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Health and Demographic Profile of Scheduled Tribes in Selected Areas of Thiruvallur and Thiruvannamalai Districts, Tamil Nadu: A Cross-Sectional Study

Research Article

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Abstract

The Scheduled Tribe (ST) population of Tamil Nadu, accounting for approximately 7.95 lakh individuals (1.1% of the state's population), faces significant barriers in accessing quality and affordable healthcare. Limited research exists on their socio-economic and health conditions, underscoring the need for comprehensive data to address their specific needs. This study aimed to assess the prevalence of Non-Communicable Diseases (NCDs) and evaluate the overall health and demographic profile of the ST population in eight ST-dominant Panchayat areas of Thiruvallur and Thiruvannamalai districts. The key focus was to explore socio-demographic determinants and risk factors associated with NCDs in these communities. A cross-sectional study was conducted between August 2020 and March 2021 in selected ST-dominant regions. Data were collected through door-to-door surveys and face-to-face interviews using a structured survey format, following informed consent procedures. Information on NCD prevalence, risk factors, and socio-demographic profiles was documented. The study included 7,074 participants from 1,729 households, comprising 50.7% males and 49.3% females. Among adults, 50.27% were illiterate, and 99.86% reported a non-vegetarian diet. Identified risk factors included smoking (13.22%), alcohol consumption (10.70%), and tobacco use (2.43%). The prevalence of NCDs was 8.98%, with conditions such as diabetes, osteoarthritis, stroke, and asthma being common. This study highlights the impact of inadequate infrastructure, unbalanced diets, lack of access to clean drinking water, poor ventilation, ineffective drainage systems, and addiction on the health of the ST population. The findings provide valuable insights to inform targeted interventions and policy measures aimed at improving living conditions and health outcomes in these communities.

Keywords: Scheduled Tribe population, Non-Communicable Diseases, Socio-demographic determinants, Risk factors, Health-related demographics, Addiction issues.

Introduction

According to the 2011 Census, the tribal population in India stands at 10.43 crore, making up 8.6% of the overall population. Of this, 89.97% reside in rural regions, while 10.03% live in urban areas[1]. In Tamil Nadu, the Scheduled Tribe (ST) population totals 7,94,697, which accounts for approximately 1.1% of the state's population (1). 85% of the ST s are living in rural areas. Majority of them are economically deprived, socially marginalised and lack resources. Their access to health, education, employment and other income opportunities is limited. Literacy rate of ST men in Tamil Nadu stood at 54.3% as against the national average 59% and ST women in the state at 46.8% as against the national average of 49.4% (2) & (3). The Tamil Nadu model has made progress in public health but still faces challenges. The growing private sector widens the gap in healthcare access between the rich and poor. Malnutrition and anaemia persist, along with increasing public demand for better health services (4). Despite commendable work done in the field by the Government and NGOs, the health and living standards of the ST population remain one of the most serious problems affecting the state. In southern India, there is a significantly higher prevalence of non-communicable diseases (NCDs) such as diabetes and hypertension, along with their associated risk factors. A cross-sectional study in Tamil Nadu found that urban areas exhibited higher rates of Diabetes, hypertension, dyslipidaemia, physical inactivity, and overweight compared to rural areas. Conversely, rural areas showed higher rates of smokeless tobacco use and alcohol consumption (5).

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The study helped in profiling Non-communicable diseases, socioeconomic and Health profiles, and in better understanding the significant risk factors of various NCDs, which is essential for proper planning and effective implementation of provisions for improving the health and living standards of the ST community.

Objectives

The study's primary objective was profiling NCDs and health status, profiling of Socio-demographic determinants and risk factors of NCDs in the ST population in selected villages of Thiruvallur and Thiruvannamalai district, Tamil Nadu.

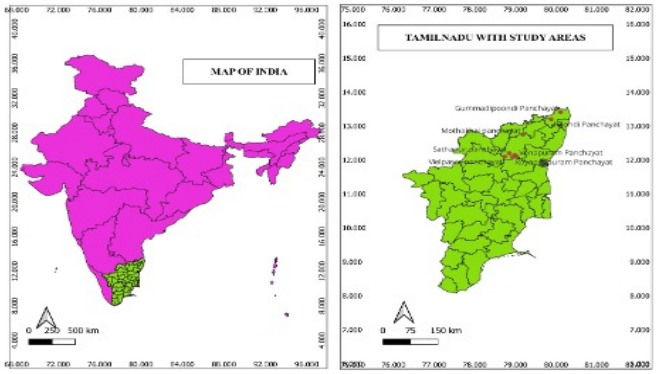
Materials & Methods

Study Design

The is an observational and community-based cross-sectional survey study.

Study Setting:

Figure 1: Map of India, Tamil Nadu and selected areas from Thiruvallur and Thiruvannamalai districts



The study was carried out in eight panchayat areas predominantly inhabited by STs. These areas included Gummudipoondi and Poondi in Thiruvallur District of Tamil Nadu and Thandrampet, Mothakkal, Melpasar, Sathanur, Vanapuram, and Royandapuram in Thiruvannamalai District of Tamil Nadu. The research followed consultations with local authorities and received approval from the IEC of the Dr. Achanta Lakshmipathi Regional Ayurveda Research Institute in Chennai. The study spanned eight months, from August 2020 to March 2021 (Fig.1).

Study Participants

Participants for the survey were recruited from selected areas, specifically targeting individuals from the Scheduled Tribe (ST) community who were willing to participate. An initial household survey was conducted to identify members of the ST community, which formed the sampling frame for the study. Individuals residing in these areas but not belonging to the ST community were excluded from the survey. The study included ST participants of all age groups. For children under 18 years old, information regarding health status and other demographic variables was collected with the assistance of one of the parents.

Study tools

Data was collected using a structured questionnaire.

Variables

1. **Area Information**: Details of the areas selected for the survey.
2. **Demographic and Housing Conditions**: Assessment of factors such as caste, tribe, religion, type of house, number of family members, ventilation, availability and source of drinking water, toilet facilities, drainage systems, and the number of children, women, and elderly individuals per household.
3. **General and Health-Related Data of adult Personnel**: Analysis of personal and health factors including name, gender, age, marital status, education, occupation, addictions, NCDs, menstrual history for women, diet and nutrition, lifestyle, and obesity status.
4. **Measurable Variables**: Measurements such as height, weight, blood pressure, haemoglobin levels, and blood sugar levels. Additionally, age of individuals, and the number of male and female participants in the survey.

Study procedure

Over the course of the study period, selected villages were visited weekly for population surveys using standardised forms. These forms collected data on socio-demographic status (including living conditions, occupation, education, source of income, and socio-economic status), health behaviours (such as diet, lifestyle, and addictions), medical history, and current health conditions. A dedicated project team conducted these surveys, and village officials were notified in advance to raise awareness about the visits. From a fixed landmark within each area, houses were visited in chronological order. During house-to-house visits, residents were personally interviewed using structured questionnaires.

Anthropometric Measurements:

Height: Measured with an anthropometric rod (MCP 20-210 cm). Participants stood upright without shoes, feet together, heels against the wall, with their head in the Frankfort horizontal plane. **Weight:** Measured using a digital weighing scale (S.cure). Participants were weighed without shoes and in light clothing, with the scale calibrated before each use. Oral informed consent was obtained from all participants. Screening for anaemia, diabetes mellitus, and hypertension was offered to those who consented. Quantitative measurements included: **Blood Pressure:** Measured with a sphygmomanometer, using an Omron automatic device for sitting blood pressure. **Laboratory investigations:** A spot Random peripheral capillary Blood Sugar & Capillary Haemoglobin test was measured by using a Kernel multi check GCU Hb meter. Project staff were extensively trained and regularly monitored to ensure the accuracy and quality of all measurements.

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Bias

The survey team implemented rigorous training and used a pre-designed survey format to ensure accurate, unbiased data collection. Despite these efforts, the use of convenience sampling introduces a risk of sampling bias, as it may not fully represent the broader population.

Sample-Size

The CCRAS implemented a research-focused public healthcare program in tribal-dominated areas, offering healthcare services directly to the residents while promoting awareness about health, nutrition, and hygiene. As part of this initiative, a survey targeting a sample of 7,000 individuals was conducted to assess health-related sociodemographic factors.

Statistical method

Being an observation study, close-ended questionnaire was used for collection and documentation of data. The descriptive data were presented in numbers and percentage and the continuous data were presented in mean (SD).

Ethical considerations

Ethical clearance for the study was obtained from the Institutional Ethics Committee (IEC). Participants were thoroughly informed about the study's purpose and objectives before enrolment, and their confidentiality was strictly maintained throughout the study.

Institutional Ethics Committee (IEC)

Obtained Institutional Ethical Committee approval on 07.08.2020 to conduct this study (Approval number: F. No.4/1/2019/ALRARI/IEC/163).

Observations

The population survey involved data collection from 7,074 individuals, surpassing the target of 7,000, who were selected from 1,729 households across 8 designated areas. This was done over a period of 114 visits. The sample population was almost equally divided between males (50.7%) and females (49.3%). Data collection was carried out using closed-ended questionnaires, as depicted (in Figure 2). Regarding the housing conditions, the majority of houses had either thatched (47.8%) or Reinforced Concrete Cement (RCC) roofs (42.9%). A significant portion of households (60.4%) lacked adequate ventilation. When it came to water usage, 79.9% of the residents relied on tap water for drinking, although only a small fraction (1.04%) boiled it before consumption. In terms of sanitation, government-built toilets were available in 82.1% of households, though these facilities were not widely used. A notable 17.06% of families still resorted to open fields for sanitation purposes. Almost all homes (99.2%) had open drainage systems. As for vector control, nearly all households (almost 100%) used mosquito coils. For cooking and other needs, 53.6% of households preferred to use firewood, coal, or cow dung (Table no.1).

It was observed that, out of the total adult population (n=5043) majority 76.63% of the population above 18 years was married, 15.79% was unmarried. 50.27% were illiterate which constituted around 22.22% in males and 28.05% in females; instead the literacy rate of ST population was 59% in Tamil Nadu as per the census 2011(6). Physical activity was found to be moderate in 85.7% of the adult population and mild in 14.03% of population. *'Irular'* tribes were found prevalent in the survey population and *'Tamil'* is the main communication language in these villages. (Table no 2).

The present study examined dietary and addiction habits among adults, revealing that 99.86% of participants followed a non-vegetarian diet. Additionally, addiction issues were noted, with 13.22% of the population smoking, 10.70% consuming alcohol, and 2.43% using tobacco. (Table no 3).

As part of a health survey, the prevalence of non-communicable diseases such as hypertension, diabetes, cancer, stroke, COPD/asthma, and osteoarthritis was examined. The findings revealed that osteoarthritis was present in 7.39% of the population, diabetes in 1.46%, stroke in 0.06%, and asthma in 0.03% (Table no 4).

The health status of 2,031 children under 18 years was surveyed. Of these children, 67.89% were attending school, while 32.10% of those under 10 years were not. The survey also assessed infection recurrence over the past six months, revealing that 1.96% had more than three episodes of respiratory tract infections, 1.47% of gastrointestinal infections, and 1.37% of skin infections. None of the children were using supplements such as iron, calcium, multivitamins, or general health tonics. Furthermore, 88.47% of girls aged 11-18 had reached menarche, while 11.52% had not. (Table No. 5).

Table 1: Status of Basic House Facilities in the village (n=1729)

Sr. No.	Information	Items	Number (n)	%
1	Type of House	RCC	743	42.9
		Pukka Assam	145	8.3
		Kachha Assam	14	0.80
		Thatched	827	47.8
2	Ventilation	Adequate	684	39.5
		Non Adequate	1045	60.4
3	Drinking Water	Tap	1383	79.9
		Well/Pond	346	20.01
4	Drinking Water Purification	Not Purified	1709	98.8
		Boiled	18	1.04
		Simple Filter	2	0.11
5	Toilet Facilities	Inside	14	0.8
		Outside	1420	82.1
		Open Field	295	17.06
6	Vector born disease prevention	Coils	1729	100
7	Drainage Facility	Open	1716	99.2
		Closed	13	0.75
8	Cooking (Purpose)	Gas LPG	802	46.3
		Wood/Coal/cow dung cake	927	53.6

Table 2: Socio-demographic status of surveyed adult population (above 18 years) (n=5043)

Age		18-30 yrs	31-40 yrs	≥41 yrs	Total (n)	%
Marital status						
Married	M	591	556	804	1951	38.68
	F	844	510	560	1914	37.95
Unmarried	M	487	27	19	533	10.56
	F	254	6	4	264	5.23
Widow	M	1	5	17	23	0.45
	F	12	43	298	353	6.99
Divorce/ Separate	M	0	0	1	1	0.01
	F	1	1	2	4	7
Educational status						
Illiterate	M	240	260	621	1121	22.22
	F	355	351	709	1415	28.05
Primary School	M	130	111	112	353	6.99
	F	144	78	62	284	5.64
Middle School (Upto 8th)	M	156	73	46	275	5.45
	F	203	64	32	299	5.92
High School (Upto 10th)	M	206	110	61	377	7.47
	F	188	43	23	254	5.03
Intermediate (12th/Diploma)	M	243	31	26	300	5.94
	F	168	12	7	187	3.70
Graduate & Above	M	94	11	2	107	2.12
	F	63	4	4	71	1.40
Physical Activity Status						
Vigorous	M	6	0	0	6	0.11
	F	6	0	2	8	0.15
Moderate	M	1042	485	633	2160	42.85
	F	1067	488	606	2161	42.85
Mild	M	29	85	222	336	6.66
	F	40	90	242	372	7.37

Table 3: Diet and addiction

Variables		Number (n)	%
Diet	Vegetarian	7	0.13
	Non-Vegetarian	5036	99.86
Addiction	Tobacco	123	2.43
	Gutakha /Pan masala	29	0.57
	Alcohol	540	10.70
	Smoking	667	13.22
	Tobacco Snuff	8	0.15
	None	3676	72.89

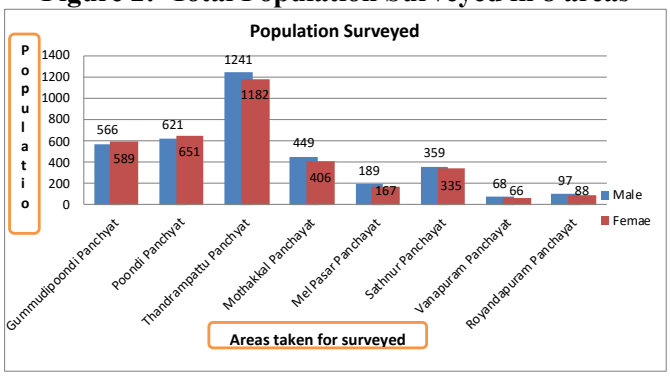
Table 4: Prevalence of Non-Communicable diseases

Number of screened population	Non- Communicable Diseases						
	HTN/ CVD	Diabetes	Cancer	Stroke	COPD/ Asthma	Osteo-arthritis	None
(n) 5043	0	74	0	4	2	373	4590
(%)	0	1.46	0	0.06	0.03	7.39	91.01

Table 5: Cumulative data of children surveyed up to 18 years

Variables	0-10 years, n (%)	11-18 years, n (%)	Total, n=2031 (%)
Education (School Going)			
Yes	429 (21.12%)	950 (46.77%)	**1379 (67.89%)**
No	652 (32.10%)	0	**652 (32.10%)**
Recurrent Infection (For RTI and GI More than 3 episodes in last 6 months) (For Skin infection-any infective lesion in last 6 months)			
a. Respiratory Tract infections-	23 (1.13)	17 (0.83%)	**40 (1.96%)**
b. Gastrointestinal Tract infections-	16 (0.78%)	14 (0.68%)	**30 (1.47%)**
c. Skin Infections	19 (0.93%)	9 (0.44%)	**28 (1.37%)**
None	1081 (53.22%)	950 (46.77%)	**2031 (100%)**
Menarche attained: Yes/No			
Yes	0	1797 (88.47%)	**1797 (88.47%)**
No	0	234 (11.52%)	**234 (11.52%)**

Figure 2: Total Population Surveyed in 8 areas



Discussion

Environmental factors and demographic profiles play a crucial role in shaping the health of populations in any country. Survey studies can provide valuable insights into health-influencing demographic factors, contributing uniquely to the development of preventive strategies (7). This study offers critical insights into the socio-demographic and health profile of the Scheduled Tribe (ST) population in the Thiruvallur and Thiruvannamalai districts of Tamil Nadu, highlighting key health challenges that need attention.

A striking observation is the near-universal prevalence of non-vegetarian diets (99.86%), suggesting that while these communities may have access to protein, there are likely deficiencies in other key nutrients, especially micronutrients such as iron, calcium, and vitamins. These deficiencies are particularly concerning for children and women of reproductive age, as they are vulnerable to conditions such as anaemia and developmental delays. Nationally,

the Comprehensive National Nutrition Survey (CNNS, 2016-18) indicated widespread micronutrient deficiencies among children (8), a trend that is mirrored in the surveyed population. Awareness was given to the people by the team for consuming more green leafy vegetables, milk etc.

Sanitation remains a challenge, with 82.1% of households having toilets but a low usage rate, and 17.06% of the population still practicing open defecation. Poor ventilation in 60.4% of homes further exacerbates health issues like respiratory infections. The Swachh Bharat Mission data indicates that sanitation coverage has improved in Tamil Nadu, but behavioural factors limit its impact. Furthermore, 98.8% of the population drinks non-purified water, contributing to gastrointestinal diseases, underscoring the need for improved water safety education.

In Tamil Nadu, only 0.2% of women smoke tobacco, while 0.4% use smokeless tobacco (9). Globally, tobacco consumption accounts for approximately 7.2 million premature deaths annually. According to the Global Adult Tobacco Survey 2 (GATS 2), 28.6% of adults in India aged 15 years and older use tobacco in some form (10,11). Among the study population, the illiteracy rate is significantly high at 50.27%, exceeding the national average of 41% (Census 2011). Low literacy levels are linked to poor health-seeking behaviours, contributing to higher rates of tobacco use (2.43%), smoking (13.22%), and alcohol consumption (10.70%) are recognised risk factors for non-communicable diseases (NCDs). Data from the National Family Health Survey-5 (NFHS-5) further underscore the increasing burden of NCDs among marginalised communities (12). This study identified a prevalence of diabetes in 1.46% of participants and osteoarthritis in 7.39%.

The surveyed population faces significant challenges due to improper water purification methods. It's estimated that contaminated water, coupled with inadequate sanitation and hygiene, results in over 1.2 million deaths annually among children under five due to diarrhea (13). Alarmingly, 98.8% of the respondents reported using non-purified water for drinking. This situation, along with insufficient ventilation, likely contributes to recurrent respiratory tract infections and gastrointestinal diseases. Raising awareness about effective water purification methods and promoting their implementation are crucial steps in preventing these health issues in the community. Educating the population on proper sanitation practices can significantly reduce the incidence of these preventable diseases.

Gaps in child health and education are evident, with 32.10% of children under 10 not attending school due to factors like poverty and distance. Moreover, 88.47% of girls have reached menarche, but 11.52% have delayed onset, likely due to malnutrition and socio-economic factors. National programs like Rashtriya Kishor Swasthya Karyakram aim to address adolescent health but need stronger implementation in tribal areas.

Conclusion

National and state-level policies must be tailored to meet the unique needs of ST populations to achieve equitable health outcomes. The study highlights pressing issues such as poor sanitation, malnutrition, high illiteracy, and rising NCDs in the ST population. Addressing these challenges requires targeted interventions, particularly around education, healthcare access, and awareness of hygiene and nutrition practices to improve health outcomes in Tamil Nadu's tribal communities.

Limitations

The study employs a cross-sectional design, utilising a convenience sampling method, which limits the ability to accurately represent the overall population.

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