

# Fungal Infections in Pediatric Patients with Hematologic Malignancies

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## Abstract

As the data on the epidemiology and outcome of fungal infections in children with hematologic cancer are limited especially in Iran, this study was aimed to delineate the epidemiologic features and outcome of fungal infections in this population.

The medical records of all children with hematologic malignancies diagnosed with a fungal infection from 2005 to 2010 at a tertiary pediatric hospital (Ali Asghar Children's Hospital, Tehran, Iran) were reviewed. The results indicated that out of 617 children hospitalized in the hematology/oncology department during the study period, 115 (18.6%) were diagnosed with a fungal infection. Between 87 patients with fungal infection whose records were complete, *Candida* species caused the majority (73.6%) of fungal infections. *Aspergillus* species were found in 14.9% and *Mucor* species in 11.5% of patients. The mortality rate significantly correlated with the organism causing the infection ( $P < 0.0001$ ) and was especially high in patients with *Aspergillus* infections (61.5%). Improved prevention, early detection, and advanced treatment strategies are needed to improve the outcome.

**Keywords:** Fungal, infection, pediatric, hematologic, malignancy.

## Dear Editor

Since drastic improvement in the field of treatment for pediatric patients with hematologic malignancies has been accompanied by the increasing rate of invasive fungal infections, a serious risk has been posed to these patients.

Although the incidence of invasive fungal infections in adults has been reported as high as 30%, and the mortality, up to 50%<sup>1, 2</sup>, the data in children, particularly for the last 10 years, are limited. Moreover, most pediatric studies of fungal infections have focused on blood-borne infections<sup>3-6</sup> or have not been limited to the oncology population<sup>7-9</sup>.

For that reason, we reviewed the records of 617 pediatric patients with hematologic malignancies over a period of five years in Ali Asghar Children's Hospital, Tehran, Iran. Among them 466 patients who did not have fungal infections and 64 patients with fungal infection but incomplete records were excluded from the study. Obviously, this high percentage of incomplete patients' records was one of the limitations of our study.

For the remaining 87 patients, the medical and microbiological records were reviewed.

The results showed that the age range of the patients was 1 to 19 years and their mean age was  $8 \pm 4.5$  years. The most common age for acquiring fungal infection was 2 years old and most (64.3%) of patients who were proved to have fungal infection were less than 10 years old. Patients with lymphoid leukemia had a much higher risk of developing fungal infections (72.4%) followed by those with myeloid leukemia (17.2%). Lymphoma was the diagnosis of 8% of the patients (5 patients Hodgkin lymphoma, 3 patients Non Hodgkin lymphoma and 1 patient Burkitt lymphoma). In relation to the stage of therapy, 49.4% were diagnosed in induction phase of chemotherapy, 44.8% in maintenance phase and 5.7% were diagnosed during cancer relapse or recurrence. Overall, *Candida* species caused the majority (73.6%) of fungal infections. *Aspergillus* species were found in 14.9% and *Mucor* species in 11.5% of patients. Considering the site of infection, oral

infections were the most common (73%). Upper respiratory tract (13.7%), lower respiratory tract (12.8%), external ear (4.5%) and skin (1.1%) were the other sites of infection. Twenty three percent of patients died and the fungal infection in 67 patients were resolved. Among the patients who had died, 35% were due to *Candida* infections, 25% due to *Aspergillus* infections and 40% due to *Mucor* infection.

The mortality rate significantly correlated with the organism causing the infection ( $P < 0.0001$ ); and was especially high in patients with *Aspergillus* infections (61.5%). Nearly half of patients with *Mucor* infections and only 11% of patients with *Candida* infections died. In a study by Mor et al. 10, mortality due to *Candida* infection was 20%, and the mortality rate due to mold infection was 21.7%. Rosen et al. 11 reported that although the mortality rates were not significantly different among patients with different fungal organisms, those with non-*Candida albicans* and *Aspergillus* infections tended to have worse outcomes. Even though we found no correlation between the site of infection and the rate of mortality, in other studies, the mortality rate was especially higher in patients with a fungal lung infection 12.

Ultimately, as fungal infections in pediatric patients with cancer undergoing intensive chemotherapy are often life-threatening complications, in this study we tried to establish the magnitude of the problem in Iran.

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