Environmental Surveillance of Filamentous Fungi in Hospital Air Sampling.

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Abstract

Aero-filamentous fungi are mostly opportunistic fungi, which are responsible for opportunistic infection to immunosuppressive patients admitted in Hospital. In the present study, air sample was collected from indoor of TMMC and RC Hospital, Moradabad, U.P., India. Before fumigation total 100 air samples (March 2014-December 2014) were collected from indoor of TMMC and RC Hospital by settle plate method. In this study, filamentous fungi were identified by their cultural characteristics, 10% KOH preparation and LCB preparation. The most prevalent fungi collected from air were Aspergillus spp. (43.0%), Mucor spp. (16.0%), Fusarium spp. (12.0%), Penicillium spp. (9.0%), and Others spp. (14.0%). PICU was most contaminated by Aspergillus spp. (14.0%) and Major O.T. (4%) was least contaminated department in TMMC and RC Hospital. In the present study, most of the indoor of TMMC and RC air was contaminated by opportunistic fungi Aspergillus spp, which more invasive filamentous fungi is causing invasive Aspergillosis, Aspergilloma and superficial infections to the immunosuppressive patients. Environment of TMMC and RC Hospital should be maintained in a clean and hygienic manner. We suggest regular cleaning of the floor of indoor by antifungal agent or germicidal agent and fumigation programme should be done in Hospital, which helps to improve removal of filamentous fungi.

Keywords: Filamentous fungi, Air sampling, Settle plate method, Opportunistic infection, Aspergillus spp.

1. Introduction

Hospital environment contaminated by filamentous fungi is a risk factor for causing opportunistic infection to immunosuppressive patients (post-operative, haemopoietic stem cell transplant, haematological malignancy patients) (Alberti et al., 2001; Heinemann et al., 2004). Mainly Aspergillus spp., Penicillium spp. and Mucor spp. are responsible for human infection (Diaz-Guerra et al., 2000; Gosbell et al., 1999). In hospital environments fungal spores are transmitted through air, air conditioning, patients and visitors (Beggs et al., 2003; Lugauskas et al., 2004). Approximately 200 fungal spores are inhaled per day through human respiratory tract, which reach the alveoli (Latge, 1999). In alveoli these fungal spores are destroyed by alveolar macrophages (Inbrahim-Granet, 2003). Invasive local or disseminated infections are caused by filamentous fungi in laboratory for incubation (25°C for 4 days) and for further analysis. Filamentous fungal colonies were individuals with defective body defense systems (Roiildis, 2003). In immunocompromised hosts, mainly Aspergillosis occurs. Prolonged muscles cramps, colds, joint pain, watery eyes are generally seen in these patients (Hollaren, 1991).

2. Materials and Method

The present study was carried out from March 2014 to December 2014 at TMMC and RC Hospital, Moradabad (U.P.), India. Total 100 air samples were collected before fumigation from indoor of Hospital (PICU, NICU, SICU, ICCU, NEURO ICU, CCU, MAJOR OT, MINOR OT, GYN O OT and LABOUR ROOM and OBST). Air samples were collected by settle plate method by exposing Petridish containing Sabouraud Dextrose Agar medium at the height of 1 meter above the ground level for 20-30 minutes. The exposed Petridish was closed and brought to the
identified by their morphological characteristics, Lactophenol cotton blue and 10% KOH preparation was observed under microscope (Sampath, 2014).

3. Results and Discussion

The filamentous fungi were isolated in indoor of hospital. The isolated species were: Aspergillus spp. (43.0%), Aspergillus niger 19.0%, Aspergillus flavus 13.0%, Others Aspergillus spp. 11.0% fungi were isolated, Mucor spp. (16.0%), Fusarium spp. (12.0%), Penicillium spp. (9.0%), Rhizopus spp. (6.0%) and Others spp. (14.0%).

PICU was most contaminated by Aspergillus spp. (14.0%) and Major OT was least contaminated department in TMMC and RC Hospital (Fig 1 and Fig 2).

In this study air samples were collected from various wards of hospital before fumigation by settle plate methods. Filamentous fungi were identified on the basis of cultural characteristics, 10% KOH preparation and LPCB preparation for microscopy. The most filamentous fungi isolated were Aspergillus spp., Mucor spp., Fusarium spp. and Penicillium spp. Mostly Aspergillus spp. (43.0%) was isolated from various wards of Hospital. The Aspergillus niger (19.0%) was the most common isolated species (Table 1).

Table 1: Distribution and characteristics of filamentous fungi isolated from air samples.

<table>
<thead>
<tr>
<th>Isolated Filamentous Fungi</th>
<th>No. of Filamentous Fungi</th>
<th>Colour of Colonies</th>
<th>Texture</th>
<th>Prevalence (in %age)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspergillus spp.</td>
<td>66</td>
<td>-</td>
<td>-</td>
<td>43.0%</td>
</tr>
<tr>
<td>Aspergillus niger</td>
<td>29</td>
<td>Black</td>
<td>Cottony</td>
<td>19.0%</td>
</tr>
<tr>
<td>Aspergillus flavus</td>
<td>20</td>
<td>Yellow</td>
<td>Velvety</td>
<td>13.0%</td>
</tr>
<tr>
<td>Other Aspergillus spp.</td>
<td>17</td>
<td>Depending upon spp.</td>
<td>-</td>
<td>11.0%</td>
</tr>
<tr>
<td>Penicillium spp.</td>
<td>14</td>
<td>White-powdery</td>
<td>Velvety</td>
<td>9.0%</td>
</tr>
<tr>
<td>Mucor spp.</td>
<td>24</td>
<td>Light dull to grey colonies</td>
<td>-</td>
<td>16.0%</td>
</tr>
<tr>
<td>Rhizopus spp.</td>
<td>10</td>
<td>White</td>
<td>Cottony</td>
<td>6.0%</td>
</tr>
<tr>
<td>Fusarium spp.</td>
<td>18</td>
<td>Depending upon spp.</td>
<td>Wolly-Cottony</td>
<td>12.0%</td>
</tr>
<tr>
<td>Other spp.</td>
<td>22</td>
<td>Depending upon spp.</td>
<td>Depending upon spp.</td>
<td>14.0%</td>
</tr>
<tr>
<td>Total</td>
<td>154</td>
<td>-</td>
<td>-</td>
<td>100%</td>
</tr>
</tbody>
</table>
The indoor of hospital was contaminated by spores of filamentous fungi because near the hospital wards construction of new buildings was being carried out at the time of air sampling, which increased the chances of air contaminated by spores of filamentous fungi. In rainy season, dampness of hospital wall also facilitated the growth of fungi. The most significant filamentous fungi was *Aspergillus* spp. which is causative agent of respiratory tract infection and others spp. occasionally causes infection to the immunosuppressive patients.

In the previous studies, *A. niger* was most filamentous fungi isolated from West-Chennai Hospital (India) air sample (Sudharsanam, 2012). In Civil Hospital Aiwa, Mizoram (India) isolated fungi were *Aspergillus* spp., *Penicillium* spp., *Fusarium* spp. (Karuppasamy, 2013). In three Greek hospitals: Thessalonika Northen Greece, Athens Central Greece and Heraklion Southen Greece Hospitals air samples *A. niger* was the most prevalent spp. in the air (Panagopoulou, 2002).

In this study, the spores of filamentous fungi were supposed to be transmitted by visitors, patients, contaminated water and vehicles used in Hospital.

4. Conclusion

In this finding, air of indoor wards was contaminated by *A. niger* which is more invasive and causes aspergillosis, aspergilloma and superficial infections to the humans. Environment of TMCC and RC should be maintained in a clean and hygienic manner. Washing or cleaning of the floor and wall of hospital by germicidal agent or anti-fungal agent is advised. Fumigation programme should be done in Hospital which helps in removal of filamentous fungi.

References


