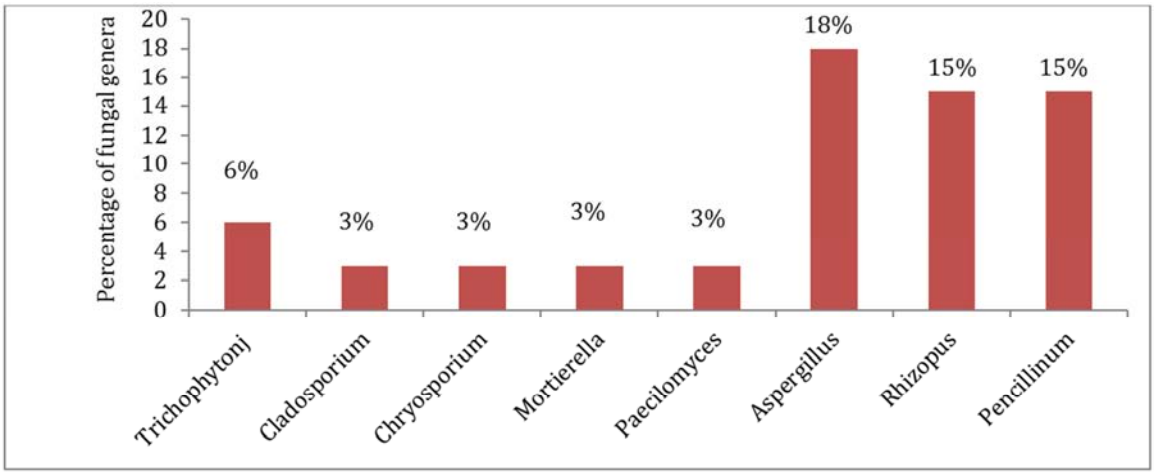

Figure 3. *Percentage and types of fungal genera isolated from all Hospitals. No significant differences at (P<0.05) were observed among these fungal genera. (p-value=0.543).*

The result showed in Figure 4. The percentage of pathogenic fungi in all Hospital as: Hospital A, Hospital B, Hospital C and Hospital D, represent 3 (9%), 1 (3%), 0 (0%), 2 (6%) respectively. No significant differences at (P<0.05) were observed among pathogenic fungi and Hospitals. Rather than the percentage of opportunistic fungi in each Hospital represents: 9 (26%), 6 (18%), 6 (18%), and 7 (29%) respectively. A significant differences at (P<0.05) were observed among opportunistic fungi and Hospitals.

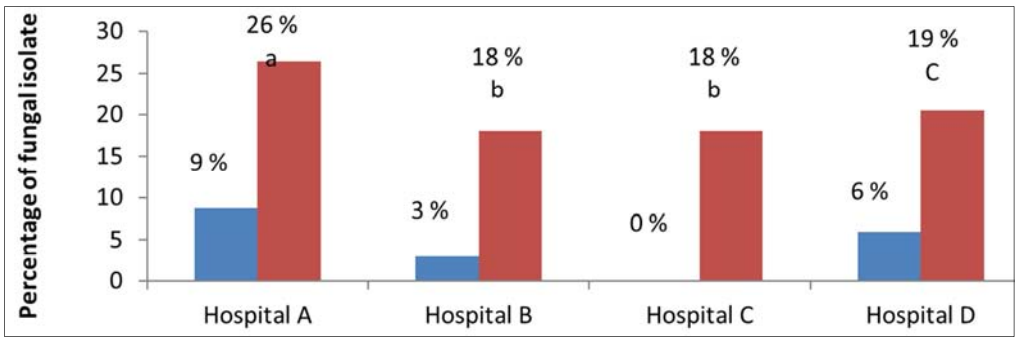

Figure 4. *Percentage of pathogenic and opportunistic fungai in each Hospital. The percentage of opportunistic, with different letters notification are significant at P< 0.05, were observed among opportunistic fungi and Hospitals, (p-value=0.0002). Rather than the percentage of pathogenic fungi in each Hospital showed No significant differences at (P<0.05) were observed, (p-value=0.173).*

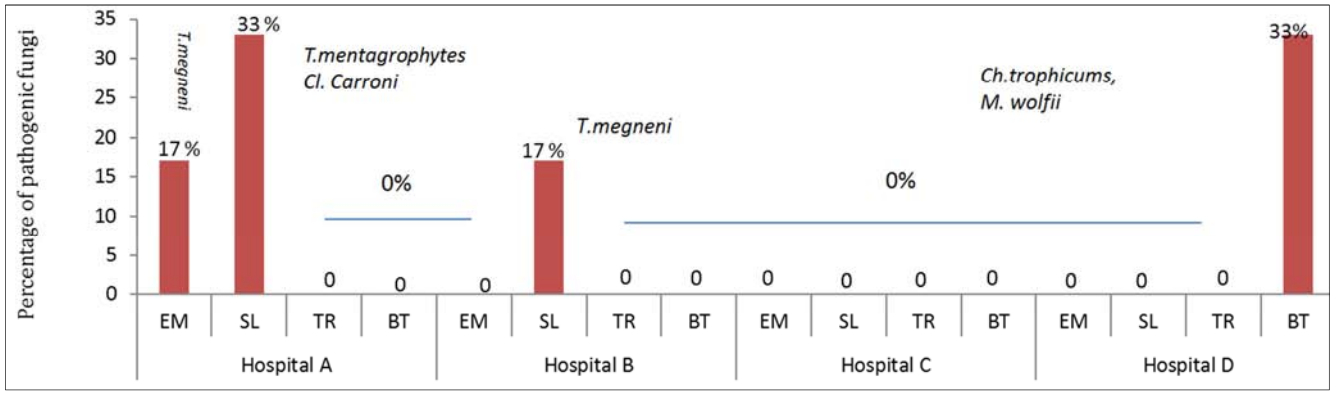

Figure 5. *Distribution of Pathogenic fungi in each hospital department. No significant differences at (P<0.05) were observed, (P- value=0.560).*

The results of pathogenic and opportunistic fungi identified are depicted in Figure 2. As shown, pathogenic fungi in all Hospitals were identified in 6 (18%); whereas, Opportunistic fungi in all Hospitals also identified in 28 (82%). No significant differences at (P<0.05) were observed among pathogenic and opportunistic fungi. These results are disagreeing with the findings of Saad (2003) who reported 92% opportunistic fungi and 8% pathogenic fungi.

The isolated fungal cultures belonging to 8 genera and 13 species (Figure 3) which include Aspergillus, (Rhizopus and Penicillinum), Trichophyton, Cladosporium, Chryosporium, Mortierella and Paecilomyces, represented, 18 (53%), 5 (15%), 2 (6%), 1 (3%), 1 (3%), 1 (3%), and 1 (3%), respectively. The highest number of fungal isolates in general was genus belonging to Aspergillus. No significant differences at (P<0.05) were observed among these fungal genera.

The result showed in Figure 5. distribution the percentage of Pathogenic fungi in each department of each hospital. No significant differences at (P<0.05) were observed. Also the results revealed that: In Hospital A a highest number 2 (33%) of *Trichophyton mentagrophytes* and *Cladosporium carroni,* was isolated from the slumber department (SL) and 1 (17) of *Trichophyton rubrum*was isolated from emergency department (EM); whereas the lower 0 (0%) isolated from tracks (TR) and Bathrooms (BR). In Hospital B a highest number 1 (17%) of *Pacilomyces. varioti*was isolated from the slumber department (SL); whereas the lower 0 (0%) from emergency's section (EM), tracks (TR) and bathrooms (BR). In Hospital C no pathogenic fungi detected in all Hospital departmens. InHospital D a highest number 2 (33%) of *Chrysporium trophicums* and *Mortierella. wolfii*was isolated from tracks (TR); whereas the lower 0 (0%) from Emergency's section (EM), Slumber section (SL) and Bathrooms (BR) as in Figure 5.

The differences of the fungal numbers and types between these Hospitals and Departments are may attributed to the degree of these Hospitals environment hygiene. That's poor management, poor hygiene, density of visitors, patient's number; weathers (level of the air and dust, temperature and humidity), methods of disinfection, Hospitals design, Hospital site and methods of safety and security. Consequently, there is an effect rate of infections between these Hospitals (Jaffal et al., 1997, WHO, 2002).

4. Conclusion

The current study concluded that the highest numbers of fungal isolates in general were: in Hospital A. and the lowest were in Hospital C. Percentages of opportunistic fungal species were higher than pathogenic in general. 34 isolates belongs 8 fungal genera were isolated and identified. 28 isolates were diagnosed as opportunistic fungi. 6 isolates were diagnosed as pathogenic fungi. The highest numbers of pathogenic fungi were in both Hospitals: A and D Hospital, and the lowest in Hospital C. The highest numbers of pathogenic fungi were in both departments Slumber section and Tracks.

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