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Challenges in the diagnosis and treatment of pulmonary fungal infections in Pakistan

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A significant burden of pulmonary infections exists in low and low middle-income countries (LMICs) resulting in high morbidity and mortality.¹ Fungi are an important cause of respiratory infections particularly in patients with compromised immune system, structural lung disease, prolonged ICU stay and post TB and viral infections. Pulmonary fungal infections result in severe respiratory complications, high mortality, and significant healthcare costs. *Aspergillus* spp, are responsible for a majority of these infections, however in endemic settings histoplasmosis, coccidioidomycosis and blastomycosis could present as community acquired pneumonias. In Pakistan, a high burden of pulmonary fungal infections has been estimated with chronic pulmonary aspergillosis rates are estimated to be highest (39/ 100,000) because of the high TB burden.² Invasive aspergillosis was estimated to be around 5.9/100,00.² Despite having a high burden in the country, the diagnosis and management of pulmonary fungal infections is challenging due to non-specific clinical presentation, lack of awareness amongst health care professionals, unreliable and limited diagnostic facilities and lack of specialized medical expertise, and inadequate infrastructure. In this editorial, we will elaborate on the problems related to the diagnosis and management of pulmonary fungal infections in Pakistan and will propose measure to address these challenges.

Diagnostic challenges

Accurate diagnosis of fungal infections is the major problem limiting the control of pulmonary fungal infections in Pakistan. Clinical laboratories in Pakistan also have a limited capacity for fungal diagnostics.³ The conventional fungal diagnostic methods are slow and have limited sensitivity and specificity and even these are not readily available in most microbiology laboratories in the country.⁴ Another problem of culture-based diagnostics is difficulty in discriminating between colonization and infection, especially in patients with underlying lung diseases. There is also misdiagnosis of pulmonary aspergillosis as smear negative TB leading to irrational use of antituberculous medications. Increased education and awareness of prevalent pulmonary fungal infections in the country is one of the steps to address this challenge. The development and implementation of cost-effective, point-of-care diagnostic tools tailored to our country could significantly improve early detection and timely treatment initiation. Widespread availability of antigen and PCR based fungal diagnostics that could be performed in serum and respiratory

secretions will be the key to improved diagnosis. Serological tests for the diagnosis such as *Aspergillus* specific IgG using simpler and rapid platforms needs to be made widely available. Clinical algorithms should also be modified to include tests for screening and early diagnosis of invasive pulmonary infections such as aspergillosis and pneumocystosis.

There is under diagnosis of fungal infections as the clinical expertise for early detection of these infections is present in only a few tertiary care hospitals. Additionally, public awareness regarding pulmonary fungal infections remains low in Pakistan leading to delayed seeking of medical care and inappropriate self-medication practices.

Treatment challenges

In Pakistan, the availability and affordability of antifungal drugs can be limited, leading to suboptimal treatment and compromised patient care. Antifungal resistance has also emerged to azoles in the country and pose a significant threat to successful treatment outcomes. International collaboration and advocacy efforts are crucial to ensure access to essential antifungal medications at affordable prices. Supply chain and distribution of antifungals also needs to be improved as well as antimicrobial stewardship programs should be developed to stop indiscriminate antifungal usage and to stop emergence of antifungal resistance.

Pulmonary fungal infections often affect immunocompromised individuals such as patients with HIV/AIDS, transplant, post TB or post viral infections or other chronic illnesses. The management of these infections becomes more challenging when dealing with patients who have multiple health issues or co-infections⁵. Integrated healthcare approaches that address both the underlying conditions and the fungal infections are vital to improve overall patient care. Treatment guidelines are also not available in local setting are clinicians are therefore using antifungals indiscriminately. These standardized guidelines need to be developed and implemented.

Educational campaigns targeting healthcare providers, as well as the general population, could increase awareness about the signs, symptoms, and risk factors of pulmonary fungal infections, leading to early diagnosis and improved patient outcomes. There is a need to invest

in training programs and capacity building initiatives for health professionals with the necessary skills to identify and treat pulmonary fungal infections effectively.

Conclusion

The diagnosis and management of pulmonary fungal infections in Pakistan present significant challenges that require a multipronged approach. Combining efforts to improve diagnostic capabilities, medical expertise, public awareness, antifungal accessibility, and antifungal resistance surveillance will be essential in reducing the burden of these infections and enhancing patient outcomes.

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