

# Estimation of the burden of chronic and allergic aspergillosis in India

Arunaloke Chakrabarti, Ritesh Agarwal, Donald C. Cole, Alex Pleuvry and David W. Denning

Departments of Medical Microbiology and Pulmonary Medicine, Postgraduate Institute of Medical Education & Research, Chandigarh, India; Dalla Lana School of Public Health, University of Toronto, Toronto, Canada; Oncalex, High Peak, U.K The University of Manchester, Manchester, UK, in association with the LIFE program at [www.LIFE-worldwide.org](http://www.LIFE-worldwide.org)

## Abstract

**Objective:** India is the world's second most populous country, with high rates of TB and HIV. Comprehensive baseline data is necessary for effective prioritization of limited public health resources. Using scoping review methodology and deterministic modelling, we have estimated the incidence and 5yr period prevalence of chronic pulmonary aspergillosis (CPA) following TB and prevalence of allergic bronchopulmonary aspergillosis (ABPA) complicating asthma in India.

**Methods:** The bases for the computations have been published (Denning et al, Bull WHO 2011;89:864-72 and Denning et al, Med Mycol 2013. In press). Estimated pulmonary TB rates were updated from 2007 to 2011 using WHO statistics, with deaths excluded. Asthma rate in adults was estimated from the country-specific prevalence of asthma from the GINA report applied to population estimates (mean prevalence of current wheezing in children was 88% of adults in the countries which participated in both studies). Additional modeling was done to accommodate several ABPA studies in India.

**Results:** In 2011, the population of India was estimated at 1,241,000K. The number of cases of pulmonary TB in India were 3,100K (249/100K) and the mortality was 300K (24/100K). The annual estimated incidence of new CPA cases was 85,012 while 5 year period prevalence was 267,987. Rates of ABPA complicating asthma with good denominators of referral populations (n=5 studies) vary from 0.7 to 3.5%, with the median being 2.5%. The number of adult asthmatics is estimated at 23,709K and ABPA at 592,719. If rates of 5%, 7% and 20% are applied, the gross numbers of ABPA patients estimated in India rises to 1,185K, 1,660K and 4,742K respectively.

All estimates (n=7) of Aspergillus sensitization rates in adult asthmatics in India exceed 16% and are 50% in asthmatics admitted to ICU with asthma.

**Conclusion:** The total burden of antifungal-responsive chronic and allergic aspergillosis in India is not known, but is likely to exceed 860,000 patients. CPA has many underlying conditions in addition to TB, which are not estimated. CPA carries an early mortality of 30% after diagnosis (Korea and Japan), emphasizing the importance of antifungal therapy to minimize death and morbidity. Epidemiological studies are required to better categorize the burden of these diseases in India.

Year	Population	Time frame	N studied	ABPA N	Comments	Reference
1976	Secondary and tertiary ? fungal disease referrals	3-4 years	367	17 (4.6%)	IgE not measured, patients had to have asthma and periodic infiltrates, positive skin test, eosinophilia, A. fumigatus grown from sputum and positive Aspergillus precipitins.	Khan et al
2005	Sequential referrals to a tertiary centre	NS	105	8 (7.6%)	12 patients excluded. Healthy control group also evaluated. Patients also sensitized to non-fumigatus Aspergilli	Maurya et al
2007	Sequential referrals to a tertiary centre	4.5 years	755	155 (20.5%)	Full diagnostic details not provided for all ABPA patients.	Agarwal et al
2010	Tertiary center referrals	1 year	215	15 (7%)	Excluded: those in receipt of steroids for 2 weeks in prior 6 months. 6 patients grew A. flavus.	Ghosh et al

## Background & Objectives

- Asthma of any severity may be complicated by allergic bronchopulmonary aspergillosis (ABPA).
- Treated pulmonary tuberculosis (PTB) can lead to complications, including progressive loss of lung function, persistent pulmonary symptoms and the most subtle, yet the most severe, chronic pulmonary aspergillosis (CPA).
- Both ABPA and CPA respond well to antifungal therapy.
- Using scoping review methodology and deterministic modelling, we estimate the prevalence of ABPA complicating asthma; and the incidence and 5yr period prevalence of CPA following PTB, in India.

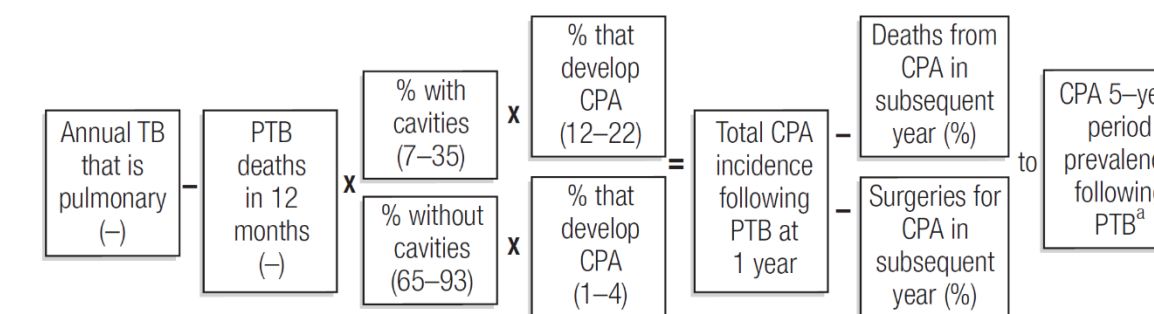
## Methods

We estimated the adult burden of asthma by the GINA estimates. The prevalence of ABPA complicating asthma was estimated at 2.5% (0.7-3.5%) [Ref. 1]. The following factors were used in estimation of ABPA:

$$\text{Asthma cases per 100,000 population} \times \text{\% of asthma in adults} \times \text{Proportion with ABPA among new referrals for asthma (2.5\%)}$$

Asthma rate in adults was estimated from the prevalence of asthma from the GINA report applied to population estimates (mean prevalence of current wheezing in children was 88% of adults in the countries which participated in both studies). Additional modeling was done to accommodate several ABPA studies in India.

The burden of CPA complicating pulmonary TB was made on the following assumptions [Ref. 2]:



Estimated pulmonary TB rates were assessed for the year 2011 using WHO fact sheet (<http://www.who.int/tb/country/data/profiles/en/index.html>), with deaths excluded.

## Results

- In 2011, the population of India was estimated at 1,241,000K.
- The number of cases of pulmonary TB in India has fallen slightly from 3,305K to 3,100K (2,100K – 4,300K) (249/100K) and the mortality also from 331K to 300K (24/100K).
- The annual estimated incidence of new CPA cases has risen from 83,000 to 85,012 and 5 year period prevalence from 261,679 to 267,987.
- Rates of ABPA complicating asthma with good denominators of referral populations (n=5 studies) vary from 0.7 to 3.5%, with the median being 2.5% [Ref. 1].
- The number of adult asthmatics is estimated at 23,709K and ABPA at 592,719.
- If rates of 5%, 7% and 20% are applied [Refs. 3-6], the gross numbers of ABPA patients estimated in India rises to 1,185K, 1,660K and 4,742K respectively.
- All estimates (n=7) of Aspergillus sensitization rates in adult asthmatics in India exceed 16% and are 50% in asthmatics admitted to ICU with asthma [Ref. 7].

## Conclusions

- The total burden of antifungal-responsive chronic and allergic aspergillosis in India is likely to exceed 860,000 patients.
- Epidemiological studies are required to better categorize the burden of these diseases in India.

## References

- Denning DW, et al. Global burden of allergic bronchopulmonary aspergillosis with asthma and its complication chronic pulmonary aspergillosis in adults. Med Mycol 2013; IN PRESS
- Denning DW, et al. Global burden of chronic pulmonary aspergillosis as a sequel to pulmonary tuberculosis. Bull World Health Organ 2011;89:864-872
- Khan ZU, et al. Allergic bronchopulmonary aspergillosis: A study of 46 cases with special referencne to laboratory aspects. Scand J Respir Dis 1976; 57: 73-87
- Maurya V, et al. Sensitization to Aspergillus antigens and occurrence of allergic bronchopulmonary aspergillosis in patients with asthma. Chest 2005; 127:1252-1259
- Agarwal R, et al. Clinical significance of hyperattenuating mucoid impaction in allergic bronchopulmonary aspergillosis: an analysis of 155 patients. Chest 2007; 132:1183-1190
- Sarkar A, et al. Occurrence of allergic bronchopulmonary mycosis in patients with asthma: An Eastern India experience. Lung India 2010; 27:212-216
- Agarwal R, et al. Aspergillus hypersensitivity and allergic bronchopulmonary aspergillosis in patients with acute severe asthma in a respiratory intensive care unit in North India. Mycoses 2010; 53:138-143