

# Respiratory Disease Burden In Rural India: A Review From Multiple Data Sources

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## Citation

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## Abstract

**Aim:** The paper aims to review the respiratory disorder burden of rural Indians by utilizing data on survey of cause of death (rural).

**Methods:** The data was mainly extracted from the "Survey of Causes of Death (rural)" annual reports of Registrar General of India (RGI), Census of India 2001, National Family Health Survey I & II and various community based studies. Trend of tuberculosis (TB), asthma & bronchitis and pneumonia calculated by five-yearly moving averages for the period of 1966-94, rank-wise distribution of leading cause of death during 1971-91 was reviewed. Distribution of housing, source of cooking fuel was studied in relation to household pollution and state wise age-standardized prevalence rates of TB, asthma & bronchitis and pneumonia were calculated.

**Results:** The analysis shows that poverty and unhealthy environment are strongly related to the respiratory disorders. Bronchitis and asthma recorded as leading cause, pneumonia and tuberculosis of the lungs ranked one of the five causes of deaths in rural India. The respiratory disorders have shown a reduction from 24.7 to 19.2 during the study period. Asthma and bronchitis prevalence rates in Karnataka, Gujarat, Haryana, Uttar Pradesh, Kerala and Madhya Pradesh are above national average. TB prevalence is high in Madhya Pradesh, Uttar Pradesh, and Gujarat where Tamilnadu and Maharashtra recorded lowest prevalence.

**Conclusions:** Though national wide health plans have succeeded in reducing fatality of respiratory diseases to a certain extent; there is however, a great need for improved and effective area-specific health programs and social and economic development are mandatory in rural areas to achieve the desired health goals.

## BACKGROUND

Most of the disease burden in rural India is due to the respiratory disorders namely asthma, bronchitis & tuberculosis (TB) and pneumonia. In low resource settings these diseases are mainly attributed with exposure to indoor pollution, solid-cooking fuels, poor housing, low nutritional status and sanitary conditions [1]. The association of respiratory disorders with geographical region may be relevant with population density, industrial and textile pollutants, and tobacco consumption. The relationships between socio-economic developments, behavioral and environmental factors of these diseases were well premeditated [2].

In India, precise studies are not available to estimate respiratory health related disease burden in rural areas to

help proper area-specific public health interventions, to increase accountability on public health spending. Reliable data on mortality and morbidity are scarce in general; they are almost nonexistent in the vast rural area. Paucity of this adequate data makes the understanding of the public health situation more complex, but one can use cause of death analysis that may reveal the sickness load in the country. But the data from death registration sources are neither reliable nor complete; good percent of cases will go unregistered out of which only 10% of deaths are medically certified. But some sources like Survey of Causes of Death (SCD) do reveal interesting findings that may very well be true and used for international comparisons [3]. Keeping the above points in view, this paper will discuss about the disease burden with focus on mortality due to respiratory disorders as one of the endeavor to use cause of death data in an

intricate way.

## METHOD

Data have been collected from the survey of causes of death (rural), Registrar General of India annual reports [4]. To calculate the trend of TB, asthma & bronchitis and pneumonia disease burden together, five-year moving averages are used for their percentage distribution during 1966-94. For prevalence calculations, state wise population and their age distributions are borrowed from Census and Sample Registration Systems (SRS) respectively and standardized rates are calculated using Indian rural population for 1994. In spite of a few limitations like improper medical certification and reclassification of disease groups' overtime, SCD (Survey of Causes of Death) is by far the most reliable source of mortality statistics in rural areas of India and this data is analysed for accident and violence related mortality for international comparisons in the past [3]. SCD data is steadily improving with time and one of the most important improvements is the classification of SCD data as per ICD-10 and mentioning of the list of symptoms for each cause. To supplement the discussions the data extracted from National Family Health Survey [5,6] and census 2001 [7] was used. The analysis is mainly critical and explanatory in nature.

## RESULTS

Leading cause of death between rural male and female was highlighted in Table-1. Bronchitis and asthma recorded as leading cause, pneumonia and tuberculosis of the lungs ranked as one of the five leading causes of deaths in rural India. The percentage distribution of five yearly moving averages for tuberculosis, asthma & bronchitis and pneumonia together calculated and plotted in the graph-1. It reveals that in last three decades, these diseases have slightly reduced from 24.7 in late sixties to only 19.2 in early nineties. Table-2 presents rank-wise distribution of all diseases during 1971-91, asthma & bronchitis was a leading cause in last three decades accounting about 9-11% of all deaths. Tuberculosis was the third most killer during this time, which constitute about 5-6% of all deaths. Table-3 presents the housing conditions in India, mainly to reveal the distribution of separate kitchen and type of fuel that used for cooking in the houses. It is clear that more than four-fifth of rural women and nearly half of urban women use solid cooking fuels in rural India. Liquid petroleum gas (LPG) is seen as a substitution for solid fuels in Indian kitchen, but only 17.5% household are using LPG in rural areas. Without a separate kitchen, the exposure to the indoor pollutants will

increase; one- third of rural and one-fourth of urban households live without kitchen, means more dangerous living environment. Table-4 highlights age standardized prevalence rates from all major states wherever the data is available. Asthma and bronchitis prevalence rates in Karnataka, gujarat, haryana, uttar pradesh, kerala and Madhya pradesh are above the national average. TB prevalence is high in Madhya pradesh, uttar pradesh and Gujarat where tamilnadu and maharastra recorded lowest prevalence. Outstandingly, Pneumonia prevalence is almost 5 times national average in Haryana.

**Figure 1**

Table 1: Leading causes of mortality by sex in rural India, 1994

Causes of mortality	As a per cent of all deaths (%)		Ranking	
	Female	Male	Female	Male
<b>Bronchitis and asthma</b>	<b>7.7</b>	<b>9.6</b>	<b>1</b>	<b>1</b>
Prematurely	5.1	4.7	2	4
Heart attack	4.9	7.3	3	2
<b>Pneumonia</b>	<b>4.7</b>	<b>4.4</b>	<b>4</b>	<b>5</b>
Cancer	4.2	3.6	5	7
<b>Tuberculosis of lungs</b>	<b>4.2</b>	<b>6.4</b>	<b>6</b>	<b>3</b>
Anemia	3.6	2.5	7	8
Paralysis	3.4	3.8	8	6
Non classifiable	2.5	—	9	—
Gastroenteritis	2.3	—	10	—
Vehicle accidents	—	2.9	—	9
Suicides	—	2.1	—	—

**Figure 2**

Table 2: Rank distribution of leading cause of death in rural India during 1971-91

1971	%	rank	1981	%	rank	1991	%	rank
1. violence & injury			1. accident & injury			1. accident & injury		
a. drowning	0.8	8	a. drowning	1.1		a. vehicular accident	2.2	9
b. accident from vehicles	0.6		b. vehicular accidents	0.9		b. suicide	1.9	
c. fall	0.4		c. burns	0.5		c. drowning	1.1	
2. child birth & complicated pregnancy			2. child birth & pregnancy			2. child birth & pregnancy		
a. anaemia of pregnancy	0.2		a. anaemia	0.2		a. bleeding of pregnancy	0.3	
b. post partum haemorrhage	0.2		b. puerperal sepsis	0.1		b. anaemia	0.2	
c. eclampsia	0.1		c. abortion	0.1		c. toxemia	0.1	
3. digestive disorders			3. digestive disorders			3. digestive disorders		
a. dysentery	5.0	3	a. gastro enteritis	2.8	8	a. gastro enteritis	2.1	10
b. food poisoning	0.3		b. debility & malnutrition	1.8	10	b. acute abdomen	1.7	
c. cholera	0.3		c. acute abdomen	1.4		c. dysentery	1.0	
4. coughs			4. coughs			4. coughs		
a. broncho pneumonia	11.0	1	a. asthma & bronchitis	9.0	1	a. asthma & bronchitis	8.8	1
b. tb of respiratory system	6.1	2	b. pneumonia	5.9	2	b. tb of lungs	5.4	3
c. pneumonia	2.4		c. tb of lungs	5.5	3	c. pneumonia	4.5	5
5. circulatory diseases & swellings			5. disorders of circulatory system			5. disorders of circulatory system		
a. plague	0.5		a. heart attack	0.6	4	a. heart attack	8.2	2
b. cirrhosis of liver	0.4		b. anaemia	0.2	6	b. anaemia	3.0	8
c. congestive heart disease	0.4							
6. fevers			6. fevers			6. Fevers		
a. tuberculosis	1.2	5	a. typhoid	3.2	7	b. typhoid	1.8	
b. septicemia	1.2	6	b. influenza	1.8		7. causes peculiar to infancy		
c. diphtheria	1.1	7	c. malaria	1.4		a. prematurity	4.9	4
7. infant deaths			7. causes peculiar to infancy			b. respiratory infection	1.7	
a. prematurity	0.8	8	a. prematurity	4.4	5	8. other clear symptoms		
b. infections to new born	0.8		b. respiratory infections	1.9		a. cancer	3.9	6
c. cyanosis	0.8		c. malnutrition	1.4		b. jaundice	1.3	
8. other clear symptoms			8. other clear symptoms					
a. diseases of urinary tract	0.5		a. cancer	2.5	9	9. disorder of central nervous syst.		
b. hypertension	0.5		b. tetanus	1.8		a. paralysis	3.6	7
c. cerebral haemorrhage	0.4		c. cirrhosis of liver	0.9		b. convulsions	0.6	
			9. disorder of central nervous syst.			c. meningitis	0.5	
			a. meningitis	2.6				
			b. paralysis	0.6				

**Figure 3**

Table 3: Distribution of households by availability of separate kitchen and type of fuel used for cooking

availability of separate kitchen in the house:	Total %	Rural%
Urban %		
Total	100.0	100.0
Available	64.0	59.4
Not available	23.9	26.1
Cooking in open	11.8	14.2
No cooking	0.3	0.2
Type of fuel used for cooking:		
Fire-wood	52.5	64.1
Crop residue	10.0	13.1
Cowdung cake	9.8	12.8
Coal, lignite, charcoal	2.0	1.1
Kerosene	6.5	1.6
LPG	17.5	5.7
Electricity	0.2	0.1
Biogas	0.4	0.5
Any other	0.6	0.2

Source: Table H-11. Census India 2001. Office of the Registrar General, India, New Delhi.

**Figure 4**

Table 4: Age Distribution Of Prevalence Rate Of Major Killer Diseases In India, 1994 (per 100000)

	Age 0 -4	Age 5 -14	Age 15 -44	Age 45-59	Age 60+	ASPR
<b>Bronchitis and asthma</b>						
India	33	4	13	87	763	75
AP	8	3	6	42	510	45
Bihar	0	12	28	86	523	62
Gujarat	16	0	21	115	1018	96
Harayana	17	0	12	96	1077	95
Karnataka	32	3	9	81	1522	126
Kerala	0	0	6	54	1061	84
MP	18	3	12	124	816	80
Maharashtra	6	0	6	60	795	67
Punjab	0	9	7	71	381	40
Rajasthan	43	4	18	63	772	76
Tamil Nadu	17	0	18	36	558	53
UP	131	3	16	202	687	95
<b>tuberculosis of the lung</b>						
India	2	6	43	85	192	43
AP	2	1	27	80	245	38
Bihar	0	12	46	124	178	49
Gujarat	0	0	83	128	203	64
harayana	6	3	26	72	306	42
Karnataka	16	26	29	61	197	42
MP	0	0	94	116	311	76
Maharashtra	5	4	31	40	74	25
Rajasthan	0	12	50	117	212	53
Tamil Nadu	0	0	13	40	216	25
UP	0	14	72	146	243	68
<b>pneumonia</b>						
India	245	12	18	7	48	46
Bihar	339	11	2	0	13	48
Harayana	410	618	3	0	45	216
MP	360	21	7	6	27	57
Maharashtra	118	6	2	2	9	18
UP	483	37	10	21	132	87

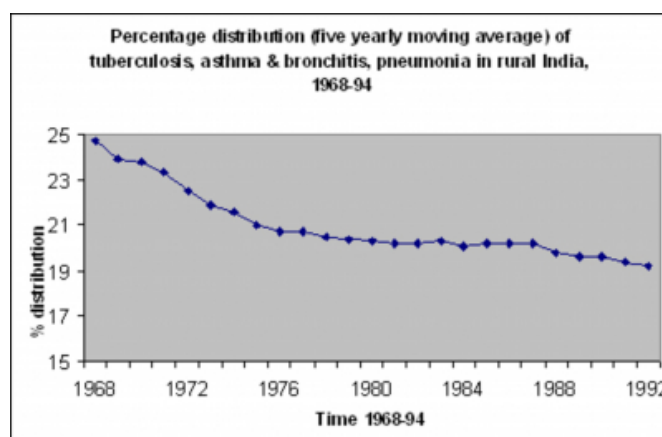
Source: Survey of Causes of Death 1994.

ASPR (Age standardized prevalence rates) is calculated on the basis of rural Indian population for the year 1994.

Few states were omitted from each category due to lack of data.

**Figure 5**

Graph 1



## DISCUSSION

To assess the burden of respiratory disorders among rural population in India, various data sets that are available were very carefully appraised. The recent data on mortality required a separate analysis as tuberculosis incidence has changed due to the impact of HIV/AIDS after year 1995. In India, some major state boundaries were reclassified due to new states, which may complicate the comparisons. So only the data available before 1995 was considered for this analysis with an aim to sketch the level of respiratory mortality over the period of time.

Respiratory disorders are mainly due to unfavourable housing and living conditions [6]. In India, National Family Health Survey (NFHS-II), 1996-99, reveals that only 19% people live in pucca (good) houses and remaining live in kaccha and semi-pucca houses with mud walls and roofs. Looking at sanitary conditions, only 9 percent of the households have a flush toilet and a substantial proportion (87%) has no toilet facility. Most strikingly, one-fifth of the houses place the livestock inside the house, which may worsen their housing condition. A large-scale study suggests that the biomass cooking fuels may be strongly attributable with the risk of tuberculosis [8]. This situation leads to highest TB prevalence i.e 138 per 100,000 in India while the world average is only 59.7 [9]. India has 30% of global burden and one person die every minute with TB [10].

The Indian Government has introduced universal immunization program (UIP) in 1985-86 to vaccinate 85% if all infants by 1990, but in 1993 only 54% (64% in 1996-99) of rural children are vaccinated for BCG [7,11]. So the TB prevalence is high among children (10.3%) with high annual risk of infection (1.9%), suggests intensification of TB

control programs and Immunization coverage. Smoking as a strong causal factor, causes about 0.7 million deaths in India, mainly due to respiratory diseases. The risk of TB is 4.2 times comparing to non-smokers in rural areas [12]. As number of HIV/AIDS cases increase in India, TB has emerged as most predominant opportunistic infection (OI) with about 47% all infections [13]. A comprehensive approach of TB eradication should be in the line of effective implementation of immunization, tobacco prevention and national HIV/AIDS control programs.

Asthma & bronchitis takes major toll in India, it has recorded to be highest in Karnataka and lowest in Punjab. These chronic diseases are more predominant in children and aged population, causes are not very well known. Major causative agents implicated are pollen grains, fungal spores, dust mites, insect debris, animal epithelia [14], several environmental factors like poor housing conditions, dust mite, bed dust allergy may also be seen as association [15]. Hard and unfavourable occupations also seen as asthma prone, the rural occupation stone crushing is largely risky [16], if the labourers are children they are more prone to asthma (high asthma rates are found among children who works in sivakasi fire work industry) [17]. Certain pollens mostly entomophilic also studied as a causal factor, a study conducted to establish the possible role of cashew pollen shows that *anacardium occidentale* may trigger an asthmatic response in allergic individuals [18]. The most common insects seen in the household like flies, cockroaches, mosquitoes, moths will significantly influence the bronchial asthma [19]. It is clear from this illustration that mostly the sanitation and poor hygienic conditions may suffocate an individual due to these environmental shortcomings. A recent study examined effect of cooking smoke on the reported prevalence of asthma in elderly (>60 years age) based on NFHS-II conducted during 1998-99. After controlling for all confounders, it reveals that the risk of asthma is 1.59 times (women 1.83 and men 1.32 times) among rural household who use biomass fuel for cooking. This explains the role of biomass fuels on polluting in-house environment, and advocates an urgent need to find a substitute for that [20]. Another community-based study suggests that prevalence is 18% of children between 6-12 years are suffering with symptoms suggestive asthma [21].

The incidence rate for pneumonia in developing countries may go up to 10% but about 16% in India [22]. In our study children under 5 are shown high risk, exceptionally high in Haryana state. The most frequent underlying cause of persist

pneumonia in children were post tubercular bronchitis and asthma and due to neonatal care management. A case control study clearly marks that solid fuel use for cooking (OR 3.97); poor economic status (OR 4.95) and keeping animals at home (OR 6.03) were associated with high-risk pneumonia after adjusting for confounders. Pre-history of asthma is a useful prognosis for early action for prevention of severe pneumonia [23]. Another predominant cause for pneumonia is malnourishment, as the relative risk is 2.3 in malnourished and children with no immunisation of DPT (diphtheria, pertussis and tetanus) and measles vaccine 2.7 times more risk of exposure [24].

Health and social development are inter-related, health targets may not be possible to achieve or sustained without development in rural areas. From this review it is clear that with health interventions and disease control programs only achieve the health targets partially, further achievements are depending on social development of rural India. TB is still one of the major killers in rural India because of the lack of early detection, poverty as more than half (52.2%) population are below international poverty line, that is, below \$1 per day in 1992 [25]. Poverty associated symptoms like poor housing conditions, biomass cooking fuel, Ignorance, poor sanitation, malnutrition, irregular treatment and choice of high cost drugs are seen as obstacles, which may suggest the eradication can only resolved if the living conditions are improved.

Despite of doubts about quality of cause of death in rural India, it cannot be ignored that the findings of this attempt will help the health planners of India to identify the dominance, intensity and variation of prevalence of respiratory diseases and to adopt necessary steps to improve the health status at macro and micro levels. In summary, two major implications that need to be considered, steps should be taken to improve detection and treatment of diseases at the field level (district and block) to examine the feasibility of area specific programs to combat respiratory diseases. The other is to the referral services should be enhanced, comprehensive programs like immunization, Tobacco control, population control, HIV/AIDS control program should always address the issue of TB and other respiratory disorders. The new revaluations like globalization and internationalization of health care industry and redistribution of health services ought to create a new links among corporations, international organizations, government, communities, and families. Government should make sure that the benefits should reach the rural India in every turn.

Research on verbal autopsy proved as an effective tool, which will provide most accurate and systematic underlying death of a patient so that the cause of death statistic will be more accurate.

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