

Emerging Fungal Infection- A Challenge

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Fungi once considered to be a saprophytic environmental organism either causing minor inconveniences or rarely posing as an opportunistic pathogen to immunocompromised hosts are showing some sinister shifts in terms of virulence and pathogenicity in these advancing years. The global prevalence of fungal diseases estimates more than 1.5 billion mortality and morbidity affecting more than a billion people. Now it is a matter of concern that mortality associated with fungal disease more than one million is similar to that of tuberculosis and more than three folds of malaria [1]. These rising trend of fungal infection is persistently continuing even in the presence of advanced antifungal. Although till now they have not superseded bacterial and viral infections, but they will be sharing the same position as them in recent future.

Factors responsible for emergence

The incidences of human fungal infections are continuously rising. Emergence of new fungal pathogens previously considered as environmental contaminants as well as established pathogens with exalted virulence factors and modified pathogenicity are responsible for this rising trend. But contrary to it even now fungal infections are underreported due to their varied clinical presentations, poor laboratory confirmation and limited treatment options.

The multifactorial association of this emergence are related to advancement in medical practices like increase in invasive procedures; successful immunosuppression in transplant patients; and immunomodulatory agents for treating underlying diseases from cancer to rheumatoid arthritis. Risk factors such as changes in land use, seasonal migration, international travel, extreme weather, and natural disasters, and the use of azole antifungal agents in large-scale agriculture are believed to underlie many of the increases in community-acquired fungal infections [2].

Increase in number of immunocompromised hosts and increased laboratory confirmation has resulted from both increased awareness and incidences. AIDS epidemic results in increased numbers of a variety of associated fungal disease such as mucocutaneous candidiasis, *Pneumocystis carinii* pneumonia and cryptococcal meningitis and many others. In highly endemic areas, the prevalence of coccidioidomycosis and histoplasmosis in AIDS patients is as high as 30% [3].

Increased incidence of fungal infections in transplant recipients leads to inadvertent and uncontrolled use of antifungal agents in hospital settings and in the community including over-the-counter use. These may be the factor contributing evolution of antifungal resistance and a need for antifungal stewardship. The level of resistance to antifungal agents is relatively low due to the possible absence of drug-resistant plasmid or transposons in fungi [4]. Emergence of intrinsically resistant fungal species as a human pathogen is compounding the challenge of planning treatment strategies. Beyond these confounding factors, the conditions leading to clinical resistance should be kept in mind while managing invasive fungal infections in immune-compromised patients [5].

In this modern world implementation of advanced techniques in treatment of critically ill patients, as well as the use of prophylactic antibiotics, indwelling catheters and prosthetic devices, hyper alimentation, intensive cancer chemotherapeutic regimens, and organ and

bone marrow transplants increase the chances of fungal infection in patients. Environmental factors like newer land use, travel and commerce also promote emergence of new fungal infections in immune-competent persons who are not previously exposed.

The emerging trend

Recent global estimates found 3,000,000 cases of chronic pulmonary aspergillosis, 223,100 cases of cryptococcal meningitis complicating HIV/AIDs, 700,000 cases of invasive candidiasis, 500,000 cases of *Pneumocystis jirovecii* pneumonia, 250,000 cases of invasive aspergillosis, 100,000 cases of disseminated histoplasmosis, over 10,000,000 cases of fungal asthma and 1,000,000 cases of fungal keratitis occur annually [1].

Keeping aside albicans and nonalbicans *Candida* and invasive Aspergillosis Zygomycetes, *Fusarium*, *Scedosporium*, *Paceilomyces*, *Trichoderma*, *Scopulariopsis*, Dematiaceous fungi (*Exophiala*, *Alternaria*, and *Bipolaris*), Chromoblastomycosis, *Trichosporon*, *Malassezia*, *Rhodotorula*, *Penicillium marneffeii*, *Paracoccidioides* and *Sporothrix* are emerging fungal infection among immunosuppressed individuals [4].

Due to Indian tropical climate well suited to fungal infections, this country shares a huge burden of mycoses present whole over the world, most of which are underreported due to lack of good diagnostic laboratories, rapid diagnostic kits and defective treatment strategies. However invasive candidiasis stands as the most common opportunistic mycoses with higher prevalence of *Candida tropicalis* followed by invasive aspergillosis. Invasive zygomycosis, cryptococcosis and penicilliosis continue treading ahead due to rising uncontrolled diabetes cases and untreated or partially treated AIDS cases respectively [6].

Prevention strategies

As most invasive fungal infections contribute to high mortality morbidity rates, reducing the incidence of these diseases often relies on rapid and specific diagnostics, effective antifungal drugs, novel immunotherapeutic strategies, and adherence to infection control and sterility practices. Public awareness should be created regarding environmental exposures.

Continued public health efforts toward defining, characterizing, and tracking the emergence of fungal infections can help to focus studies on priority infections and settings. Extensive effort to develop novel diagnostics, vaccines, and treatments is the timely need along with improvement of our knowledge about the pathogenesis of fungal infections and the biology of fungal agents.

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