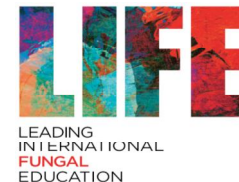




# Burden of Serious Fungal Infections in Nepal

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## Introduction

The number of serious fungal infections in Nepal is not known. Both pathogenic and allergenic fungi including *Aspergillus* species are common in the air in Kathmandu valley and fungal keratitis has been reported frequently. Every year, 45,000 people develop active TB, and 20,580 have infectious pulmonary disease. As of 2012, national estimates indicate that approximately 48,600 adults and children are infected with the HIV virus in Nepal. In this context, estimates of the burden of serious fungal infections will have a substantial public health importance for diagnosis and treatment of fungal diseases in Nepal. We have estimated the number of serious fungal infections.

## Methods

All published papers reporting fungal infection rates from Nepal were reviewed. We also extracted annual morbidity data of infections nationally, the asthma rate and population data from the annual report of the Department of Health Services (2012/2013). When few data existed, we used specific populations at risk and fungal infection frequencies in those populations to estimate national incidence or prevalence. Using scoping review methodology and deterministic modelling, we estimated the prevalence of allergic bronchopulmonary aspergillosis (ABPA) in adults with asthma (Denning et al, *Med Mycol* 2013; 51:361-370) and the incidence and 5-year period prevalence of chronic pulmonary aspergillosis (CPA) following TB in Nepal (Denning et al, *Bull WHO* 2011; 89:864-72). The prevalence of ABPA complicating asthma was estimated at 2.5% (0.7-3.5%). The incidence of fungal keratitis was estimated by using data obtained from different studies which documented the fungal keratitis cases in Nepal.

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Table 1: Estimated burden of serious fungal diseases in Nepal

Infection	No of infections per underlying disorders per year				Total Burden	Rate/100K
	None	HIV/AIDS	Respiratory	Immunocompromised		
Oral candidiasis	-	9900	-	-	9900	36.2
Oesophageal candidiasis	-	2875	-	-	2875	10.5
Cryptococcal meningitis	-	109	-	55	164	0.6
<i>Pneumocystis pneumonia</i>	-	358	-	-	358	1.3
Recurrent vulvovaginal candidiasis	464,929	-	-	-	464,929	1702
<i>Aspergillus</i> infection	847	-	-	-	847	3.1
Invasive aspergillosis	-	-	936	183	1119	4
ABPA	-	-	9,546	-	9546	35
SAFS	-	-	12,600	-	12,600	46.1
CPA	-	-	6611	-	6611	24.2
Fungal keratitis	19,938	-	-	-	19,938	73
Allergic fungal rhinosinusitis	628	-	-	-	628	2.3
Fungal otomycosis	1010	-	-	-	1,010	3.7
Fungal onychomycosis	819	-	-	-	819	3
<i>Mucormycosis</i>	19	-	-	55	74	0.27

Estimated Burden of Serious Fungal Infections in Nepal



CM= Cryptococcal Meningitis, PP = *Pneumocystis Pneumonia*, IA= Invasive Aspergillosis, ABAP= Allergic Bronchopulmonary Aspergillosis, SAFS= Severe Asthma with Fungal Sensitization, CPA= Chronic Pulmonary Aspergillosis, FK= Fungal Keratitis, AFR= Allergic Fungal Rhinosinusitis.

## Results

In 2013/2014, the population of Nepal was estimated at 27.3M of which 2.8M are children (under 5 years) and 7.38M are women aged between 15-49 years. 22.6M Nepali live in rural areas of the country. Table 1 shows the total burden of fungal infections, the number of infections according to the main risk factors, as well as the rate for 100,000 inhabitants annually. 464,929 women probably suffer from recurrent vulvovaginal candidiasis. We estimated the incidence of infective keratitis at 188/100K annually of which 73/100K fungal keratitis. Fungal rhinosinusitis was estimated at 3/100K according to recorded cases. Infection due to *Aspergillus* species was estimated at 3.1/100K, usually *Aspergillus flavus* followed by *A. niger* and *A. fumigatus*. COPD is common with 215,765 cases, contributing to the total 1,119 cases of invasive aspergillosis (IA). Of 381,822 adult asthma cases, we estimated 9,546 patients (range 2,673-13,364) develop ABPA and 12,600 have severe asthma with fungal sensitization (SAFS). Based on 26,219 cases of pulmonary TB, the annual incidence of new CPA cases was estimated at 1,678 with a 5 year period prevalence of 5,289, 80% of the total CPA cases. Of 22,994 HIV patients with CD4 counts <350 not on ARVs, *Pneumocystis pneumonia* was estimated at 358. Cases of oral and oesophageal candidiasis in HIV/AIDS patients were estimated at 9,900 and 2,875 respectively. The rate of cryptococcal meningitis was estimated at 0.6/100K.

## Conclusion

About 1.94% of the Nepalese population was estimated to suffer from a serious fungal infection annually and the most serious fungal infections occur in HIV/AIDS and immunocompromised patients. Fungal keratitis is the most prevalent fungal infection in Nepal. There is also a high burden of ABPA and CPA. This study will provide a preliminary data to determine the public health impact of fungal diseases in the country. Further epidemiological studies are necessary to better categorize and validate these estimates.

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