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POPULATION ATTRIBUTABLE FRACTION FOR UNDER NUTRITION IN TB, IN THE SELECTED DISTRICTS OF TAMIL NADU; THE STATE TB SURVEY

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Abstract

ABSTRACT: A population based state wide TB survey was conducted in 2021-2022 in Tamil Nadu, India, among the participants aged 15 and above, to identify the microbiologically confirmed pulmonary TB cases. Population attributable fraction (PAF) was calculated for the state and the districts. In total 130,932 participants were screened across the state and 244 participants were diagnosed with microbiologically confirmed pulmonary TB. PAF for the risk factors for TB with under nutrition (BMI<18.5 Kg/m2) was 39(32-46), alcohol use was 38(30-46), smoking was 31(24-39), and age >60 years was 27(20-34). Krishnagiri 78(23 - 97), Pudukkottai 72(14 -96) and Vellore 71(37–90) districts were having higher PAF values for under nutrition. Wide range was observed due to low sample size. Population attributable risk factors for TB in Tamil Nadu state was higher for under nutrition. Public health interventions could be planned to address this issue accordingly, during TB elimination activities.

KEYWORDS : Population attributable fraction; TB Survey; Tamil Nadu; Tuberculosis.

MAIN CONTENT

Tuberculosis is a global public health problem of low and middle income countries, leading to a significant morbidity and mortality. Worldwide, 10.6 million people developed TB and 1.3 million succumbed to TB in 2022 as per Global TB Report 2023.[1]

India is the highest contributor of global burden of TB with 27% of burden, followed by other countries like Indonesia, China and Philippines.[1] Apart from this about 31.3% of the Indian population was infected with TB and in this 5-10% develop the disease in course of a lifetime.[2,3]

The United Nations Sustainable Development Goal-3 (SDG-3) has targeted to end the TB epidemic by 2030 with the aim to reduce the TB incidence and TB death by 80% and 90%, compared to 2015, respectively.[4]

However, the India's National Strategic Plan-2015 has ambitiously set to achieve these Global targets of 2030 in 2025 itself, which is five years ahead of SDG-3.[5] Tamil Nadu is the only South Indian state having TB prevalence higher than the national average.[2]

Tamil Nadu state is taking leading steps in combating this deadly disease by various strategies. One of the major steps taken was the performance of state wide district level prevalence survey for TB with the support of National Institute for Research in Tuberculosis.

We intended to analyse the population attributable fraction as a sub analysis from the main to study to understand public health importance of risk factors associated with TB, so that appropriate interventions could be planned at the state and district level.

Population attributable fraction is defined as the fraction of cases that would have not occurred if the exposure has been eliminated.[6]

This cross sectional survey was conducted in all the thirty two districts of Tamil Nadu, among participants aged 15 years and above, to identify microbiologically confirmed pulmonary TB, from February 2021 to July 2022.

There were 180 clusters and 800 population per cluster were enumerated for screening. Participants with symptoms suggestive of TB or any Chest X-Ray abnormality were further assessed with sputum examination.

Cartridge based nucleic acid amplification test (CBNAAT), Sputum smear and Liquid Culture were done to confirm the diagnosis. Data in the field were collected electronically and analysed using STATA/MP version 15.1. Population attribution fraction (PAF) was calculated using Levin's formula.[7] The study protocol was approved by the

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Institutional Human Ethics Committee of NIRT (National Institute for Research in Tuberculosis) (017/NIRT-IEC/2021).

In total 130932 participants were screened across the state and 244 participants were diagnosed with microbiologically confirmed TB. PAF for the risk factors for TB with under nutrition ((BMI<18.5 Kg/m2)) was 39(32-46), alcohol use was 38(30-46), smoking was 31(24-39), and age >60 years was 27(20-34).

Low BMI is the modifiable risk factor which has higher PAF. When individual districts were taken into consideration for PAF analysis for under nutrition, it was observed that Krishnagiri 78(23 - 97), Pudukkottai 72(14 -96) and Vellore 71(37–90) districts were having higher PAF values for under nutrition.

While considering the TB elimination activities, addressing the under nutrition, especially in these districts could be prioritized. In the world TB report 2023, under nutrition was considered as the major risk factor when comparing with other risk factors.[1]

Recent RATIONS study in India has shown that there is significant reduction in the incident TB among the households of Index TB cases with the nutritional intervention.[8] Reduction in the mortality among the Index cases was also observed in this study.[9]

Even though this is a population based study with huge sample size and high coverage across the state, there are few limitations in the PAF results.

Table 1: Population attributable fraction of under nutrition (BMI<18.5Kg/m2) for TB in the Districts of Tamil Nadu - Prevalence survey in 2021-2022

S.No	Name of District	Total survey population (N)	TB cases n(%)	Under nutrition n(%)	PAF attributed to Under nutrition in TB (95% CI)
	Tamil Nadu State	**1,30,932**	**244 (0.19)**	**16898 (12.91)**	**39 (32, 46)**
1	Krishnagiri	3547	5 (0.14)	380 (11)	78 (22, 97)
2	Pudukkottai	3002	4 (0.13)	339 (11)	72 (14, 96)
3	Vellore	7321	12 (0.16)	946 (13)	71 (37, 90)
4	Erode	4519	11 (0.24)	544 (12)	69 (33, 90)
5	Sivaganga	2278	3 (0.13)	322 (14)	61 (1, 95)
6	Salem	6268	13 (0.21)	800 (13)	56 (25, 81)
7	Cuddalore	4417	10 (0.23)	689 (16)	53 (17, 81)
8	Thoothukkudi	3068	5 (0.16)	524 (17)	52 (4, 88)
9	Coimbatore	5980	7 (0.12)	744 (12)	51 (12, 84)
10	Thiruvarur	2218	5 (0.23)	434 (20)	50 (1, 88)
11	Thiruvallur	6341	17 (0.27)	617 (10)	48 (23, 71)
12	Thanjavur	4505	8 (0.18)	700 (16)	41 (5, 76)
13	Dindigul	3740	14 (0.37)	454 (12)	35 (10, 64)
14	Chennai	7246	10 (0.14)	632 (09)	34 (8, 67)
15	Viluppuram	6659	12 (0.18)	1046 (16)	31 (3, 64)
16	Tiruchirappalli	5082	11 (0.22)	618 (12)	28 (2, 61)
17	Madurai	5994	24 (0.40)	738 (12)	24 (6, 47)
PAR for Ariyalur, Dharmapuri, Kancheepuram, Kanniyakumari, Karur, Nagapattinam, Namakkal, Perambalur, Ramanathapuram, The Nilgiris, Theni, Tirunelveli, Tirupur, Thiruvannamalai, Virudhunargar districts were unable to calculate due to low sample size to estimate PAR.					

First, many of the PAF has wide range of CI due to lower sample size at district level, second, the PAF of a particular risk factor was not adjusted for other risk factors and hence the sum of PAF could be more that 100 and the third, PAF for some of the districts were unable to calculate due to low sample size.

Caution should be taken while interpreting the results. However the PAF gives us a preliminary idea on the risk factors to be considered during TB elimination activities.

To conclude, population attributable fraction for TB in Tamil Nadu state was high for under nutrition, alcohol use and smoking. Under nutrition in TB was higher in few districts of Tamil Nadu. Public health interventions should be considered accordingly.

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