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TUBERCULOSIS PREVALENCE AND IMPACT IN INDIA: EVIDENCE FROM THE FIFTH NATIONAL FAMILY HEALTH SURVEY

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ABSTRACT

Tuberculosis (TB) is an infectious disease and is caused by germ (bacterium) called Mycobacterium Tuberculosis. Transmission of tuberculosis is mainly through air by inhalation of infected droplet nuclei, which are discharged in the air when a patient with untreated sputum positive tuberculosis (TB) coughs or sneezes. Other modifier of the risk of disease are age, with greater risk during infancy and adolescence, and gender, with young women more likely to develop disease soon after infection. This article reports a self-reported levels and socioeconomic patterns in the distribution of tuberculosis (TB) cases in India, based on information collected under the National Family Health Survey-Round 5 (NFHS-5, 2019–21). The prevalence of TB in various characteristics of households along with Rural-Urban break-up is studied and it is seen that the prevalence of TB is 1% at India level. The prevalence of TB is higher in Rural areas as compare to Urban areas. The percentage distribution of sample households by with TB patients are also influenced by other socio-economic characteristics.

KEYWORDS: *Tuberculosis, NFHS-5, Households*

INTRODUCTION

Tuberculosis (TB) is an infectious disease and is caused by germ (bacterium) called Mycobacterium Tuberculosis. Transmission of tuberculosis is mainly through air by inhalation of infected droplet nuclei, which are discharged in the air when a patient with untreated sputum positive tuberculosis (TB) coughs or sneezes (Grosset J. et. al., 2003). The length of exposure and the degree of ventilation of ambience environment also influence the probability of becoming infected with tuberculosis. The infection of Mycobacterium Tuberculosis is generally detected by a tuberculin test (Jilani TN. Et. al., 2024).The body's response to the active TB infection produces inflammation, which can eventually damage the lungs. Other modifier of the risk of disease are age, with greater risk during infancy and adolescence, and gender, with young women more likely to develop disease soon after infection (Peer V, Schwartz Net. al., 2023). Tuberculosis remains a worldwide public health problem (Zaman K. et.al., 2010) despite the fact that the causative organism was discovered more than 100 years ago and highly effective drugs and vaccine are available making tuberculosis a preventable and curable disease. Technologically advanced countries have achieved spectacular results in the advent of BCG or chemotherapy (Luca S et.al., 2013) and have been attributed to changes in the "non-specific" determinants of the disease such as improvements in the standard of living and the quality of life of the people coupled with the application of available technical knowledge and health resources.

TB causes an enormous socio- economic burden to India (Ananthakrishnan R. et.el 2012). TB primarily affects people in their most productive years of life. While two- thirds of the cases are male, TB takes disproportionately larger toll among young females, with more than 50 per cent of female cases occurring before the age of 34 years. India is the highest tuberculosis (TB) burden country in the world having an estimated incidence of 26.9 lakh cases in 2019 as per World Health Organization (WHO). As per the TB India report 2020, there were around 24 lac notified TB cases registered in India.

As India has the highest burden of TB and continues to be one of high toll of disease and death in India (Bhargava A et al., 2020) but due to lack of limitations of existing quality of data from national Prevalence survey. NFHS is the largest – ever nationally representative household sample in India require effective studies on how TB is spread and awareness for early care for policy making for nation interest. As NFHS-4, NFHS-5 also has district-level estimates for several important indicators. NFHS-5 contents are similar to NFHS-4 and allow comparisons over time. However, NFHS-5 includes some new topics, such as preschool education, disability, access to a toilet facility, death registration, bathing practices during menstruation, and methods and reasons for abortion (NFHS -5 compendium of fact sheets). Recent data from NFHS -5 is reviewed and approved by ICF IRB. Protocol for NFHS-5 survey was also approved by the IIPS IRB (Institutional Review Board), the national coordinating agency for conducting the survey. All these ensures that the survey complies with the U.S. Department of Health and Human Services Regulations. NFHS-5, Indian version of the Demographic and Health Surveys conducted with the largest sample in the world, includes data on self- reported TB and might offer useful insights on the scale and distribution of TB, Care- seeking patters for people affected by TB and public awareness about

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TB while building on similar prior research (Mazumdar S et.al., 2019).

In this article, demographic and other characteristics of tuberculosis and non-tuberculosis households have been studied. A household has been defined as tuberculosis household if any of its members was suffering from tuberculosis at the time of NFHS – 5 surveys, else the household is categorised as non- tuberculosis household. The analyses will give and insight as to whether there is any observed difference between the demographic and other characteristics of tuberculosis and non- tuberculosis households? The results have been presented for rural and urban areas for all India, geographic regions and social determinants of health provides a real opportunity to expand the current paradigm for TB control.

METHODOLOGY

The present article studied the prevalence of TB at households' level. The distribution of TB at India level as well as among all states of India. The distributions have also been studied with the variables representing the socioeconomic status of households. The selected socioeconomic variables are places of residence, electricity, gender of head of family. Further the distribution of TB households obtained with toilet facility available in the household and uses of fuel for cooking. As earlier literatures suggested these are the important variables which are responsible for the availability of the TB cases in various household status (Singh SK et.al., 2018. Padmapriyadarsini, C et. al., 2016). The above written methodology regarding study the distribution of the TB was executed through NFHS-5 data.

The National Family Health Survey (NFHS) is a series of surveys conducted in India to collect information on various health and demographic indicators. NFHS-5, like its predecessors, focused on collecting data related to fertility, mortality, maternal and child health, nutrition, family planning, and various other aspects of reproductive and child health. The survey was designed to cover a nationally representative sample of households, and the collected data has crucial for policymakers, researchers, and program implementers to assess the impact of existing health programs and formulate new strategies. The descriptive univariate analysis of data is performed first, later on a bivariate analysis along with chi-square test is executed to studied the relationship of TB prevalence with other socio-economic factor of households.

RESULT

NFHS-5 field work for India was conducted in two phases – Phase 1 from 17th Jun 2019 to 30th Jan 2020 covering 17 states and 5 UTs and Phase 2 from 2nd Jan 2020 to 30th April 2021 covering 11 states and three UTs and gather information from 6 Lac, 36 thousand 699 household. It is evident from below Table 1 that the prevalence of the TB is higher in rural areas as compare to urban areas at all India level and difference is also Statistically significant. The most of the states of northern and central region of India showing the same pattern. Further, Manipur in north- east region has the same pattern like India but other states of north-east region showing that the prevalence of TB in urban areas are higher than the rural areas. The south Indian states are also showing that the prevalence of TB is higher in rural areas as compare to the urban areas. The full table for Table-1 is given in annexure-1.

Table-1 – Prevalence of TB in India amongst the households from different states.

S.No	States	Category	Number of Household	Prevalence of TB		P- Value
				Number of patients with TB	Prevalence (%)	
01	All India	Combined	636699	6457	1.0%	< 0.001
		Rural	476561	5187	1.1%	
		Urban	160138	1270	0.8%	
02	Jammu & Kashmir	Combined	18086	129	0.7%	0.75
		Rural	14663	106	0.7%	
		Urban	3423	23	0.7%	
03	Himachal Pradesh	Combined	10698	86	0.8%	0.80
		Rural	9784	78	0.8%	
		Urban	914	8	0.9%	
04	Punjab	Combined	18824	116	0.6%	0.66
		Rural	12690	76	0.6%	
		Urban	6134	40	0.7%	
05	Uttarakhand	Combined	12169	48	0.4%	0.53
		Rural	9811	37	0.4%	
		Urban	2358	11	0.5%	
06	Haryana	Combined	18229	93	0.5%	0.15
		Rural	12484	70	0.6%	
		Urban	5745	23	0.4%	
07	Rajasthan	Combined	31817	326	1.0%	0.002
		Rural	24994	279	1.1%	
		Urban	6823	47	0.7%	

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Table no.-2 Prevalence of TB amongst the households with various socioeconomic variables.

Category	Number of Household	Prevalence of TB		P- Value
Type of Place of residence		**Number of patients with TB**	**Prevalence (%)**	
Combined	636699	6457	1.0%	< 0.001
Rural	476561	5187	1.1%	
Urban	160138	1270	0.8%	
Electricity				
No	22592	381	1.7%	< 0.001
Yes	614107	6076	1.0%	
Sex of head of household				
Male	527220	5538	1.1%	<0.001
Female	109463	919	0.8%	
Transgender	16	0	0.0%	

It is been found from the table no 2 that the prevalence of TB is lower amongst the household who has electricity connection as compare with those household who don't have electricity connections. It also shows that the household those have female head having lower prevalence of TB. The difference is also statistically significant.

Table no.-3 Prevalence of TB amongst the households with various types of toilet facility.

			Prevalence of TB		
S.No	**Type of Toilet Facility**	**Number of Household**	**Number of patients with TB**	**Prevalence %**	**P-Value**
01	Combined	636699	6457 (100%)	1.0%	< 0.001
02	Flush to piped sewer system	46562 (7.3%)	369 (5.7%)	0.8%	
03	Flush to septic tank	285642 (44.9%)	2499 (38.7%)	0.9%	
04	Flush to pit latrine	87929 (13.8%)	912 (14.1%)	1.0%	
05	Flush to somewhere else	4959 (0.8%)	63 (1%)	1.3%	
06	Flush, don't know where	892 (0.1%)	7 (0.1%)	0.8%	
07	Ventilated improved pit latrine (VIP)	4085 (0.6%)	42 (0.7%)	1.0%	
08	Pit latrine with slab	41092 (6.5%)	465 (7.2%)	1.1%	
09	Pit latrine without slab/ Open pit	9826 (1.5%)	129 (2%)	1.3%	
10	No facility/bush/field	115137 (18.1%)	1505 (23.3%)	1.3%	
11	Composting toilet	30650 (4.8%)	324 (5%)	1.1%	
12	Dry toilet	7986 (1.3%)	106 (1.6%)	1.3%	
13	Other	1938 (0.3%)	36 (0.6%)	1.9%	

The prevalence of TB is lower amongst the household who has flush to piped sewer toilet facility system as compare with those household who don't have facility of toilet or using bush/field for toilet facility system. In addition to this the households having facilities of LPG and electricity as a cooking fuel are lower prevalence of TB whereas those household using wood, agriculture crop and animal dung as cooking fuel are having higher prevalence of TB. These results are statistically significant [table 3&4].

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Table no.-4 Prevalence of TB amongst the households with various types of cooking fuel.

S.No	Type of cooking fuel	Number of Household	Prevalence of TB		P-Value
			Number of Patients with TB	Prevalence %	
01	Combined	636699	6457	1.0%	< 0.001
02	Electricity	7282	91	1.2%	
03	LPG	327347	2608	0.8%	
04	Biogas	2204	32	1.5%	
05	Kerosene	3051	35	1.1%	
06	Coal, lignite	4919	54	1.1%	
07	Charcoal	5081	79	1.6%	
08	Wood	246040	2955	1.2%	
09	Straw/shrubs/grass	5695	118	2.1%	
10	Agricultural crop	9836	164	1.7%	
11	Animal dung	23537	303	1.3%	
12	No food cooked in house	1075	7	0.7%	
13	Other	632	11	1.7%	

DISCUSSION

Tuberculosis is one of the major infectious diseases for developing countries and remains a major public health concern for a developing country like India. The respective study has been studied at all India level as well as states level which describes the socioeconomic status of households with TB prevalence focusing on variables which are places of residence, electricity, gender of head of family, toilet facility available in the household and uses of fuel for cooking. this article shows that the prevalence of tuberculosis (TB) is 1% which is supported by other articles published (Thiruvengadam K et.al., 2023; Bhargava A et.al., 2021).

It was also found that the percentage distribution of sample households with TB patients are influenced by other socio-economic characteristics e.g. places of residence, electricity, gender of head of family, toilet facility available in the household and uses of fuel for cooking. The same finding also reported in previous literatures (Singh SK et.al., 2018; James R. Hargreaves et al., 2011; Pathak D et al., 2021; Thakur G et al., 2021). In a study it was reported that Metropolitan city Mumbai has the highest prevalence among the cities studied. Living standards, place of residence and absence of windows and electricity in the households are the factors associated with TB prevalence (Marimuthu P et al., 2016). In a south India based study it was concluded that TB is a major public health problem in urban area. Undernutrition, slum dwelling, indoor air pollution and alcohol intake are modifiable risk factors for TB disease (Dhanaraj B et al., 2015). There are many other studies argued the same (Muniyandi M et al., 2008; Elf JL et al., 2019; Bhargava A et al., 2014; Sailo CV et al., 2022).

As India is working on national strategic plan to eliminate TB by 2025 and it is seen from the result that the prevalence of TB in various characteristics of households with Rural-Urban break-up is (1%) at all India level where prevalence of TB is higher in Rural areas as compare to Urban areas. Further, it is also found that there is lower prevalence of TB amongst household having electricity connection and female as head of house. In addition to that it is also found about facility of toilet have lower prevalence of TB having flush to piped sewer system and higher prevalence of TB having Straw/shrubs/grass as cooking fuel. Though there were various studies been done relating to same issue in past and having the same result but the current studies supports that the claimed pattern of TB is still persistent, however it is descriptive study and further more sophisticated analytical studies need to be performed for proving the claim results.

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ANNEXURE 1

S.No	States	Category	Number of Household	Prevalence of TB		P- Value
				Number of patients with TB	Prevalence (%)	
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		Rural	14663	106	0.7%	
		Urban	3423	23	0.7%	
03	Himachal Pradesh	Combined	10698	86	0.8%	0.80
		Rural	9784	78	0.8%	
		Urban	914	8	0.9%	
04	Punjab	Combined	18824	116	0.6%	0.66
		Rural	12690	76	0.6%	
		Urban	6134	40	0.7%	
05	Chandigarh	Combined	761	1	0.1%	0.86
		Rural	21	0	0%	
		Urban	740	1	0.1%	
06	Uttarakhand	Combined	12169	48	0.4%	0.53
		Rural	9811	37	0.4%	
		Urban	2358	11	0.5%	
07	Haryana	Combined	18229	93	0.5%	0.15
		Rural	12484	70	0.6%	
		Urban	5745	23	0.4%	
08	Nct Of Delhi	Combined	9486	59	0.6%	0.41
		Rural	306	3	1.0%	
		Urban	9180	56	0.6%	
09	Rajasthan	Combined	31817	326	1.0%	0.002
		Rural	24994	279	1.1%	
		Urban	6823	47	0.7%	
10	Uttar Pradesh	Combined	70710	749	1.1%	0.006
		Rural	56657	630	1.1%	
		Urban	14053	119	0.8%	
11	Bihar	Combined	35834	720	2.0%	0.036
		Rural	32045	661	2.1%	
		Urban	3789	59	1.6%	
12	Sikkim	Combined	3516	78	2.2%	0.314
		Rural	2916	68	2.3%	
		Urban	600	10	1.7%	
13	Arunachal Pradesh	Combined	18268	332	1.8%	0.731
		Rural	14554	262	1.8%	
		Urban	3714	70	1.9%	
14	Nagaland	Combined	10112	210	2.1%	0.449
		Rural	7687	155	2.0%	
		Urban	2425	55	2.3%	
15	Manipur	Combined	7881	152	1.9%	0.101
		Rural	5873	122	2.1%	
		Urban	2008	30	1.5%	
16	Mizoram	Combined	7257	180	2.5%	0.587
		Rural	4175	100	2.4%	
		Urban	3082	80	2.6%	
17	Tripura	Combined	7209	88	1.2%	0.972
		Rural	5827	71	1.2%	
		Urban	1382	17	1.2%	
18	Meghalaya	Combined	10148	275	2.7%	0.192
		Rural	8962	236	2.6%	

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S.No	States	Category	Number of Household	Prevalence of TB		P- Value
				Number of patients with TB	Prevalence (%)	
		Urban	1186	39	1.2%	
19	Assam	Combined	30119	369	1.2%	0.022
		Rural	26131	335	1.3%	
		Urban	3988	34	0.9%	
20	West Bengal	Combined	18187	185	1.0%	< 0.001
		Rural	12745	153	1.2%	
		Urban	5442	32	0.6%	
21	Jharkhand	Combined	22863	221	1.0%	0.001
		Rural	18562	198	1.1%	
		Urban	4301	23	0.5%	
22	Odisha	Combined	26467	220	0.8%	0.184
		Rural	22760	196	0.9%	
		Urban	3707	24	0.6%	
23	Chhattisgarh	Combined	24550	139	0.6%	0.221
		Rural	20032	119	0.6%	
		Urban	4518	20	0.4%	
24	Madhya Pradesh	Combined	43552	231	0.5%	0.653
		Rural	34548	186	0.5%	
		Urban	9004	45	0.5%	
25	Gujarat	Combined	29368	266	0.9%	0.006
		Rural	20136	203	1.0%	
		Urban	9232	63	0.7%	
26	Dadra & Nagar Haveli And Daman & Diu	Combined	2676	10	0.4%	0.625
		Rural	1134	5	0.4%	
		Urban	1542	5	0.3%	
27	Maharashtra	Combined	31643	189	0.6%	0.244
		Rural	21349	135	0.6%	
		Urban	10294	54	0.5%	
28	Andhra Pradesh	Combined	11346	94	0.8%	0.138
		Rural	8154	74	0.9%	
		Urban	3192	20	0.6%	
29	Karnataka	Combined	26574	213	0.8%	0.098
		Rural	18847	162	0.9%	
		Urban	7727	51	0.7%	
30	Goa	Combined	1856	18	1.0%	0.967
		Rural	713	7	1.0%	
		Urban	1143	11	1.0%	
31	Lakshadweep	Combined	921	7	0.8%	0.164
		Rural	197	3	1.5%	
		Urban	724	4	0.6%	
32	Kerala	Combined	12330	192	1.6%	0.702
		Rural	7283	116	1.6%	
		Urban	5047	76	1.5%	
33	Tamil Nadu	Combined	27929	159	0.6%	0.246
		Rural	16123	99	0.6%	
		Urban	11806	60	0.5%	
34	Puducherry	Combined	3520	19	0.5%	0.00
		Rural	700	13	1.9%	
		Urban	2820	6	0.2%	
35	Andaman & Nicobar Islands	Combined	2624	31	1.2%	0.057
		Rural	2097	29	1.4%	
		Urban	527	2	0.4%	
36	Telangana	Combined	27351	226	0.8%	0.065
		Rural	20191	179	0.9%	

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S.No	States	Category	Number of Household	Prevalence of TB		P- Value
				Number of patients with TB	Prevalence (%)	
		Urban	7160	47	0.7%	
37	Ladakh	Combined	1818	26	1.4%	0.693
		Rural	1410	21	1.5%	
		Urban	408	5	1.2%	