Prevalence and Determinants of Substance Use Among Indigenous Tribes in South India: Findings from a Tribal Household Survey

Anvar Sadath, [1]✉

Email anvar.sadathvakkayil@ucc.ie

Kurian Jose, [2]

Email kurianpsw@gmail.com

KM Jiji, [2]

Email jijikm10@gmail.com

VT Mercy, [2]

Email mercyvt@gmail.com

G Ragesh, [3]

Email rageshpsw@gmail.com

Ella Arensman, [1,4]

Email ella.arensman@ucc.ie

[1] Department School of Public health & National Suicide Research Foundation AQ1 , University College Cork, Cork, Ireland

[2] Tribal Mental Health Project (TMHP) for Wayanad, Institute of mental Health and Neurosciences, Kozhikode, Kerala, 673 008 India

[3] Department of Psychiatric Social Work, Institute of mental Health and Neurosciences, Kozhikode, Kerala, 673 008 India

[4] Australian Institute for Suicide Research and Prevention, Griffith University, Brisbane, Australia

Received: 28 October 2020 / Accepted: 7 January 2021

Abstract

AQ2

Background

Indigenous populations have higher substance use than non-indigenous populations. Current evidence on indigenous substance use is largely derived from national household surveys, while there are no specifically designed, culturally specific methodological studies available to determine the prevalence of substance abuse among the indigenous tribes. The present study examined the prevalence and predictors of alcohol use, smoking, and betel quid chewing among indigenous tribes in South India.

Method

We conducted a cross-sectional population-based random survey of 2186 tribal households in the Wayanad District, Kerala. A self-prepared, pilot-tested structured interview schedule was used to collect information on sociodemographic variables and substance use. Multivariate logistic regression models were used to examine the sociodemographic predictors of substance use.

Results

The overall prevalence of current alcohol use, current smoking and daily betel quid use was 17.2%, 18.8% and 47.6% respectively. Consistently, male gender (alcohol use OR = 13.55; smoking OR = 3.42; betel quid use OR = 1.65), increasing age (OR = 1.32; OR = 1.01; OR = 1.03), Paniya tribe status (OR = 2.24; OR = 1.39; OR = 5.38) and employment status being working (OR = 2.07; OR = 1.77; OR = 1.26) increased the risk of alcohol use, smoking and betel quid chewing. Furthermore, having ‘no formal education’ was associated with smoking (OR = 1.35), and betel quid chewing (OR = 3.27).

Conclusion

Substance use was high among the indigenous tribes. The male gender, increasing age, Paniya tribe and working status significantly influenced alcohol use, smoking and betel quid chewing. The results underscore the need for indigenous specific de-addiction policies and programmes, alongside a consideration of the critical sociodemographic predictors.

Keywords

Alcohol use
Smoking
Betel quid
Indigenous population
Tribes
South India

Background

Substance abuse is high among indigenous populations [1, 2, 3] compared to non-indigenous groups [4, 5, 6]. In India, the proportions of individuals smoking, chewing tobacco and using alcohol among indigenous populations were 25%, 36% and 26% respectively, compared to 18%, 19% and 9% for non-indigenous populations [4], and these differentials were significant for smoking and alcohol use [4]. The disproportionate level of substance abuse among this group [4, 7] is inherently related to their socio-economic marginalization and historical oppression [8, 9]. Evidently, socio-economically disadvantaged groups are at higher risk to substance misuse [10, 11]. The high substance abuse combining with lower help-seeking behaviour and unequal access to treatment services among these groups further increases the risk of for worst health outcomes [4, 12]. Substance abuse among indigenous populations is associated with a wide range of health and social problems, including violence, family breakdown, child neglect and abuse, loss of income, diverting income away from family needs, high morbidity and premature mortality [13].

In India, indigenous people are known as scheduled tribes (STs), or Adivasis, and they live in a group with distinctive social, cultural, historical and geographical circumstances [4, 14]. The STs have worse health status [15], and they lag behind the national average of several important public health indicators [12, 16]. Substance abuse, especially alcohol [8, 15] and betel quid use [9, 17], is very common among them, yet only a few studies have addressed this [4, 6]. Data derived from a national survey indicate that STs have the highest likelihood of using any substances [6]. The available evidence on indigenous substance use

in India is mostly derived from national household surveys, and therefore, it is primarily data driven. To our knowledge, no specifically designed studies are available to determine the prevalence and predictors of substance use among tribes. Due to heterogeneity of the population, culture and ethnic groups in India, national surveys do not adequately capture the exact prevalence of substance use specific to smaller subgroups [18] especially the one like tribes. Thus, a culturally sensitive methodology is essential for determining the magnitude of substance abuse among the tribal population [15]. Furthermore, there is a huge heterogeneity and subgroup variation within the tribes and levels of substance use and misuse vary among them [19]. Paniya tribes are more backward [15], and they suffer disproportionate levels of substance abuse [19]. As an advancement of our previous exploratory research [8, 9, 20, 21] and other relevant research work in this area [15, 19], we conducted this survey to examine the prevalence and determinants of substance abuse among tribes in Kerala, South India. Precisely, the following research questions are being answered in this study: (1) What is the prevalence of substance use (alcohol, smoking and betel quid) among indigenous tribes, and (2) To what extent are gender, age, tribe subgroup status, education and employment status associated with alcohol use, smoking and betel quid use among indigenous tribes?

Materials and Methods

A cross-sectional population-based household survey was conducted among indigenous tribes in Wayanad District, Kerala, during November 2018–July 2019. The study was conducted as part of developing specialized mobile mental health services for the tribes. The study was approved by the ethics committee of the Institute of Mental Health and Neurosciences. Informed consent was obtained in the form of thumb impression/signature after orally explaining the details about the study. The participants who requested support or those with extreme levels of substance abuse were referred to the community mental health extension clinic for the counseling and de-addiction services.

Setting

The study was conducted in the Wayanad district, which is located in the north-east of Kerala state, South India, with a population of 816,558. The STs account for more than 18.5% of the total population in the district, compared to 1.5% of the state average of STs. Among the 484,839 of scheduled tribe population in the state, 152,808 are from Wayanad District [22]. The district consists of 4 community development (CD) blocks (i.e. Mananthavady, Kalpetta,

SulthanBathery, Panamaram) which contain 26 Grama Panchayaths (GPs) in total. The STs disproportionately spread across the GPs.

Population and Sample

The STs consist of various subgroups including Paniya, Kurichiyar, Kurumas/MulluKurumar, Kattu Nayakan, Adiya and Oorali are being the majority [22] (see Appendix Table 6). This subgroup classification was predominantly based on their historical occupation [23]. As we were interested examining subgroup variation on substance, we randomly selected samples proportionately from the six major tribal subgroups. For the six subgroups, there were 35,466 households which constituted a 150,084 tribal population. However, other subgroups were very less (only 669 household), and therefore, a random selection was not feasible; hence, we selected them consecutively. We used a multistage cluster random sampling method to select the potential tribal households. First, we listed out the tribal extension offices (TEOs) in Wayanad, and there were 15 TEOs spread across Kalapatta, Mananthvadi and Bathery CD blocks. Using the lottery method, we selected 8 TEOs as the first stage of the sampling. Second, we listed out the tribal promoters (TPs) who come under these TEOs, and there were 200 TPs in total. The TPs are members of the tribal subgroups and they were appointed to function as facilitators in tribal areas for channelizing and extending the benefits of tribal development schemes. Third, via Tribal Extension Officers we organized several face-to-face meetings with the TPs, and we could meet 180 TPs over a 3-month period. We had extensive discussion with the TPs to explore the details about potential tribal subgroups, households and colonies in their areas. Fourth, with the help of TPs, we prepared a source population list which contained subgroup wise distribution of tribal households in their respective areas. From this list, we got the details about the number of tribal households under each of the TPs. On an average, 95 tribal households representing 7 to 8 tribal colonies were distributed under each of the TPs, although this number was slightly varied across different subgroups. Finally, using the lottery method, we selected 30 TPs proportionately from each of the major subgroups. All the potential tribal households that come under these TPs were included. In cases we had difficulties to reach an optimal number of households due to the unavailability of respondents, we additionally selected a few more TPs (< 10) following the same procedures.

Sample Size Estimation

We conducted sample size estimation in OpenEpi, Version 3, using the following formula. Sample size $n = [\text{DEFF}*\text{Np}(1\text{-}p)] / [(d^2/Z^2_{1\text{-}\alpha/2} \times (N\text{-}1) + p \times (1\text{-}p)]$. We entered a number of tribal households in Wayanad i.e. 36,135 [24] as our

population size. The outcome factor in the population derived from a previous study, which estimated a prevalence rate pf 26% for alcohol use among indigenous populations in India [4]. Furthermore, we assumed a margin of error/confidence limits at 3%.

Population size (for finite population correction factor or fpc)(N): 36135.

Hypothesised % frequency of outcome factor in the population (p): 26% ± 3.

Confidence limits as % of 100(absolute ± %)(d): 3%.

Confidence level (%): 99.9%.

Design effect (for cluster surveys *DEFF*): 1.

Thus, we calculated a sample size of 2176 which was rounded up to 2200.

Data Collection

A specifically trained mental health team comprising a psychiatric social worker (project director), a professionally qualified social worker (project coordinator), and a registered staff nurse was involved fulltime for the data collection. All staff members involved in data collection had several years of experience in working with tribal populations in the concerned district. A few postgraduate students in social work and MPhil trainees in psychiatric social work were involved in data collection on a part-time basis. Adequate training was provided for all persons involved in the data collection. Furthermore, due to the sensitive nature of the population under study, special training on research ethics was provided to all staff members.

The team visited the tribal households for the data collection, and mostly, the TPs of the concerned colonies accompanied the team. The adult individual available in the home and who consented was included in the study. In situations where more than one potential respondent was available in the household, preference was given to the eldest one in the family. Our sample unit was a household; thus, only one potential adult tribe form a household was included in the study. The included eligible participants were 18 to 70 years old (self-reported approximate age) and had not suffered any severe mental disorders which affected participation in the survey.

Measures

We used a brief, pilot-tested interviewer-administered structured schedule for the data collection. The schedule contained two sections: (a) standard socio-

demographics including age, gender, marital status, tribe group affiliation, education, occupation and income-related information; (b) substance use, including alcohol, smoking and betel quid chewing characteristic of the study participants and their family members. The items in section b included more general question first to all the participants (e.g. Do you drink alcohol in last 12 months?) with binominal categorical response (yes/no), following more specific question to the subgroup for exploring the phenomenon of interest (e.g. How often do you have a drink containing alcohol in the last 12 months?)

Pilot Study A pilot study was conducted with 1% of the study samples ($n=22$households) for understanding the feasibility~~ of the main study~~. Specifically, the pilot study tested the cultural appropriateness and comprehensiveness of the measurement tools, time for completing an interview and the feasibility of availing required population within the study period. The interview schedule had modified based on the pilot result, and this modified version was used for the main study.

Analysis

The data analysis was performed by SPSS (version 25). For descriptive analysis, we used frequencies, percentage, mean and SD to describe socio-demographic variables and substance use characteristics. The association between sociodemographic variables and substance use characteristics was explored first using fisher's exact test and independent sample *t* test. The significant variables ($p < 0.05$) in these analyses were introduced to multivariate binary logistic regression model. This variable selection procedure has the capability of retaining important confounding variables, resulting potentially in a slightly richer model [25]. We performed three multivariate models, treating the sociodemographic variables as predictors and various substance use (current alcohol use, current smoking and daily betel quid use) as dependent variables. We entered age as a continuous variable in all of the models. All other variables were categorical, which was condensed into binary responses and dummy coded (Table 1). Furthermore, we tested multicollinearity using multiple linear regression, and there was no evidence of this in the model (VIF ≤ 1.03). Furthermore, we analysed the predictive probability of these models, using receiver operating characteristics (ROC) analysis.

Table 1

Operationalization, categorisation and dummy codes for the study variables

Age 'Age' is a variable like gender, tribe status, educational status etc. It should be aligned in the left side with normal font (not in bold letter) and colours as like other variables in the table.	Self-reported age, and treated as continuous variable
Gender	Gender was operationalized as either (a) male or (b) female (Dummy codes: male = 1; female = 0)
Tribe sub-group status	Tribe ethnicity status as shown in appendix 1. For descriptive, we provided the sub-groups details. For the rest of the analysis, we condensed the subgroups into binary category (dummy codes: Paniya = 1; all of the other subgroups = 0)
Educational status	Refers the self-reported educational status. We provided the specific details in descriptive table. For the rest of the analysis, we condensed the educational status as either (a) having no formal education or (b) having any formal education (dummy codes: illiterate = 1; having any formal education = 0)
Employment status	We provided details about the employment in the descriptive table. For the rest of the analysis, we condensed employment status as either (a) working or (b) not working. The first category included those who involved in any amount of paid work or unpaid work (i.e. working own agriculture land). The 'not working' category predominantly included those who do not have paid or unpaid work. However, this category included those who involved in occasional income generation work (e.g. collecting honey, gooseberry, areca nut or bamboo) (dummy codes: working = 1; not working = 0)
Current alcohol use	In accordance with National Drug Use survey, we defined current alcohol use as use of any alcoholic beverages (even once) within preceding 12 months [24] (dummy codes: yes = 1; no = 0)
Current smoking	Oriented on National Drug Use survey, we defined current smoking as use of Beedi/Cigar (even once) within preceding 12 months [24] (dummy codes: yes = 1; no = 0)
Daily betel quid use	Use of betel quid (consists of betel leaf, areca nut and slaked lime with or without tobacco [8]) one or more times in a day (dummy codes: yes = 1; no = 0)

Missing Data Handling

Only completed data for all the variables were included in the analysis. Missing data occurred for some participants (> 100), and the data collection was repeated for them. However, in the final verification check, there were still missing values

for 14 respondents, and they were excluded from the analysis. Thus, our final sample consisted of 2186 tribal households.

Results

Most of the study participants were females (70.5%), Paniya tribe (21.4%) and married (68.3%), and the average age was 40.84 years (SD = 15.29) (Table 2).

Table 2

Sociodemographic profile of the study participants

Variables	*n* (%)/mean (SD)	Variables	*n* (%)/mean (SD)
Gender		Age	40.84 (15.29)
Male	645 (29.5)		
Female	1541 (70.5)		
Tribe group affiliation		Marital status	
Paniya	467 (21.4)	Unmarried	333 (15.2)
Kattunayakar	388 (17.7)	Married	1495 (68.3)
Kuruma	358 (16.4)	Separated	67 (3.0)
Kurichiar	318 (14.5)	Widow/widower	291 (13.3)
Adiya	282 (12.9)		
Oorali	162 (7.4)		
Others	211 (9.7)		
Educational status		Married to:	
No formal education	672 (30.7)	Not applicable (unmarried)	333 (15.2)
Primary	746 (34.1)	Same tribe	942 (43.0)
High school	531 (24.2)	Another tribe	~~942(43.0)~~ 881 (40.3)
Diploma/degree	196 (8.9)	Non-tribe	~~881 (40.3~~)30 (1.3)
Postgraduate or above	41 (1.8)		~~30 (1.3)~~
Years of formal education	5.16 (4.45)		
Family type		Earnings in a month (INR)	INR 2665 (INR 3625.7)

*Mahatma Gandhi National Rural Employment Guarantee Act is an Indian labour law and social security measure that aims to guarantee the ‘right to work’

Variables	*n* (%)/mean (SD)	Variables	*n* (%)/mean (SD)
Nuclear family	1660 (75.9)		
Joint family	472 (21.5)		
Extended family	54 (2.4)		
No of days working in a month	8.44 (9.51)	Type of house	
No of family members in the household	4.32 (2.44)	Kutcha	257 (11.8)
		Pucca	1246 (57.0)
		Semi Pucca	619 (28.3)
		Other type	64 (2.9)
Employment status			
Not working	916 (41.9)		
Working-*MGNREGA	597 (27.3)		
Working-manual labour/daily wage	505 (23.1)		
Working-agriculture related	168 (7.7)		
*Mahatma Gandhi National Rural Employment Guarantee Act is an Indian labour law and social security measure that aims to guarantee the 'right to work'			

Prevalence of Various Substance Use Among Indigenous Tribes

The overall prevalence of current alcohol use among the tribes was 17.2%, and more than 9% were drinking two or more times per week. Alcohol use was highly prevalent in tribal families, and more than 51% of the respondents reported alcohol use in their household. The prevalence of current smoking was 18.8%, and nearly 12% were daily smokers and smoking prevailed in 28% of the tribal households. Daily use of betel quid was prevalent in 47.6% of the survey respondents, and 67.1% in households. Furthermore, cannabis use was prevalent in 3.5% of the households (see Table 3).

Table 3

Substance use characteristics of the respondents and their family

AQ3

Variable	*n* (%)	Variable	*n* (%)

Variable	*n* (%)	Variable	*n* (%)
Do you currently drink alcohol (last 12 months)?		Currently smoking tobacco (12 months)?	
Yes	376 (17.2)	Yes	412 (18.8)
No	1810 (82.8)	No	1774 (81.1)
How often did you have a drink containing alcohol (last 12 months)		Do you smoke daily? Never smoked/not smoked	
Not applicable	1810 (82.8)	in 12 months	1774 (81.1)
Monthly or less	70 (3.2)	Yes, daily smoking	261 (11.9)
Two to four times a month	104 (4.7)	No daily smoking	151 (6.9)
Two or three times a week	168 (7.7)		
Four or more times a week	34 (1.5)		
*Have you taken treatment for alcohol abuse (12 months)?		*No of Beedi/Cigar smoke in a day	
Yes	20(5.3)	1 to 5 a day	195 (74.7)
No	347 (94.7)	6 to 10 a day 11 or above	39 (14.9) 27 (10.3)
Anyone in your household currently drink alcohol (last 12 months)?		Anyone in your household currently smoke Beedi/Cigar	
Yes	1132 (51.7)	Yes	610 (27.9)
No	1054 (48.2)	No	1576 (72.0)
On an average, how many times a day do you use betel quid?		Anyone in your household currently use Cannabis?	
Never used/ no daily use	1145 (52.3)	Yes	
1 or 2 times day	207 (9.5)	No	78 (3.5)
3 to 5 times a day	487 (22.3)		2108 (96.4)

*subgroup analysis

Variable	*n* (%)	Variable	*n* (%)
6 to 9 times a day	267 (12.2)		
10 or more times a day	80 (3.6)		
Anyone in your household using betel quid daily?			
Yes	1468 (67.1)		
No	718 (32.8)		
*subgroup analysis			

The gender, tribe subgroup status, employment status and age were associated with alcohol use, smoking and betel quid chewing. The educational status was associated with smoking and betel quid chewing, while it was not associated with alcohol use (see Table 4).

Table 4

Association of sociodemographic variables and various substance use using cross tabulation and Fisher's exact test

	Yes	No	*P* value (FET)
	n (%)	*n* (%)	
Gender			
Current alcohol use			
Male	290 (45.0)	355(55.0)	0.000
Female	86(5.6)	1455 (94.4)	
Current smoking			
Male	217 (33.6)	428 (66.4)	0.000
Female	195 (12.7)	1346 (87.3)	
Daily betel quid use			
Male	346 (53.6)	299 (46.4)	0.000
Female	695 (45.1)	845 (54.9)	
Tribe subgroup status			
Current alcohol use			
Paniya	356 (76.2)	111 (23.8)	0.000

	Yes	No	*P* value (FET)
	n (%)	*n* (%)	
Other subgroups	265 (15.4)	1454 (84.6)	
Current smoking			
Paniya	104 (22.3)	363 (77.7)	0.038
Other subgroups	308 (17.9)	1411 (82.1)	
Daily betel quid use			
Paniya	351 (75.2)	690 (40.2)	0.000
Other subgroups	116 (24.8)	1029 (58.8)	
Educational status			
Current alcohol use			
No formal education	107 (15.9)	565 (84.1)	0.292
Having formal education	269 (17.8)	1245 (82.2)	
Current smoking			
No formal education	145 (21.6)	527 (78.4)	0.030
Having formal education	267 (17.6)	1247 (82.4)	
Daily betel quid use			
No formal education	457(68.0)	215 (32.0)	0.000
Having formal education	584 (38.6)	930 (61.4)	
Employment status			
Current alcohol use			
Working	281 (22.1)	989 (77.9)	0.000
Not working	95 (10.4)	821 (89.6)	
Current smoking			
Working	290 (22.8)	980 (77.2)	0.000
Not working	122 (13.3)	794 (86.7)	
Daily betel quid use			
Working	628 (49.4)	642 (50.6)	0.016
Not working	413 (39.7)	503 (54.9)	
Age			
	Mean age (SD)		*P* value (*t* test)

	Yes	No	*P* value (FET)
	n (%)	*n* (%)	
Current alcohol use			
Yes	42.81 (13.78)		0.000
No	40.22 (15.52)		
Current smoking			
Yes	43.77 (15.43)		0.000
No	40.16 (15.43)		
Daily betel quid use			
Yes	43.89 (15.66)		0.000
No	38.06 (14.41)		

Sociodemographic Predictors of Alcohol Use, Smoking and Betel Quid Use

In all of the three models, the Omnibus tests of model coefficients were significant and Hosmer and Lemeshow tests were non-significant suggesting that the models fit the data well (see Table 5).

Table 5.

Multivariate logistic regression models for testing the association of sociodemographic variables and various substance uses

	Wald's χ^2	*P* values	Adjusted OR	95% CI
Model 1 Dependent variable: current alcohol use				
Gender (male)	345.00	0.000	13.55	10.29–17.84
Age	19.51	0.000	1.32	1.01–1.02

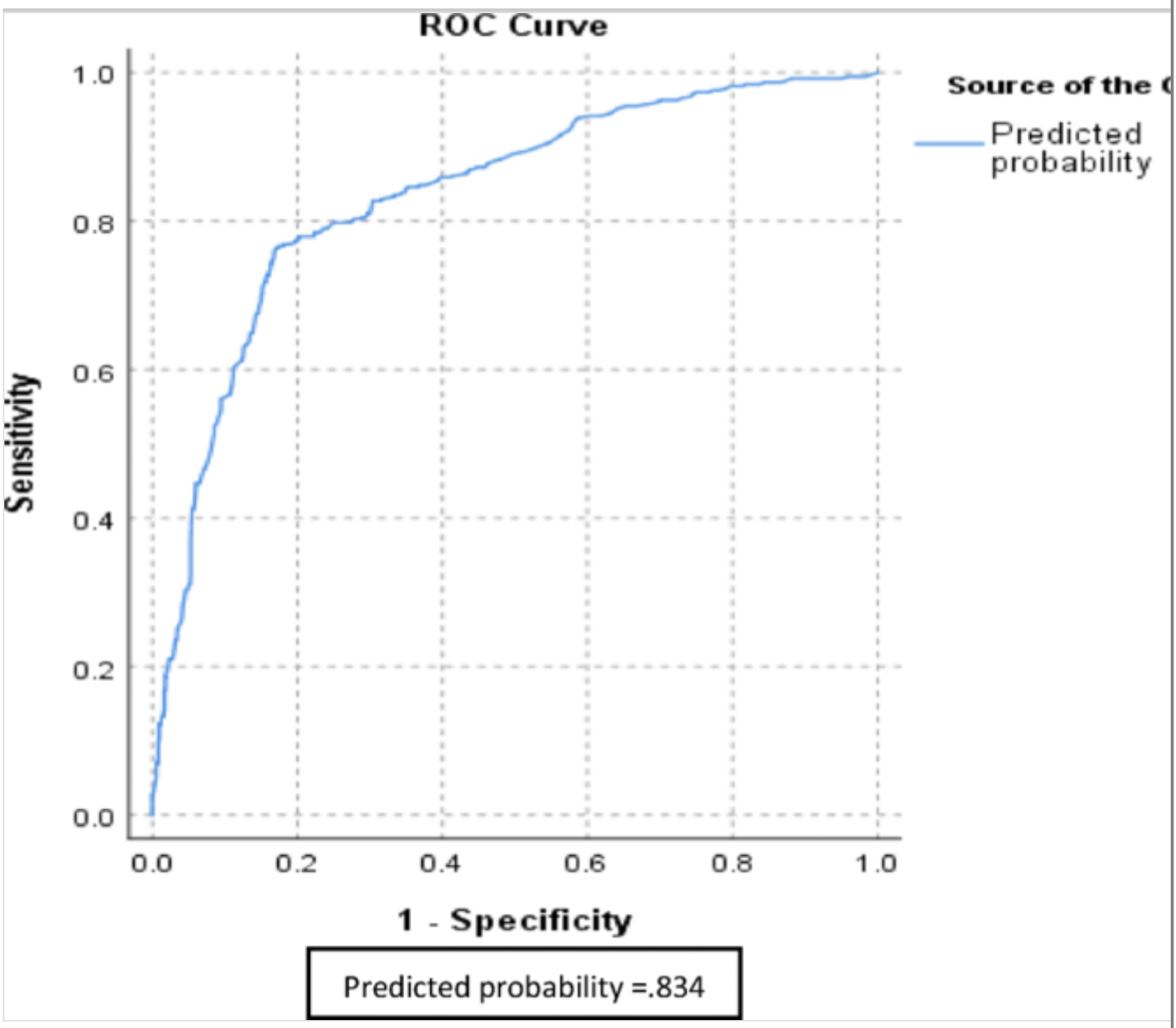
Model 1: Omnibus tests of model coefficients = χ^2 = 520.37; df = 4; P = 0.000; Hosmer and Lemeshow test P = 0.089; Cox and Snell R^2 = 0.212; Nagelkerke R^2 = 0.353
Model 2: Omnibus tests of model coefficients = χ^2 = 169.58; df = 5; P = 0.000; Hosmer and Lemeshow test P = 0.072; Cox and Snell R^2 = 0.075; Nagelkerke R^2 = 0.121
Model 3: Omnibus tests of model coefficients = χ^2 = 409.05; df = 5; P = 0.000; Hosmer and Lemeshow test P = 0.271; Cox and Snell R^2 = 0.171; Nagelkerke R^2 = 0.228

	Wald's χ^2	*P* values	Adjusted OR	95% CI
Tribe (Paniya)	27.66	0.000	2.24	1.66–3.03
Employment (working)	24.85	0.000	2.07	1.55–2.75
Model 2 dependent variable: current smoking				
Gender (male)	108.23	0.000	3.42	2.79–4.32
Age	7.57	0.006	1.01	1.00–1.02
Tribe (Paniya)	6.16	0.042	1.39	1.07–1.81
Employment (working)	21.37	0.000	1.77	1.39–2.26
Educational status (no formal education)	4.44	0.035	1.35	1.02–179
Model 3~~2~~ dependent variable: daily betel quid use				
Gender (male)	22.62	0.000	1.65	1.34–2.04
Age	12.07	0.001	1.03	1.00–1.05
Tribe (Paniya)	179.98	0.000	5.38	4.20–6.88
Employment (working)	5.81	0.044	1.26	1.04–1.53
Educational status (no formal education)	93.60	0.000	3.27	2.57–4.16
Model 1: Omnibus tests of model coefficients = χ^2 = 520.37; df = 4; P = 0.000; Hosmer and Lemeshow test P = 0.089; Cox and Snell R^2 = 0.212; Nagelkerke R^2 = 0.353				
Model 2: Omnibus tests of model coefficients = χ^2 = 169.58; df = 5; P = 0.000; Hosmer and Lemeshow test P = 0.072; Cox and Snell R^2 = 0.075; Nagelkerke R^2 = 0.121				
Model 3: Omnibus tests of model coefficients = χ^2 = 409.05; df = 5; P = 0.000; Hosmer and Lemeshow test P = 0.271; Cox and Snell R^2 = 0.171; Nagelkerke R^2 = 0.228				

Model 1 examined the role of sociodemographic variables on current alcohol use. Educational status was not included in model 1 as this was not associated with alcohol use in FET. Overall, the model explained 35.3~~6~~% (Nagelkere R^2) of variance on alcohol use. Male gender (X^2 = 345.00; P = 0.000; OR = 13.55) increasing age (X^2 = 19.51; P = 0.000; OR = 1.32) Paniya tribe status (X^2 = 27.66; P = 0.000; OR = 2.24) and working status (X^2 = 24.85; P = 0.000; OR = 2.07) ~~together~~ increased the risk for alcohol use. The predictive probability indicated by the area under ROC curve was 83~~4~~.4% (Fig 1).

Fig. 1

Receiver operating characteristics (ROC) curve for the predictors of alcohol use

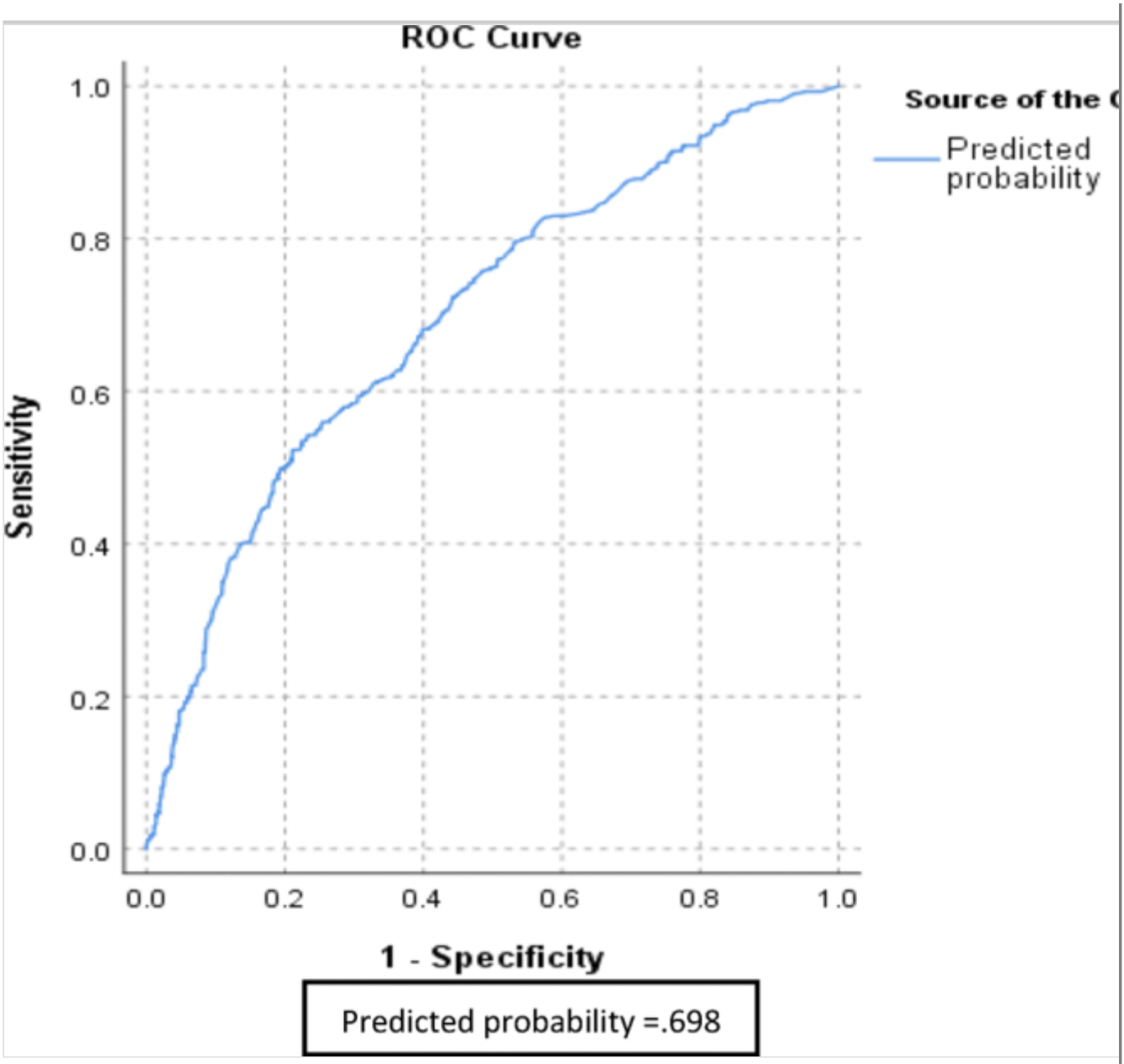


AQ4

Model II examined the role of sociodemographic variables on current smoking. Overall, the model explained 12.1% (Nagelkerke R^2) of variance on current smoking. Male gender (X^2 = 108.23; P = 0.000; OR = 3.42), increasing age (X^2 = 7.57; P = 0.006; OR = 1.01), Paniya tribe status (X^2 = 6.16; P = 0.042; OR = 1.39), working status (X^2 = 21.37; P = 0.000; OR = 1.77) and 'no formal education' (X^2 = 4.44; P = 0.035; OR = 1.35) ~~together~~ increased the risk for smoking. The predictive probability indicated by area under ROC curve was 69.8% (Fig 2).

Fig. 2

ROC curve for the predictors of smoking

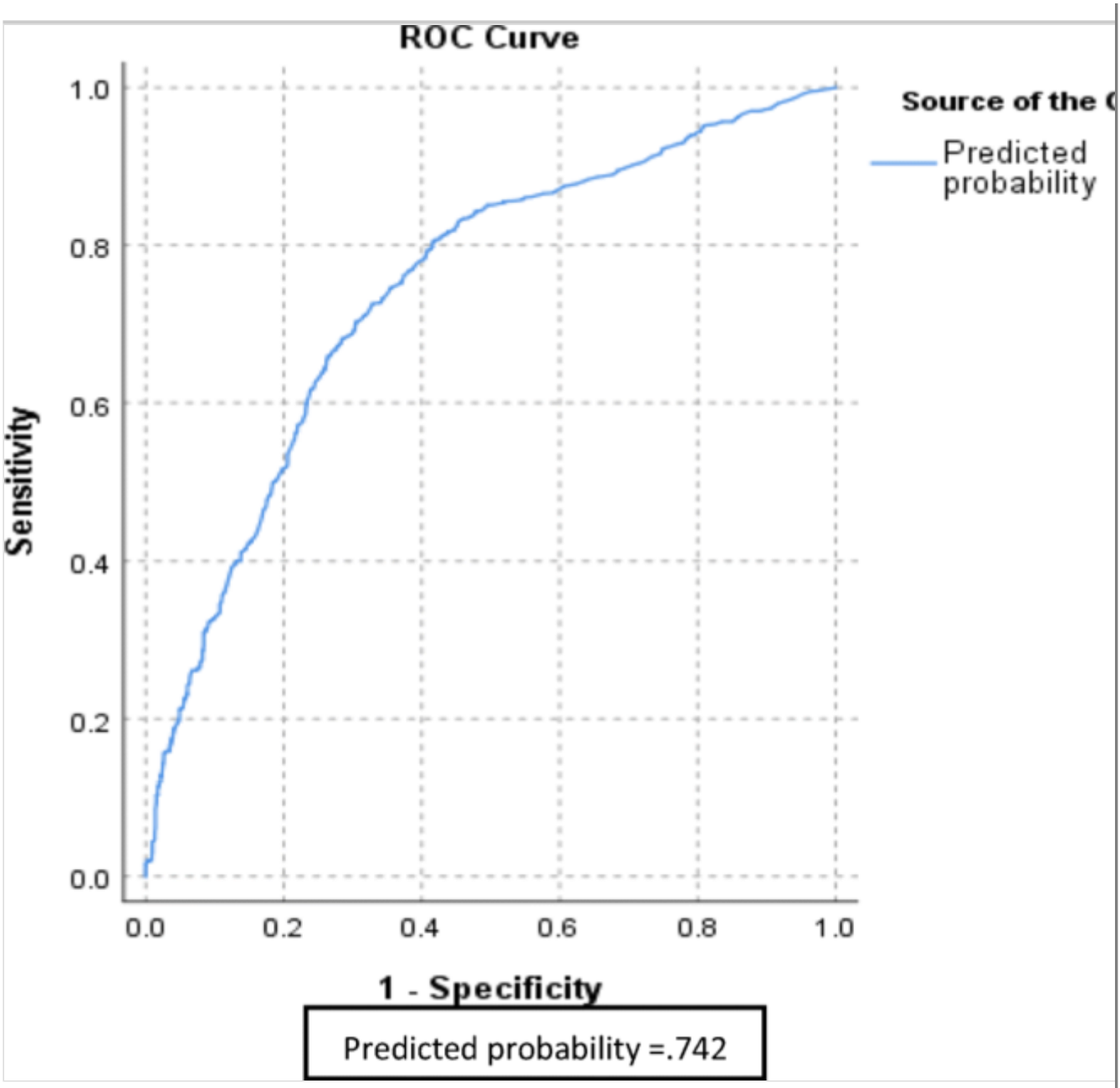


AQ5

Model III examined the role of sociodemographic variables on daily betel quid use. Overall, the model explained 22.8% (Nagelkerke R^2) of variance on daily betel quid use. Male gender ($X^2 = 22.62$; $P = 0.000$; OR = 1.65), increasing age ($X^2 = 12.07$; $P = 0.001$; OR = 1.03), Paniya tribe status ($X^2 = 179.98$; $P = 0.000$; OR = 5.38), working status ($X^2 = 5.81$; $P = 0.044$; OR = 1.26) and 'no formal education'($X^2 = 93.60$; $P = 0.000$; OR = 3.27) ~~together~~ increased the risk for betel quid use. The predictive probability indicated by the area under ROC curve was 74.2% (Fig 3).

Fig. 3

ROC curve for the predictors of betel quid use



AQ6

Discussion

The present study identified relatively high prevalence levels of current alcohol use, current smoking and daily betel quid use i.e. 17.2%, 18.8% and 47.6% respectively. The prevalence of alcohol use is comparable to the findings of a general population survey [26], but is less when compared to the previous findings for indigenous populations, which had estimated a prevalence rate of 27% for alcohol use and 25% for smoking [4]. Nevertheless, the study findings support the argument that indigenous populations have higher substance use [6], and the relatively lower prevalence of alcohol use and smoking are due to the lower representations of the males in our samples. Only 30% of samples were males, while the male and female alcohol use were 45%, and 5.6%, respectively. Interestingly, the national findings for ‘current alcohol use’ are only 27.3 for

males and 1.6 for females. Our findings on prevalence of all the substance use need to be interpreted in view of unequal gender distribution in our sample. The prevalence of current smoking among men was 33.6% compared to females (12.7%), and this figure, again, shows higher prevalence of smoking among tribes, and national population data shows 29.3% among men, and just 2.3% among females [27]. Evidently, smoking tobacco was significantly higher in rural, poorer and uneducated populations compared to urban, wealthier and more educated populations [27]. We found substantially higher use of betel quid that is too even on daily basis, among the tribes. Like other substances, betel quid use was also high among males (53.6%) than females (45.1%), but the proportion of this difference was small, yet significant. To our knowledge, in India, no previous studies have estimated the prevalence specific to betel quid chewing either in tribes or in general population. However, the prevalence of smokeless tobacco, which includes betel quid, is estimated to be an overall 25% [28] and 28.1% in men and 12% in women across studies [27]. The higher prevalence of betel quid use requires more attention, while betel quid even without tobacco is a significant risk factor for oral cancer and pre-cancer [29]. We previously examined the factors contributing to higher prevalence of alcohol and betel quid use among the tribes and had found that these substances often initiated at younger age with influences of parental and home environment, and thus, there was an early dependency on it. Furthermore, significant tribal life events preceded with alcohol and betel quid, and they perceived it as part of their culture and tradition, and it was associated with socioeconomic marginalization, illiteracy, poor awareness and exploitation by the dominant social group [8, 9].

Invariably, male gender, increasing age, Paniya tribe status and employment status being working were associated with alcohol use, smoking and betel quid chewing. In addition, ‘no formal education’ was associated with smoking and betel quid use. Gender differences in substance use are well known, with males having substantially higher alcohol use [26] and smoking [6] evidence through various national surveys from India [26, 30, 31]. Furthermore, prevalence of all types of substance use was high among those with 40 years or above [31], and there was an inverse association between substance use and education, and the prevalence was significantly increased from ‘no education’ to ‘primary education’ [6]. Our findings on sociodemographic predictors are mostly congruent with many of the findings derived from general population surveys. However, a few of the findings like higher substance use among the Paniya tribes, and the association between working status and substance use, needs further explanation and discussion within the tribal context. In general, tribes are marginalized, while the Paniya who previously enslaved by upper castes is extremely marginalized and deprived within the tribal community [15]. They are predominantly landless, less educated, have poor housing and living conditions,

spending significant proportion of their household income on alcohol and tobacco [15], and they suffering disproportionate level of substance abuse [19]. Overall, the association between employment and substance use yielded mixed results [32, 33]; however, contrary to our findings, a review examining the link of these associations concludes that unemployment is a significant risk factor for substance use [34]. Nevertheless, the tribes have different experience in their work settings, and we previously identified wide supply of alcoholic beverages by landlords/employer at workplaces to attract the tribes for work. Furthermore, tribes themselves had perceived the substances would keep them energetic during the work hours [8, 9]. Peer pressure was also contributed to the initiation of the substance use at workplace [9].

One of the strengths of this study is that this was conducted among indigenous tribal populations in Kerala, which are known to be difficult to reach as many of them live in dense forest or remote locations. We consider the methodology of this study innovative and appropriate within this context, especially the selection of the participants through TPs. Using this technique, we were able to ensure adequate representation of the subgroups, which is an advantage over traditional household hold surveys that used wards/panchayats/block panchayats as sampling units, with the consequence of the disproportionate spread of tribal households and tribal subgroups. In India, the National Mental Health Programme (NMHP) primarily visualized for providing minimum mental health care for all, particularly to the most vulnerable and underprivileged sections of the population [35]. However, mental and behavioural disorders still remain a significant issue among the indigenous population in India. The current findings are helpful to understand the prevalence and predictors of various types of substance use, with implications in formulating indigenous specific policies and programmes.

A limitation of the present study is the overrepresentation of females, which is related to the fact that men were away from home, mostly in workplaces at the time of the household survey. During daytime, even not in a typical working day, many tribal men spend time with their peer groups outside home or engage in parttime income generation activities (e.g. collecting honey, gooseberry, areca nut or bamboo), which is also would have led to the overrepresentation of the females in our samples. In addition, we could not use any standardised instruments, while these were not tailored to the population under study, which limited determining substance use disorders.

Conclusion

Substance use is high among indigenous tribes, with males having significantly higher levels of alcohol use, smoking and betel quid chewing than females. Consistently, male gender, increasing age, Paniya tribe status and being in work were associated with alcohol use, smoking and betel quid chewing for the people in the indigenous tribes involved in work facilitated access to substances. Furthermore, having no formal education increased the risk for smoking and betel quid use.

Publisher's Note

Acknowledgements

We thank Social Work students in WMO College, Wayanad and MPhil Psychiatric Social Work trainees at IMHANS, Calicut, for their support to the data collection.

Authors' Contributions

The study was conducted as part of a funded project led by the corresponding author, and who prepared first draft of this manuscript with support from rest of the authors. Initial draft revised substantially, with further inputs from all of the co-authors. All the authors have agreed the final draft for the publication.

Funding

This study was funded by Department of Social Justice, Govt. of Kerala as part of developing a specialized mental health services for the indigenous tribal population in Kerala.

Data Availability

The data of this study is available on request from corresponding author, with permission from the Ethics Committee of IMHANS.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Code Availability The SPSS code is available on request.

Ethics Approval This study has been approved by the ethics committee of Institute of mental health and Neurosciences, and has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

Appendix

Table 6

Distribution of various indigenous tribal groups in Wayanad District

Tribe subgroup	No of colonies	No of households	Population
Paniya	1210	15,876	69,116
Kurichiyar	511	5812	25,266
Kurumar/Mullu Kurumar	397	5139	20,983
Kaattu Nayakan	418	4369	17,051
Adiya	177	2570	11,196
Oorali	174	1700	6472
Thachanadan Muppan	45	390	1646
Wayandan Kadar	35	174	673
Malayarayan	–	43	166
Karimpalan	5	39	145
Ulladan	3	23	94
Total	2975	36,135	152,808
Source: Census of India, 2011			

References

1. Snijder M, Stapinski L, Lees B, Ward J, Conrod P, Mushquash C, et al. Preventing substance use among indigenous adolescents in the USA, Canada, Australia and New Zealand: a systematic review of the literature. Prev Sci. 2020;21(1):65–85. https://doi.org/10.1007/s11121-019-01038-w.

2. Singkorn O, Apidechkul T, Putsa B, Detpetukyon S, Sunsern R, Thutsanti P, Tamornpark R, Upala P, Inta C (2019) Factor associated with alcohol use among Lahu and Akha hill tribe youths, northern Thailand. Substance Abuse Treatment, Prevention, and Policy 14 (1):5. doi:https://doi.org/10.1186/s13011-019-0193-6.

3. Calabria B, Shakeshaft AP, Clifford A, Stone C, Clare PJ, Allan J, et al. Reducing drug and alcohol use and improving well-being for indigenous and non-indigenous Australians using the community reinforcement approach: a

feasibility and acceptability study. Int J Psychol. 2020;55(Suppl 1):88–95. https://doi.org/10.1002/ijop.12603.

4. Subramanian S, Smith GD, Subramanyam M. Indigenous health and socioeconomic status in India. PLoS Med. 2006;3(10):e421.

5. Nasir BF, Toombs MR, Kondalsamy-Chennakesavan S, Kisely S, Gill NS, Black E, et al. Common mental disorders among indigenous people living in regional, remote and metropolitan Australia: a cross-sectional study. BMJ Open. 2018;8(6):e020196.

6. Saikia N, Debbarma B. The socioeconomic correlates of substance use among male adults in Northeast India. Clin Epidemiol Glob Health. 2020;8(1):149–57. https://doi.org/10.1016/j.cegh.2019.06.004.

7. Kumar RK, Tiwari R. A cross sectional study of alcohol consumption among tribal and non-tribal adults of Narayanganj block in Mandla district of Madhya Pradesh, India. Int J Community Med Public Health. 2017;3:791–5.

8. Sadath A, Jose K, Meethal ST, Mathai JK, Venugopal AP, Xavier N. Factors associated with alcohol misuse among indigenous tribal men in Wayanad: a qualitative study. Indian J Psychol Med. 2019;41(6):516–22. https://doi.org/10.4103/IJPSYM.IJPSYM_326_19.

9. Sadath A, Jose K, Jiji K. Factors influencing betel quid chewing among indigenous tribal population in Wayanad, Kerala: a qualitative study. Kerala J Psychiatry. 2019;32(1).
AQ7

10. Mia MN, Hanifi S, Rahman MS, Sultana A, Hoque S, Bhuiya A. Prevalence, pattern and sociodemographic differentials in smokeless tobacco consumption in Bangladesh: evidence from a population-based cross-sectional study in Chakaria. BMJ Open. 2017;7(1):e012765.

11. Shrestha N, Mehata S, Pradhan PMS, Joshi D, Mishra SR. A nationally representative study on socio-demographic and geographic correlates, and trends in tobacco use in Nepal. Sci Rep. 2019;9(1):2682. https://doi.org/10.1038/s41598-019-39635-y.

12. Barik D, Thorat A. Issues of unequal access to public health in India. Front Public Health. 2015;3:245. https://doi.org/10.3389/fpubh.2015.00245.

13. Wilson A, Stearne A, Gray D, Saggers S. The harmful use of alcohol amongst indigenous Australians: Australian Indigenous HealthInfoNet; 2010.

14. Xaxa V. Tribes as indigenous people of India. Econ Polit Wkly. 1999:3589–95.

15. Mohindra K, Narayana D, Harikrishnadas C, Anushreedha S, Haddad S. Paniya voices: a participatory poverty and health assessment among a marginalized south Indian tribal population. BMC Public Health. 2010;10:149. https://doi.org/10.1186/1471-2458-10-149.
AQ8

16. Improving Health Services for Tribal Populations (2012) http://www.worldbank.org/en/news/feature/2012/02/28/improving-health-services-for-tribal-populations. Accessed 23/11/2018.

17. Palliyal S. Assessment of betel quid habits and risk of precancerous Oral lesions among Paniya tribes of Wayanad, India - a cross-sectional study. J Glob Oncol. 2018;4. https://doi.org/10.1200/jgo.18.16700.

18. Eashwar VMA, Umadevi R, Gopalakrishnan S. Alcohol consumption in India- an epidemiological review. J Family Med Prim Care. 2020;9(1):49–55. https://doi.org/10.4103/jfmpc.jfmpc_873_19.

19. Mohindra K, Anushreedha S, Haddad S. Alcohol use and its consequences in South India: views from a marginalised tribal population. Drug Alcohol Depend. 2011;117:70–3. https://doi.org/10.1016/j.drugalcdep.2010.12.021.

20. Sadath A, Uthaman S, Shibu Kumar T. Mental health in tribes: a case report. Indian J Soc Psychiatry. 2018;34(2):187–8. https://doi.org/10.4103/ijsp.ijsp_56_17.

21. Sadath A, Kumar S, Jose K, Ragesh G. Mental health and psychosocial support program for people of tribal origin in Wayanad: Institute of Mental Health and Neurosciences model. Indian J Soc Psychiatry. 2019;35(4):224–6. https://doi.org/10.4103/ijsp.ijsp_104_18.

22. Blasco-Fontecilla H, Jaussent I, Olié E, Béziat S, Guillaume S, Artieda-Urrutia P, Baca-Garcia E, de Leon J, Courtet P (2014) A cross-sectional study of major repeaters: a distinct phenotype of suicidal behavior. Prim Care

Companion CNS Disord 16 (4):https://doi.org/10.4088/PCC.4014m01633. doi:https://doi.org/10.4088/PCC.14m01633.

23. Kurup A (1971) Status of Kerala scheduled tribes: a study based on ethno-demographic data. Economic and Political Weekly:1815–1820.

24. Chandramouli C, General R Census of India 2011.

25. Bursac Z, Gauss CH, Williams DK, Hosmer DW. Purposeful selection of variables in logistic regression. Source Code Biol Med. 2008;3:17. https://doi.org/10.1186/1751-0473-3-17.

26. Ambekar A, Agrawal A, Rao R, Mishra A, Khandelwal S, Chadda R. Magnitude of substance use in India. New Delhi: Ministry of Social Justice and Empowerment, Government of India; 2019.

27. Rani M, Bonu S, Jha P, Nguyen S, Jamjoum L. Tobacco use in India: prevalence and predictors of smoking and chewing in a national cross sectional household survey. Tob Control. 2003;12(4):e4.
AQ9

28. Niaz K, Maqbool F, Khan F, Bahadar H, Ismail Hassan F, Abdollahi M. Smokeless tobacco (paan and gutkha) consumption, prevalence, and contribution to oral cancer. Epidemiol Health. 2017;39:e2017009. https://doi.org/10.4178/epih.e2017009.

29. Song H, Wan Y, Xu Y-Y. Betel quid chewing without tobacco: a meta-analysis of carcinogenic and precarcinogenic effects. Asia Pac J Public Health. 2015;27(2):NP47–57.

30. Murthy P, Manjunatha N, Subodh BN, Chand PK, Benegal V. Substance use and addiction research in India. Indian J Psychiatry. 2010;52(Suppl 1):S189–99. https://doi.org/10.4103/0019-5545.69232.

31. Gururaj G, Varghese M, Benegal V, Rao G, Pathak K, Singh L, et al. National mental health survey of India, 2015–16. Bengaluru: National Institute of Mental Health and Neuro Sciences; 2016.

32. Wu L-T, Schlenger W, Galvin D. The relationship between employment and substance use among students aged 12 to 17. J Adolesc Health. 2003;32(1):5–15.

33. DeSimone J. Illegal drug use and employment. J Labor Econ. 2002;20(4):952–77.

34. Henkel D. Unemployment and substance use: a review of the literature (1990-2010). Curr Drug Abuse Rev. 2011;4(1):4–27.

35. Murthy RS. National mental health programme in India (1982-1989) mid-point appraisal. Indian J Psychiatry. 1989;31(4):267–70.