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RESEARCH ARTICLE

Association of Substance Abuse and Tuberculosis among Tribes: Study in Three Tribal Settings of Kerala, India

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ABSTRACT

Substance abuse such as alcohol consumption and smoking serve as profound indicators for Tuberculosis (TB). Tribes in rural India are the vulnerable population for various diseases and substance abuse is more prevalent among them. Very few studies have been conducted to find the substance abuse and its association with TB among tribes in Kerala. Hence, we sought to understand the prevalence of substance abuse among tribes, and its association with chest symptomatic cases and cases with history of TB. This study aimed to identify the predictors of negative social behaviours among tribes and their association with chest symptomatic cases and history of TB. It was part of a collaborative research program to estimate the burden of TB amongst tribal groups, by ICMR, NIRT, Chennai and SRM University, Kancheepuram and Population Research Centre, Kerala conducted in 2018. This article presents the prevalence of substance abuse (tobacco and alcohol) among tribes, and its association with chest symptomatic cases and cases with history of TB. The study also tried to find out the predictors of substance use among tribes. Among 2609 tribes interviewed, 14.6% were smokers, 47 percent were used smokeless tobacco and 29% were consumed alcohol and only 20 respondents reported using drugs. Significant association of chest symptoms and TB history status with district, category of tribe, age, education, marital status, and nutrition are observed in the study. Chest symptomatic cases and those who had the history of TB had a highly significant association with use of smokeless tobacco and smoking. However, the study could not find a significant difference between those consuming alcohols. The predictors of substance abuse were found to be in higher age groups, low education, being in the low socio-economic profile and in the low BMI. To attain health goals like zero TB, control of substance use is an essential component especially among tribal communities. This study highlights the importance of education and better living conditions in reducing negative health behaviours among tribes.

Introduction

Tuberculosis (TB) is a major infectious cause of the global burden of disease; and is the 13th leading cause of death and the second leading infectious killer after COVID-19 (above HIV/AIDS)¹. In 2021, 10.6 million people suffered from Tuberculosis and 1.6 million died from the disease across the world¹. Exposure to tobacco smoke having been associated with tuberculosis infection, active tuberculosis, and tuberculosis-related mortality^{2,3}. Studies proved that the risk of death due to tuberculosis is nine times higher for smokers than for never-smokers⁴. Out of the 1.3 million people consumed tobacco, 80% of them live in underdeveloped or developing countries and tuberculosis rates are also high in these countries⁵. India is the second largest consumer of tobacco products in the world with as many as 35% adults (15 years and above) consuming tobacco and nearly one million Indians die due to tobacco use every year, which is much more than the combined mortality resulting from HIV/AIDS, TB and Malaria⁶. In 2020, 87% of new TB cases occurred in the 30 high TB burden countries. Out of the eight countries accounted for more than two thirds of the global total, India is one among them¹. Moreover, heavy consumption of alcohol is a risk factor for tuberculosis is found in number of studies^{7,8}. In 2021, 0.74 million new TB cases worldwide were attributable to alcohol use disorder and 0.69 million were attributable to smoking.¹Alcohol consumption is associated with an increased risk of tuberculosis and consequently a major contributor to the tuberculosis burden of disease is proved in meta analysis⁹.

Kerala, a southern state in India, is unique in its outstanding achievements in social, demographic and health with respect to other Indian states. The state is passing through an epidemiological transition with mortality and morbidity due to lifestyle diseases surpass those due to infectious diseases and Reproductive and Child Health (RCH) issues combined. Annual Risk of Tuberculosis Infection (ARTI) by Tuberculin surveys suggested a lower TB transmission in Kerala and currently about 30 presumptive TB cases need to be tested to find a new case of TB in Kerala¹⁰. Diabetes, pollution and chronic respiratory diseases, smoking, alcoholism, and migration from other states are the factors need to be addressed specifically to combat with TB situation in Kerala, according to the State TB Officer in Kerala¹⁰. TB in the state is concentrated in certain vulnerable groups, such as the poor, the homeless, migrants, and other marginalized groups like tribal. In addition, approximately 44% of TB patients in Kerala are diabetic, 45% are chronic smokers, a quarter is habitual alcoholics and one tenth had

history of a chronic respiratory illness¹¹. Bidi an indigenous form of cigarette was very popular in Kerala until recently. Due to its relatively low cost and availability in tribal areas, its use is more common among tribes. The presence of harmful and carcinogenic chemicals in the mainstream bidi smoke would harm human health¹². A significantly higher prevalence of tobacco smoking and consumption of alcohol among tribal group as compared with the prevalence in the general population is documented in Madhya Pradesh¹³. Study among tribes in 17 states in India found that the one of the socio-cultural factors posing risk for TB is Alcohol use (Country Liquor), Tobacco (Gutka) and Smoking¹⁴. Kerala is moving towards "Elimination of TB" and one of the ten components in the strategy of End TB is to address TB and other health issues among tribal population¹⁰.

The identification of differential groups (who are highly prone in substance abuse) and its determinants is important in the efforts to reduce future smoking and alcoholic prevalence among tribes. In Kerala 1.14% of tribal population constitutes of total population of the state. According to Census of India the scheduled tribe population in Kerala is 3,64,89 in 2001 and it increased to 4,84,839 in 2011¹⁵. There are 35 major tribes in Kerala and out of these Paniyar are the largest. The other major tribes in Kerala are Adiyar, Aranda, Eravallan, Mala Pulayan, Irular, Kadar, Kanikkaran, Karimpalan, Kattunayakan, Kochuvelan, Koranga, Kudiya, Kurichchan, Kurumans, Kurumbas, Mahamalarar, Malai Arayan, Malai Pandaran, Vedan, Malakkuravan, Malarar, and Malayan. Even though there are some studies regarding substance abuse among tribes, there is a significant literature gap in association of TB with substance abuse especially in Kerala. In this context, the primary objectives of this study are to understand the prevalence of substance abuse among tribes and to find out its association with chest symptomatic cases and cases with history of TB. Secondary objective is to find out the determinants of substance abuse among tribes.

2. Methods and Materials

This study was part of a collaborative research program to estimate the burden of TB amongst tribal groups, by ICMR, NIRT, Chennai and SRM University, Kancheepuram and Population Research Centre, Kerala conducted in 2018. Underlying research sought to understand treatment seeking behavior of persons having symptoms suggestive of TB. Wayanad, Palakkad and Idukki, three districts with maximum tribal population form the primary area of study. Villages with more than 50 percent tribal population were selected at the

second research stage, leading to the selection of Noolpuzha in Wayanad, Sholayur in Palakkad and Arakkulam in Idukki. Types of tribal groups in the three different sites are Irular, Kattunayakan, Kuruma, Oorali, Paniya, Malayarayan – Hindu, Malayarayan– Christian.

The study population includes 2,935 individuals aged 15 years and above, out of which 2,609 are tribal and 326 are non-tribal. In Palakkad study area, 84 percent of the population included in the study are tribes compared to 91 percent each in the Wayanad and Idukki study areas. The Study included questions on their behaviours and practices attained through qualitative and quantitative analysis. The Quantitative components of this study were used for assessing negative health behaviours such as smokeless and smoke tobacco use, and alcohol consumption.

Chest symptoms identified in tribal areas during the household survey included cough, expectoration, chest pain, weight loss, night sweats, fever, loss of appetite, haemoptysis, shortness of breath and tiredness during the previous three months. Each eligible individual was screened for presence of signs and symptoms suggestive of pulmonary tuberculosis (PTB) including persistent cough (for 2 weeks), fever or chest pain (for 1

month), haemoptysis, and history of ATT (anti-tubercular treatment). Details on any individual in the family having been diagnosed to have TB (contact history) during the previous one year or currently under treatment at the time of the interview were obtained. Sputum samples were collected from 20 chest- symptomatic individuals and sent to the Designated Microscopic Centre, Thiruvananthapuram for further processing. As per the test reports, none was found to have active TB disease. There were 53 past TB cases. Out of these, seven patients were found to have both past TB disease and chest symptoms. Hence, 113 persons either had experienced TB or were chest symptomatic. Analysis of the association of chest symptomatic cases or experience of TB depends on these 113 cases. Multivariate analysis was carried for finding the determinants of TB and symptomatic chest cases. Is substance abuse is a risk factor of TB and chest symptomatic case is the question answered. Among 2609 tribes, 380 had ever smoked, 1232 had used smokeless tobacco, 750 had ever consumed alcohol, and 20 reported drug use.

3. Results

3.1 Prevalence of smokeless and smoking tobacco and alcohol use among Tribes

Table 1: Ever and current use of substance abuse among tribes

Ever used tobacco	Smokeless	Percent	Ever consumed alcohol	Percent
Yes		47.2 (1232)	Yes	29.0 (750)
No		52.8 (1377)	No	71.0 (1859)
		2609		2609
Ever Smoked			Current Alcoholics	
Yes		14.6 (380)	Alcoholics	85.1 (638)
No		85.4 (2229)	Non Alcoholics	14.9 (112)
		2609		750
Current Smokers			Current Drug Users	
Smokers		84.7 (322)	User	0.8 (20)
Non Smokers		15.3 (58)	No User	99.2 (2589)
		380		2609
Type of Smoke tobacco			Reason for using alcohol*	
Bidi		84.2(320)	To relieve stress	2.5 (66)
Cigarette		17.1 (65)	Peer pressure	11.0 (287)
Other		2.9(11)	Workload/tired	17.7(462)
		380	Culturally normal	2.3(59)
Type of Alcohol*			Easily available	0.4 (11)
Tadimadi/Toddy		1.6 (42)	Addicted	0.8 (21)
Country liquor/mahua/sarayam		0.8(20)	Others	1.3(33)
Beer		2.4(62)		939
Wine		1.4(36)	Quantity of liquor	
Hard liquor		25.5 (666)	60ml	2.1(56)
		764	61-120ml	12.3(320)
			121-180ml	10.1(263)

	181-270ml	2.7(70)
	>270ml	0.9(23)
	Total	732

*Multiple responses

Total eligible respondents from the three districts studies are 2609 tribes. Of which about 47 percent use smokeless tobacco and 14.6 percent use smoke tobacco. Hence 61.8 percent use any form of tobacco. Type of smoking reveals that about 84 percent of those who smoke Bidis(which is 12.3 percent of the total tribes) and about 17 percent use cigarettes. Among those who ever smoked, 84.7 percent are current smokers. Alcohol use is relatively less compared to those who use smokeless tobacco. We find 29 percent of the respondents as having ever consumed alcohol. But among those who reported ever use, 85.1 percent

are currently alcoholics. Hard liquor is the most reported type of alcohol (about 26 percent using it) and is used as relief from stress (18 percent) and peer pressure (11 percent). Twelvepercent use 61-120ml of alcohol followed by 121-181ml (10 percent). Tribal areas are not free from drug use. 20 respondents (less than 1 percent)report currently using drugs.

3.2 Substance abuse and TB among tribes

TB occurs predominantly among socially and economically disadvantaged people and in immune-compromised patients.

Fig1 Behavioural Aspects among tribes

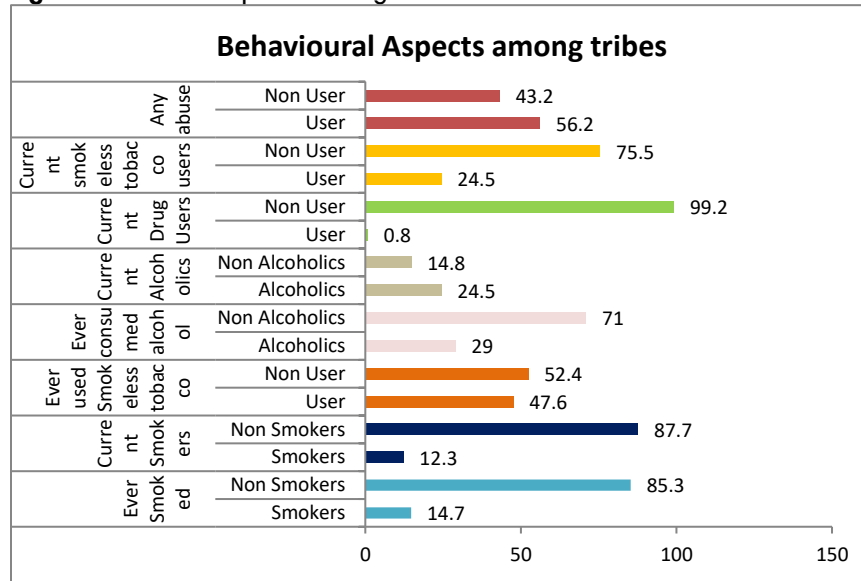


Table2: Percent Distribution of chest symptomatic cases and cases with history of TB

Had any symptom of TB*		Chest symptomatic*	
Yes	2.6 (67)	Cough	68.7 (46)
No disease	97.4 (2840)	Expectoration	23.9 (16)
	2609	Chest Pain	44.8 (30)
Suffer from any of the listed *		Fever	26.9 (18)
Persistent Cough for >1 week	62.7 (42)	Loss of Appetite	6.0 (4)
Fever for > 2 weeks	26.9 (18)	Blood in Sputum	7.5 (5)
Weight loss	10.4 (7)	Night Sweats	10.4 (7)
Chest pain for one month or more	31.3 (21)	Weight loss	17.9 (12)
Hemoptysis anytime in last 6 months	5.9 (4)	Shortness of breath	20.9(14)
Total	67	Tiredness	34.3 (23)
Availed treatment		Others	3.0 (2)
Yes	77.6 (52)	Total	67
No	22.4 (15)	Sputum collected	
Ever treated for TB		Yes	20
Yes	2.0 (53)	No	1

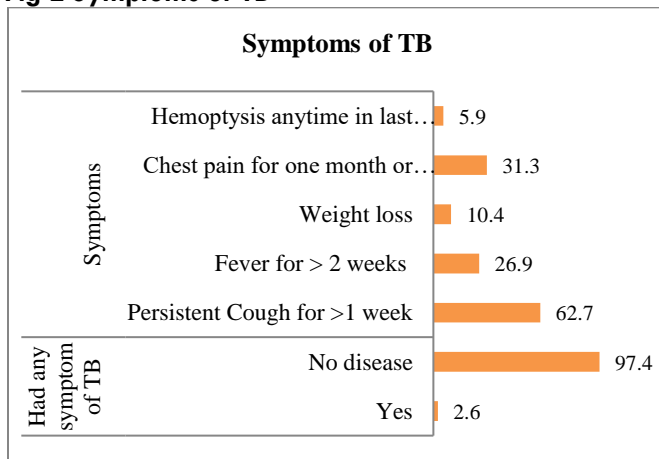
No	98.0 (2556)	Unable to produce sputum	46
Total	2609	Total	67
		TB Positive cases	0
Treatment under ATT			
Yes, Currently on ATT	3.8 (2)		
Yes, taken ATT within past 1 year	7.5 (4)		
Yes, more than one year ago	88.7 (47)		
Total	53		

* Multiple response

Table 2 provides the percent of respondents who reported chest symptoms and had a history of TB. At least one ailment like persistent cough for > 1 week, fever for > 2 weeks, weight loss, chest pain for one month or more and hemoptysis anytime within in the last 6 months, during the study period is 2.6 percent. Out of the 67 respondents, 31 percent had chest pain, nearly 63

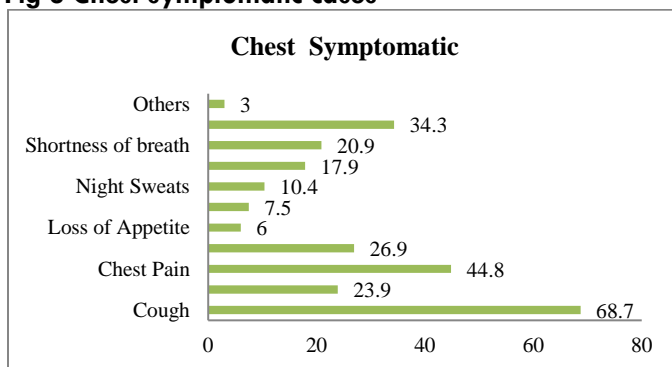
percent had persistent cough for more than one week, 27 percent had fever for more than 2 weeks, 10.4 percent experienced weight loss and 6 percent had haemotysis. Nearly 78 percent had sought treatment. In the whole study population, only 2 percent had ever undergone treatment for TB.

Fig 2 Symptoms of TB



Twenty out of 67 respondents were eligible for sputum collection as per the criteria for sputum collection laid down by the study protocol. Out of twenty none tested TB positive.

Fig 3 Chest symptomatic cases



From the 67 respondents identified to have some symptom related to TB, the chest symptomatic group was indicated to screen for TB through sputum

microscopy. The reference period for identifying chest symptomatic was three months preceding the survey period. An attempt revealed that nearly 69

percent of the respondents (out of 67 persons) had cough, 44.8 percent had chest pain, 26.9 percent had fever, around 34 percent felt tiredness, 21 percent felt shortness of breath and 24 percent had expectoration, 17.9 percent had lost weight and more than 10 percent had night sweats, less than 10 percent had each blood in sputum or loss of appetite.

Table 2 provides information on patients on anti-tubercular treatment (ATT). 53 patients had ever been treated for TB and had been on ATT. Two patients were currently on ATT and four patients had been under ATT during the past year preceding the survey. The remaining 47 patients (89 percent) had been under ATT more than a year ago.

Fig21 Treatment for TB

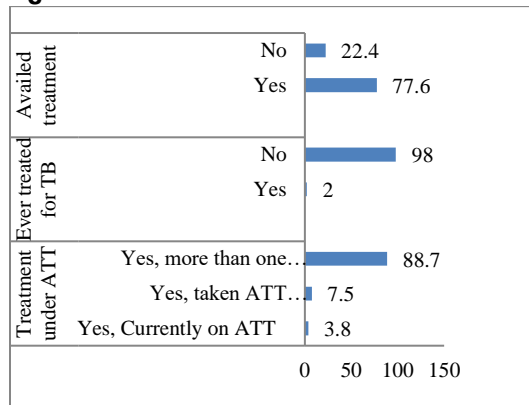


Table 3: Percent Distribution of chest symptomatic and history of TB by background characteristics

Characteristics	Chest Symptomatic	Ever had TB	Ever had TB or Chest symptomatic cases
Study Area			
Wayanad	1.1***	2.0 ^{NS}	2.8***
Idukki	0.5	2.3	2.6
Palakkad	6.4	1.8	7.9
Name of tribe			
Irular	6.4***	1.9**	7.9***
Kattunayakan	1.7	1.7	3.4
Kuruma	0.5	1.4	1.9
Oorali	0.6	1.3	1.9
Paniyan	2.5	4.5	5.6
Malayarayan-Hindu	0.2	3.2	3.2
Malayarayan-Christian	1.1	0	1.1
Age of respondents			
15-19	2.8 (7)***	0.4 (1) ^{NS}	2.8 (7)***
20-29	0.9 (5)	1.4 (8)	2.3 (13)
30-39	2.0 (12)	2.3 (14)	4.2 (25)
40-49	3.0 (14)	2.2 (10)	4.9 (23)
50-59	2.7 (8)	3.4 (10)	5.1 (15)
60-69	4.0 (11)	1.8 (5)	5.4 (15)
70+	7.8 (10)	3.9 (5)	11.6 (15)
Sex of respondents			
Male	2.3 (28) ^{NS}	1.9(24) ^{NS}	3.8(47) ^{NS}
Female	2.9 (39)	2.1(29)	4.9(66)
Marital Status			
Currently married	2.8 (47)**	2.0(33) ^{NS}	4.5(75)*
Never Married	1.3 (8)	1.8(11)	3.0(18)
Divorced/Separated	0	5.1(2)	5.1(2)
Widowed/Widower	4.6 (12)	2.7(7)	6.9(18)
Education (in no. of years of schooling)			
Illiterate	7.0 (36)***	1.7 (9) ^{NS}	8.0 (41)***
1-9 years	2.0 (21)	2.7 (29)	4.5 (48)
10 years	1.0 (5)	1.6 (8)	2.4 (12)
11-15 years	0.7 (3)	1.5 (7)	2.2 (10)
>15 years	3.7 (2)	0 (0)	3.7 (2)

Malnutrition			
Underweight	8.9(23)***	3.9 (10) *	11.7(30)***
Normal	2.2(42)	2.1 (40)	4.1(78)
Overweight/Obese	0.5(2)	0.8 (3)	1.3(5)
Ever used smokeless tobacco			
Yes	4.5(56)***	2.7 (33)*	6.7(83)***
No	0.8(11)	1.5 (20)	2.2(30)
Ever used smoke tobacco			
Yes	5.0(19)***	1.8(7) ^{NS}	6.3(24)**
No	2.2(48)	2.1(46)	4.0(89)
Ever consumed alcohol			
Yes	2.5(19) ^{NS}	2.1 (16) ^{NS}	4.4(33) ^{NS}
No	2.6(48)	2.0 (37)	4.3 (80)
Ever used drugs			
Yes	5.0(1)	0.0 (0) ^{NS}	5.0(1) ^{NS}
No	2.6(66)	2.1 (53)	4.4(112)
Ever any substance abuse			
Yes	4.1(60)***	2.5 (36) ^{NS}	6.2(90)***
No	0.6(7)	1.5 (17)	2.0(23)
Total	67	53	113

NS-Not significant, *** $p < 0.001$, ** $p < 0.05$, * $p < 0.1$

Table 3 provides information of chest symptomatic cases and cases with history of TB by background characteristics. Significant association of chest symptoms and history of TB status with district, category of tribe, age, education, marital status, nutrition, smokeless and smoke tobacco use have been observed in the study. With regard to chest symptomatic or with history of TB, 7.9 percent are in Palakkad district and on an average 2.7 percent each in Wayanad and Idukki districts. Irular tribes share 7.9 percent of those with TB or symptomatic followed by Paniyan (5.6 percent) and oldest age group holds the highest percent. Widowed group reported more prevalence than other marital groups (6.9 percent). Illiterate tribes are more vulnerable to TB compared to other educational groups. Tribes with underweight are more in reporting (11.7 percent) substance abuse than normal (4.8 percent) and overweight (1.3 percent). Higher prevalence of symptoms or history of TB are found among those with smokeless tobacco use (6.7 vs 2.2 percent) and with a history of smoking (6.3 vs 4.0). But there is not much difference between those who consume alcohol (4.4 vs 4.3 percent). The use of any substance (6.8 percent) among tribes even after they report that they had a history of TB, implies they could not quit the behaviour. Female tribes have higher prevalence of chest symptomatic or history of TB than males but it is not significant.

Demographic and Socioeconomic Predictors of substance abuse among tribes

Age is a strong predictor for smoking and consuming alcohol. We considered age groups younger than 38 and older than 38 years, which was the mean age of the respondents. Adjusted

odd ratios from multivariate logistic regression shows that those above 38 years were twice as likely to smoke and 1.5 times more likely to consume alcohol than their younger counterparts. Smokeless tobacco use is not significantly associated with age and use was common in both groups. Education is one of the strongest factors for the use of tobacco and alcohol. Those with greater education demonstrated highly significant differences in engaging in risk behaviors: those with 10 or more years of schooling showed 81 percent less chance of chewing tobacco, 80 percent less chance of smoking, and 68 percent less use of alcohol than less educational groups. As in the general population, substance abuse is less likely among females compared to men. This is more evident in smoking tobacco (98 less chance) and alcohol consumption. In the case of chewing tobacco, there is 44 percent less chance of use among females.

As economic differences are not significantly different among tribal areas, type of housing was used as an indicator for living status and was significantly associated with substance abuse behaviours. Those who live in Pucca houses, have 1.45 times greater chance of chewing tobacco, 1.3 times greater chance of smoking, and 1.7 times greater chance of consuming alcohol.

Occupation emerged as one of the predictors of tobacco use and alcohol use. Compared to the government and private service job group, there is strong significance for "other occupational groups" showing 2.8 higher chance of smokeless use, 3.7 times higher chance of smoking and 1.6 times chance of consuming alcohol.

With respect to marital status, those currently married, others (never married and divorced or

separated or widowed) have less chance of chewing (20 percent) and smoking tobacco (31 percent) and consuming alcohol (62 percent).

Chewing and smoking tobacco is also significantly associated with BMI. Compared to underweight population, those of normal weight have less chance of smokeless use (44 percent), 42

percent less smoking and 1.2 times higher chance of alcohol consumption. Among overweight people the chance of chewing tobacco is reduced by 72 percent, and for smoking (49 percent less chance) of significant associations are observed between BMI and alcoholic consumption.

Table 4. Multivariate analysis of predictors of substance abuse among tribes

Variables	Exp(B) and Confidence Interval			
	Smokeless history	Smoking history	Alcohol history	
Age	≤38 years®			
	>38 years	1.02 NS (0.85-1.22)	2.09*** (1.57-2.78)	1.521*** (1.16-2.00)
Education	<10years®			
	≥10 years	0.106*** (0.08-0.15)	0.199*** (0.107-0.372)	0.318*** (0.22-0.46)
Sex	Male ®			
	Female	.569*** (0.48-0.69)	0.017*** (0.009-.032)	0.008*** (0.005-0.013)
Type of House	Pucca®			
	Others	1.45*** (1.21-1.74)	1.325** (1.007-1.744)	1.706*** (1.32-2.204)
Occupation	Govt/Pvt®			
	Others	2.81*** (1.76-4.47)	3.712*** (1.551-8.879)	1.585* (0.954-2.634)
Marital Status	Currently married®			
	Others	0.805** (0.67-0.97)	0.687** (0.487-0.970)	0.376*** (0.280-0.506)
BMI	Underweight®			
	Normal	0.557*** (0.41-0.75)	0.581** (0.358-0.941)	1.267NS (0.794-2.02)
	Obese/Overweight	0.283*** (0.20-0.41)	0.508** (0.288-0.894)	1.204NS (0.70-2.068)
Constant		1.011	0.152	0.777

NS-Not significant, ***p<0.001, **p<0.05, *p<0.1

R square for smokeless tobacco, smoking and consumption of alcohol is 0.245, 0.51 and 0.62 respectively. This implies only 25 percent of the smokeless tobacco use can be explained by the concerned variables in the model which may be due to among tribes chewing tobacco is almost same among different subgroups of the population. Model can explain 51 percent of the predictors of smoking and 62 percent of the alcoholic consumption.

Discussion

Prevalence of tobacco use as per National Family Health Survey (NFHS-5) during 2019-20, reported 16.9 percent among men and 2.2 percent among women and consumption of alcohol is 19.9 percent among men and negligible (0.2percent) among women in Kerala. Global Adult Tobacco Survey in 2016-17 also revealed that 9.3% of all adults currently smoke tobacco (19.6%

of men, 0.2% of women) and 5.4% of all adults currently use smokeless tobacco (7.4% of men and 3.6% of women) in the state. But this study shows high prevalence (61.8percent) of tobacco use(47% smokeless and 14.6% smokeless). A higher prevalence than general population is reported among tribes by other studies in the study districts. A study in Wayanad¹⁶ reported 73.8% prevalence of tobacco use and while the other reported 39 percent¹⁷. More than 80 percent of the tribes (Kani) use tobacco is also reported in another district Thiruvananthapuram¹⁸. A comparatively less use of smokeless tobacco (24.6%) and 19 percent smoke among tribes is reported during the same period in Tamil Nadu a neighbouring state of Kerala¹⁹. Bidi is the mostly used form of smoke (84 percent of tribes) found in the study is in consistent with the study in Tamil Nadu¹⁹.

Ever consumption of alcohol in the three tribal areas in the Kerala reveals that it varies from

32 percent in Palakkad and 29 percent in Wayanad to 25 percent in Idukki (over all prevalence of 29%) but current consumption is highest in Wayanad followed by Palakkad and Idukki. It is consistent with the study in Tamil Nadu where alcohol consumption was 36% among tribes¹⁹. With a low level of annual risk of tuberculosis infection Kerala and is moving towards elimination of TB, it is critical to identify TB among marginalised groups like tribes in achieving the goal. Although there is no positive case of TB in the study areas, chest symptomatic and cases with history of TB form the basis of this study. District wise variation revealed that Palakkad has largest percent of tribes (6.4 percent) with symptoms and Idukki the lowest (0.5 percent). Tribes who had history of TB are highest in Idukki 2.3 percent and Palakkad reported the lowest percent of 1.8 percent. According to guidance document for TB Elimination Mission, Kerala¹¹ Idukki districts is in the forefront of the elimination of TB, need to give attention to test presumptive TB cases so as to reach the goal.

Significant association of chest symptoms and history of TB with district (prevalence is high in Palakkad), category of tribe (higher prevalence among Paniyans), age (70 and above years), education (among illiterate), marital status (among widowed), and nutrition (among low BMI) have been observed in the study. As behavioural aspects are expected to have direct association with health, we also found persons identified as chest symptomatic or with history of TB are reported higher prevalence of substance abuse. These persons reported higher prevalence of smokeless tobacco (6.7 vs 2.2 percent among non-users), smoke tobacco (6.3 vs 4.0 percent among non-users) and those consumed alcohol (4.4 vs 4.3 percent among non-users). About 68 percent with a history of TB reported any substance abuse which implies they were not quitted these behaviours even after the medication. Studies proved that smokers had a higher risk of developing TB than non-smokers, after controlling for the effects of age, sex, alcohol use and social class²³. Alcohol consumption was associated with an increased risk of tuberculosis in all meta-analyses²⁴. A population-based case control study in South India demonstrated an increased incidence of pulmonary TB among those who smoke and drink²⁵. The malnutrition assessed from the estimated values of Body Mass Index (BMI) in the study revealed that the chest symptomatic are more among the under nourished respondents. The findings that alcohol, smoking, and low BMI are significantly related to the higher prevalence of TB among the tribal populations in India²⁶ that reemphasised in our study as well.

Education is emerged as the one of the strongest protector of any substance abuse we studied. In tribal areas a small number of people attain higher studies. Government or private jobs are another protective factor for the use of these habits. Smokeless tobacco use is acceptable in tribal communities at all ages. Smokeless tobacco use is acceptable in tribal communities at all ages from children to old age and is not significantly associated other negative behaviours. Smokeless tobacco use among females is very high compared to men. The observed difference in percent of use of tobacco and alcohol with respect to the type of house (Pucca, semi Pucca and Kutcha) may be due to the standard of living. Pucca householders are in a more advantaged education group and have better jobs. Pucca householders are those who have better standards of living obtained through good education and employment. A cross-sectional population-based survey of 2186 tribal households in the Wayanad District²² also confirmed the above findings. The study observed that smoking and chewing tobacco is associated with no formal education, increasing age while employment status is associated with alcohol consumption. A study in the same tribal settings (Noolpuzha in Wayanad, Sholayur in Palakkad and Arakkulam in Idukki) observed a significant association of education on knowledge level about TB underscore the importance of education²⁷.

Conclusion

In conclusion, tobacco and alcohol use are high among marginalised population such as tribes of Kerala. High prevalence among women has to be addressed as it will lead to many health issues including pregnancy and child birth. Those with TB history and chest symptomatic are significantly related to negative health behaviours and poor nutrition. Education and regular jobs are found to be the protective factors to reduce smoking and alcoholic consumption. Tribes from the poor socio-economic class and less educated are less aware of the health hazards of the use. Providing better educational opportunities and job opportunities in tribal areas and motivating the use of these facilities is an important approach to reduce risk behaviours including risk of TB. Effective strategies for the awareness of the health hazards of the consumption of smokeless and smoke tobacco use and consumption of alcohol is necessary especially among females and children. Moreover, the findings highlight the need for tribe specific de-addiction and nutrition programmes and policies.

Conflicts of Interest Statement

The authors have none to declare.

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