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Burden of Pulmonary Tuberculosis and its Perception among Indian Population: A Comparative Study

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Abstract
The study focuses on burden of Tuberculosis in India. The yearly reports of National Family and Health Survey have been used in the present study. It was observed that there was very minute difference in prevalence of Tuberculosis from NFHS 4 to NFHS 5, although number of medically treated tuberculosis cases remain unchanged. In spite of good knowledge regarding tuberculosis as a disease, its transmission and its cure among Household respondents, the burden is still very high in India.

Keywords: NFHS, Tuberculosis, Disease Burden, India

Introduction

Tuberculosis (TB) is the most dreadful disease with most economic and social consequences. India is one of the high TB burden countries in the world. In most cases the disease affect respiratory system. Johann Schonlein coined the term "tuberculosis" in the 1834 and it was believed that genus "Mycobacterium tuberculosis" was known for around 150 million years [1]. In the Middle Ages, scrofula, a disease affecting cervical lymph nodes, was described as a new clinical form of TB. Dr. Robert Koch has announced "Mycobacterium tuberculosis" the bacteria that causes tuberculosis on 24th March 1882 and therefore later 24th March is celebrated as "world Tb day" [2]. Tuberculosis remains a major global health problem, declared by the WHO, a global public health emergency in 1993 [3].

Despite of being preventable and curable disease, globally 10 million people got infected and 1.5 million people died due to Tuberculosis every year [4]. And every year more than 400,000 cases get Tb drug resistant [5]. Worldwide, approx. 1.3 million people died (including 167 000 people with HIV) and estimated 10.6 million people fell ill with tuberculosis (TB) in year 2022. In year 2022, TB is the second leading infectious killer after COVID-19 (above HIV and AIDS) [6]. Globally in 2020, an estimated 1.9 million incident cases of TB were attributable to undernutrition, 0.74 million to HIV infection, 0.74 million to alcohol use disorders, 0.73 million to smoking and 0.37 million to diabetes [7].

In India, 24.2 lakh cases were notified in year 2022, which was approximately 13% increase in number of Tb cases from year 2021. According to Tb report 2021, globally the Tb Incidence was 9,870,000 and in India it was 2,590,000 and 53000 cases with HIV & TB co-morbidities [8]. Tuberculosis is the leading cause of death among PLHIV, as HIV targets immune system resulting in poor defence system of cases and thus making them at risk to Tuberculosis [9]. An HIV-positive person is 20-40 times more likely to develop TB disease once infected as compared to an HIV-negative person [10].

The TB situation in the country is further threatened by the emergence and spread of HIV and drug-resistant TB [11].

For proper treatment and diagnosis outcome, Revised National TB Control Program (RNTCP) launched in 1997. It uses WHO recommended, Directly Observed Treatment Short Course (DOTS) strategy for Tb treatment. In 2020, the RNTCP was renamed to National Treatment Elimination Program (NTEP) to emphasize the aim of the Government of India to eliminates TB in India by 2025. The central TB division developed a case based and web based system called "Nikshay" where all TB cases gets reported, also eSanjeevani, a web based comprehensive telemedicine helps in TB reporting. For treatment adherence, few schemes also launched like 99 DOT, Medication event remind monitor (MERM Pill box), Video Observed Treatment (VOT) and for Patient support, Nikshay poshan yojna, travel reimbursement, treatment supporter incentives were launched.

India being high burden of Tuberculosis that has been greatly impacted by COVID-19. The pandemic has devasted the health system and it was reported the sharp decline TB reporting among all high TB burden countries [12]. Tuberculosis services were disturbed leading to delays in diagnosis, treatment, access, increased suffering, and mental health problems among infected [13].

In the present study, the 2 rounds of NFHS has been compared, the NFHS 4 (2015-2016) before and NFHS 5 (2019-2021) after COVID 19 period. The study focuses on utilization of Tuberculosis services and adherence of TB treatment.

Methodology
The study is based on secondary data analysis, the tuberculosis data from fifth round of National Family and Health survey (NFHS 5) and fourth round of National Family and Health survey (NFHS 4) were compared. NFHS 5 and NFHS 4 were conducted by the Ministry of Health and Family Welfare, coordinated by the International Institute for Population Sciences, Mumbai, as a nodal agency of all the surveys. The NFHS 5 was conducted between 2019 to 2021 among 636699 households and NFHS 4 was conducted between February 2015 to 2016 among 628900 households. The ethical approval for NFHS 4 and NFHS 5 surveys are obtained from ethics review board of the International Institute of Population Sciences, Mumbai, India. NFHS adopted a 2-stage stratified random sampling approach by selecting primary sampling units (PSUs) (villages in rural areas and census enumeration blocks in urban areas) with probability proportional to population size at the first stage and subsequently, picking the same number of households from each of selected PSUs through systematic random sampling. Both male and female interviewers were recruited by field agencies to interview respondents.

Data collection
The data was collected by four survey schedules/ questionnaire: Household questionnaire, men's questionnaire, women's questionnaire and biomarker questionnaire. Relevant to the current study, data were collected from both men's and women's questionnaire, under other health issues heading. The information regarding knowledge of Tuberculosis, its modes of transmission, any family member suffering from Tb and perception towards its treatment.

The data was entered in Ms Excel 2007 and later analysed using statistical software, SPSS Version 21. Chi-square test was used to test the associations between different variables. p-value less than 0.05 was considered as significant.

Results
It was observed that, there was no change in the prevalence of Tuberculosis in both NFHS 4 and NFHS 5 surveys. Regarding awareness of Tuberculosis, it was observed that the perception that Tuberculosis can be cured completely was high (89-93 %) and perception that it should be kept secret when family member is suffering from tuberculosis was very less (15-23%) among both men and women in both the surveys. It was also noted that awareness about tuberculosis infection and its transmission was comparatively better among men in NFHS 4 but better or same among women in NFHS 5 survey.

It was also observed that, among men knowledge and perception regarding tuberculosis has increased from 1-2 % from NFHS 4 to NFHS 5 survey. And among women, knowledge regarding tuberculosis, its modes of transmission and perception about Tb treatment was also increased from 2-5% from NFHS 4 to NFHS 5 survey.

When prevalence of tuberculosis was assessed in both urban and rural areas among 3 different age groups (< 15, 15-59 and 60+) and both genders, it was seen that odds ratio was better in NFHS 5 as compared to NFHS 4 survey. The prevalence of tuberculosis was found to be statistically associated with age of interviewers with p-value 0.13, chi-square 8.65 in NFHS 5.

It was observed that among all factors affecting prevalence of tuberculosis, prevalence of tuberculosis was 1.2 times higher if 7 or more persons were sleeping in one room as compared to less number of people sleeping in one room, kerosene oil, agricultural crop residue and dunk cakes used for cooking fuel was approx. 1.5-2 times higher as compared to other cooking fuels. Smoke products coal, lignite, charcoal, wood straw/shrubs/grass, agricultural crop waste, and dung cakes was 1.4 times more responsible for developing tuberculosis in conducted surveys. It was found that type of fire/stove among households using solid fuels (includes coal, lignite, charcoal, wood straw/shrubs/grass, agricultural crop waste, and dung cakes or kerosene) with p value 0.049, chi-square 6.25 and type of cooking fuel used with p value 0.000 chi-square= 127.18 was statistically associated with higher prevalence of tuberculosis.
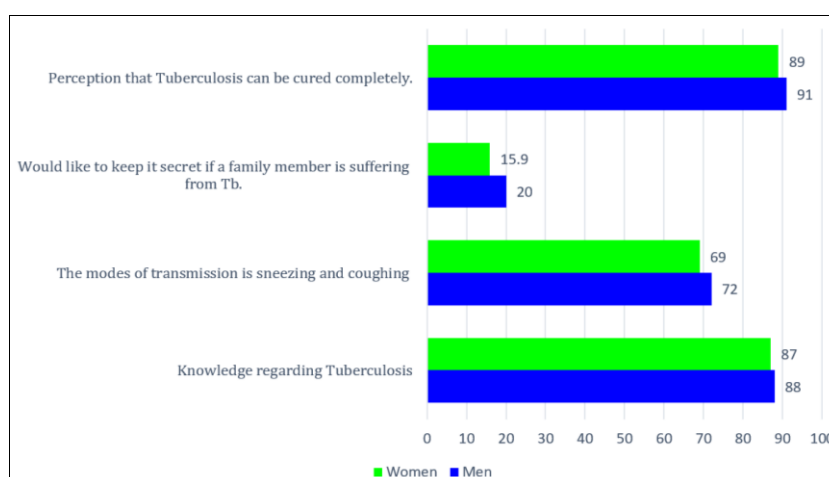

Fig 1: Knowledge and awareness about tuberculosis among study participants (NFHS 4)
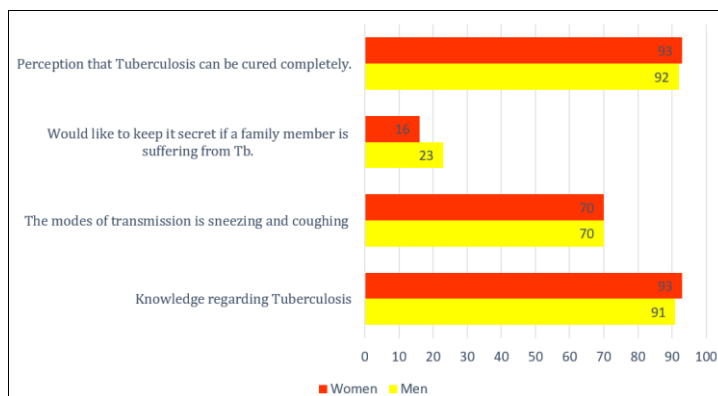
Fig 2: Knowledge and awareness about tuberculosis among study participants (NFHS 5)
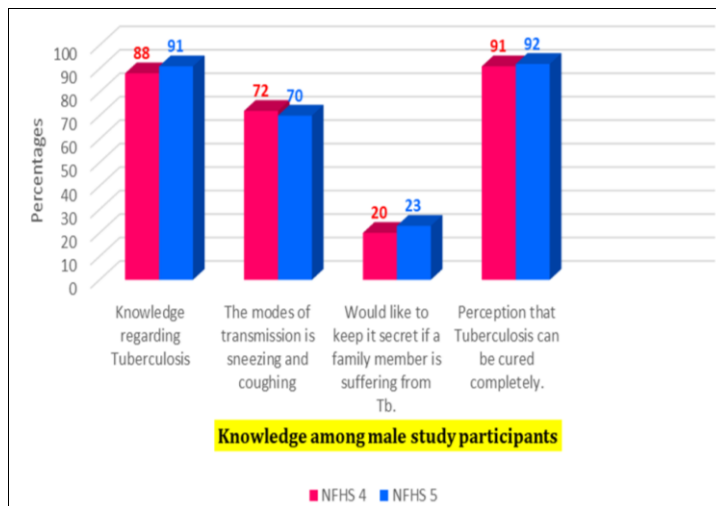

Fig 3: Knowledge and perception regarding Tuberculosis among male study participants
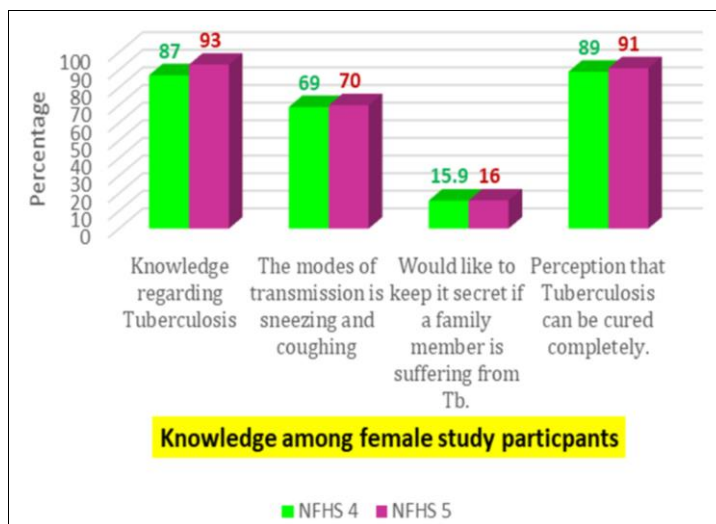

Fig 4: Knowledge and perception regarding Tuberculosis among Female study participants

Table 1: Distribution of study participants according to prevalence of Tuberculosis (Per 100,000 population)

Study Variables	Tuberculosis cases (NFHS 4)			Tuberculosis cases (NFHS 5)		
	Urban	Rural	Odds ratio	Urban	Rural	Odds ratio
Age						
< 15	56	59	0.905	37	33	1.76
15-59	271	375	0.58	196	268	1.75
60+	708	975	0.03	401	671	0.772
Sex						
Women	198	244	1.135	146	176	1.23
Men	318	445	0.88	220	327	0.811

Table 2: Factors affecting the prevalence of Tuberculosis (Per 100,000 population)

Study Variables	Tuberculosis cases (NFHS 4)	Tuberculosis cases (NFHS 5)	Odds ratio
Person per room used for sleeping			
< 3	298	225	0.93
3-4	314	222	1.013
5-6	342	250	0.96
7 or more	400	270	1.113
Cooking fuel			
Electricity or gas	212	184	0.77
Kerosene	482	186	1.892
Coal	338	340	0.64
Wood	355	269	0.89
Straw/shrubs/grass	604	517	0.76
Agricultural crop residue	541	403	1
Dunk cakes	433	283	1.05
Other	682	316	1.58
Place of Cooking			
In the house, separate room	239	182	1
In the house, no separate room	401	304	1
In a separate building	315	265	0.79
outdoors	440	285	1.17
Others	506	357	1.05
Type of stoves/ fire			
Stove	408	306	0.90
Open fire / chullah	389	287	0.93
Other	169	90	1.39

Discussion

In recent conducted surveys at national level the knowledge and perception about tuberculosis has improved markedly. Similar results were seen in a study of M. Renuka and Murli dhar (2012) done in medical college of Karnataka with more than 80 % were aware about tuberculosis, more than 85% had knowledge regarding its transmission [14]. Similarly in a study of Tim Bäckdahl and Megha Sharma (2021) done among 1665 pilgrims gathered for Kumbh Mela (2016) in Ujjain, India, 93% knew that tuberculosis is infectious disease, 94% knew that cough for more than 14 days is the commonest symptom and 81% knew that cough may be associated with blood in tuberculosis patient [15]. Similar results were seen in a study conducted by Fitzroy A. Orrett and Shimon M Shurland (2001) among Pre-university students of Trinidad and it was found that, 92.8 % had heard of tuberculosis and its transmission [16]. Also, in a study conducted by Dumpeti, Sreeharshika *et al* among rural population of six villages attached to medical college of Nalgonda district of Hyderabad, it was found that 9.6% knew that the cause of TB is bacteria and most of the participants 93.6% (95% CI: 90.3, 96.1) knew that TB primarily affects lungs [17].

In contrast to the result of present study, it was found that in a study conducted by Sharma, Suresh K *et al* in tertiary care hospital of Nainital, Uttarakhand, only 61.8% of participants had knowledge about tuberculosis and 52.7% had knowledge about its prevention and treatment [18]. Also, in a study done by Ram G. Nautiyal (2019) *et al* among pulmonary tuberculosis patient attending DOTS centre and they have found that only 2/3rd (65%) of patients had good knowledge about tuberculosis [19].

Similar to the current results it was found in a study conducted by Abinet Adane *et al* (2019) among household contacts of positive pulmonary tuberculosis patient of Haramaya District, Oromia Region, Eastern Ethiopia and it was found that risk of developing tuberculosis was associated with living in poor ventilated houses (AOR = 4.02; 95% CI: 1.38, 11.76), and living in inadequate size of living room (AOR = 3.4; 95% CI: 1.30, 8.86) [20]. Similary in a study conducted by Guillaume Muasa Patoka Kalonji *et al* in Democratic republic of congo, factors associated with TB infection were overcrowding; highest population attributable fraction ([PAF] 88.2 %; adjusted odds ratio [OR] 9.8 [95 % CI 3.1–31.6]) [21].

But in contrast to the result of present study, in a study conducted in Iran (2022), the highest prevalence of tuberculosis infection was related to the lack of physical activity (58.73%), lack of fish consumption (50.79%), lack of red meat consumption (21.20%), and second-hand smoke (19.02%) [22].

Conclusion

This study concludes that despite of good knowledge about tuberculosis, there is still less knowledge regarding prevention and treatment and still tuberculosis is attached with stigma as family members don't want to discuss about tuberculosis patient in a family and thus does not seek any treatment. There is a need to develop strategies to uplift the socio-economy and literacy, living condition of rural part of our country and to develop and implement an IEC system which is culturally sensitive.

Conflict of Interest

There are no conflicts of interest.

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