Prevalence and factors associated with tobacco use among beneficiaries attending the youth mental health promotion clinics (Yuvaspandana Kendra) in India: A case-record analysis

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ABSTRACT

INTRODUCTION Chewing tobacco and smoking among youth leads to poor health outcomes. Understanding the factors associated with chewing tobacco and smoking is thus important for interventions.

METHODS A case-record analysis among 10340 youth (aged 15–35 years) attending a unique mental health promotion program, Yuva Spandana, across the state of Karnataka in southern India, was performed to assess prevalence of chewing tobacco and smoking. Multiple logistic regression was applied to determine the factors associated with their use.

RESULTS Overall, the prevalence of chewing tobacco and smoking among beneficiaries was 3% and 2.1%, respectively. The risk of tobacco chewing and smoking increased with age and risk was higher among males, married individuals and among all occupational categories, other than students. Adjusted odds ratios of chewing tobacco were found to be highest among business/salaried beneficiaries (AOR=3.48; 95% CI: 2.27–5.34), followed by ever married beneficiaries (AOR=3.41; 95% CI: 1.27–9.17). Adjusted odds ratios of smoking tobacco were highest among males (AOR=12.89; 95% CI: 7.5–22.14), followed by emotional experience of feeling worthless (AOR=4.19; 95% CI: 2.78–6.32), beneficiaries with poor relationship with family members (AOR=3.79; 95% CI: 1.38–10.44), and business/salaried beneficiaries (AOR=2.90; 95% CI: 1.79–4.7). Strength of association of males with smoking was much higher (AOR=12.89; 95% CI: 7.5–22.14) than compared with chewing tobacco (AOR=2.49; 95% CI: 1.89–3.28).

CONCLUSIONS Early identification of these factors associated with chewing tobacco and smoking will help in focusing on youth specific health promotion and interventions to improve their overall health and wellbeing.

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INTRODUCTION

Substance use is globally prevalent and remains an intractable public health problem for healthcare systems[1]. Substance use poses a significant threat to the health, and the social and economic aspects of families, communities, and nations[2]. The epidemic of harmful substance use, mainly chewing tobacco and smoking, is increasing at an alarming pace. Nearly 1.3 billion people around the world are tobacco users and 80% of them live in low- and middle-income countries[3].

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Tobacco use kills 8 million people every year[3]. Developing countries like India are no exception. Most smoking-related deaths arise from respiratory diseases (mainly COPD), cancers and cardiovascular diseases[4]. Chewing tobacco increases the risk of cancers of the oral cavity (including cancer of the mouth, tongue, lip and gums), throat, and esophagus, as well as leading to various oro-dental diseases[4]. The recent Indian National Mental Health Survey revealed that the estimate of tobacco use disorder prevalence was very high (20.89%)[5]. Chewing tobacco and smoking impose a significant economic burden on the country. This burden is in the form of health system cost and out-of-pocket expenditure for treatment of morbidities and reduced productivity[6,7]. In 2019, nearly 7.25% (range: 6.35–8.16) of total disability-adjusted life years (DALYs) was attributed to tobacco use in India[8].

Young adults are at an increased risk for behaviors such as smoking, excessive alcohol drinking, drug use, risky sexual behaviours, and unhealthy diets etc., which can lead to poor health outcomes[9]. Circumstances such as familial or social tensions like family conflicts, nuclear families, neglect, abuse, educational and academic stress, peer pressure etc., that can occur during vulnerable ages, can lead to an increased tendency towards substance use such as smoking and chewing tobacco[10]. In 2019, there were about 1.2 billion young people aged 15–24 years in the world (16% of the global population)[11]. India has its largest (27.5%) ever adolescent and youth population (aged 15–29 years)[12]. The prevalence of tobacco use among those aged ≥15 years was 28.6% (267 million adults)[13].

The young adults make up nearly 34% of the population in the state of Karnataka[14,15]. The prevalence of tobacco use reported in Karnataka (2019–2020) was as high as 27.1% among males aged ≥15 years[16]. Notably, the prevalence among young females has also increased. The changing trend reflects an increase in the prevalence of tobacco use from 4.2% to 8.5% among women (aged ≥15 years) in the last few years[16,17].

Tobacco use at young age increases the risk of dependence on a range of nicotine containing products as well as the use alcohol and other illicit substances[18,19]. It further exposes young adults to associated mental and behavioral problems[20] like emotional disturbances, depression, mood disorders, anxiety disorders and psychosis etc.

Health and social problems associated with the use and dependence on tobacco and other illicit substances can be prevented by greater awareness among young individuals regarding behavioral modification, withdrawal clinics, and medications etc. Community level approaches such as mass media anti-tobacco advertisements, declining social acceptability of smoking or chewing tobacco, anti-tobacco campaigns, and restricted access of minors to tobacco products, can be effective strategies and public health actions[21]. Current knowledge of tobacco use prevalence and associated factors are far from complete. Moreover, the exact dimensions among young adults have not been understood adequately. This necessitates the understanding of prevalence and associated risk factors for tobacco use among young adults.

Yuva Spandana is a unique community-based mental health promotion program specifically designed to provide integrated behavioral, mental, and psychological support services for young adults through guidance centers named Yuva Spandana Kendra (YSK)[22]. The program has beneficiaries across all the districts of the state Karnataka. The present study aim was to estimate the prevalence of chewing tobacco and smoking, and to assess the association of chewing tobacco and smoking with sociodemographic, behavioral characteristics and personal issues such as health and lifestyles, personality, and emotional experiences, among the beneficiaries attending the YSKs across Karnataka. Understanding the prevalence and associated health and lifestyle issues related to tobacco use among beneficiaries attending the YSKs will provide useful insights to inform more targeted evidence-based health policies as well as interventions for young adults across the state as well as the country.

METHODS

This cross-sectional case-record analysis was conducted on data records of all beneficiaries attending the YSKs between 2017 and 2020, across Karnataka. The data records were sourced from the computerized management information system (CMIS) specifically developed for the Yuva Spandana program. A total of 10340 beneficiaries aged 15–35

years who attended the YSKs, completed both a registration and first-visit form, and were considered as 'eligible records' for the study. The conceptual framework is given in the Supplementary file.

Registration details included sociodemographic details (age, gender, visit date, district, locality, state, education level, marital status, occupation, place of occupation/educational institution) and personal habits such as chewing tobacco, smoking, alcohol, and drug use. The first-visit details included issues reported by beneficiaries with regard to: health and life style; self-development; education and academic; relationships; safety; suicidality; gender, sex and sexuality; and relationship status with family, friends and neighbors. In addition, the first-visit form had a set of 18 closed-ended 'yes/no' questions related to the beneficiary's experience of different emotions or feelings, such as feeling depressed, anxious, lonely, tired, or helpless, excessively worried, a loss of interest in work, unable to make decisions and forgetfulness, as well as concentration-related problems, suicidal ideation, and guilt. These details of the registration and first-visit forms were considered potential exposures for the study. Information related to self-reported use of chewing tobacco and smoking was considered separately as outcomes.

Statistical analysis

Univariate and multivariate logistic regression analyses were performed with each of the dependent variables namely chewing tobacco and smoking separately as outcome variables. All hypothesized exposure variables that were significantly associated with the outcome at 10% level ($p<0.10$) in univariate analysis were considered eligible to be included in the multivariate model. These variables were included in the multivariable model sequentially using a forward stepping process[23]. Variables that were significant at the 5% level ($p<0.05$) and those which changed the odds ratio of at least one exposure variable by 10% were retained in the final model. The significance of addition of each exposure variable in the model was tested using a likelihood ratio test with appropriate degrees of freedom. This was done by comparing the nested model with the previous model. Goodness-of-fit for the final model was tested using the *estat gof* command followed by fitting area under the curve using the *lroc* command. All the analyses were performed using STATA 12.0 software for Windows.

RESULTS

A total of 10340 young adults visited YSKs across Karnataka during the study period (Table 1). Among them, the overall prevalence of chewing tobacco and smoking was 3% and 2.1%, respectively. Majority were: aged 15–19 years (54.3%), male (55.7%), unmarried (90.2%), predominantly from rural areas (67.5%) of Karnataka, and students (71%).

Similar distribution of sociodemographic characteristics were found to be associated with chewing tobacco and smoking. All sociodemographic variables were significantly associated ($p<0.05$) with chewing tobacco, except for primary level of education. The association of smoking was found to be significant ($p<0.05$) for all sociodemographic variables, except among categories of occupation, education level, place of residence, and marital status (Table 1).

Issues related to sleep, physical illness, concentration/memory, exam-anxiety, education stress, relationship with parents, marital relationship, gender-based violence, and emotional issues like feeling lonely and worthless, were found to be significantly associated with both chewing tobacco and smoking. Further, chewing tobacco was significantly associated with participants reporting gender discrimination, decision making, unable to trust anyone, and feeling guilty. Similarly significant associations were found between smoking and personal issues like psychological health, low self-esteem, relationship issues, suicidality and emotional states like feeling like running away, angry with people around, feeling guilty and worthless, in the univariate analysis (Table 2).

Age, gender, locality and marital status were found to be significantly associated with both chewing tobacco and smoking. Personal issues such as education stress, relationship with relatives, emotional experiences like decision making, trust issues and feeling worthless were also found to be associated with chewing tobacco. Increase in age increased the odds of both outcomes. The age group of 25–29 years had 1.76-fold higher odds of chewing tobacco (95% CI: 1.21–2.56) whereas smoking odds increased by 1.5-fold (95% CI: 1.01–2.49). Males had higher odds of chewing tobacco

(AOR=2.49; 95% CI: 1.89–3.28) and smoking tobacco (AOR=12.89; 95% CI: 7.5–22.14) compared to females. Rural beneficiaries had 2.86 (95% CI: 2.06–3.95) times higher risk of chewing tobacco while for smoking rural beneficiaries had 31% reduced odds compared to their urban counterparts (AOR=0.69; 95% CI: 0.51–0.92). Compared to unmarried, the married individuals had higher odds of chewing tobacco (AOR=1.64; 95% CI: 1.14–2.38) as well as smoking (AOR=1.72; 95% CI: 1.1–2.69). Business/salaried category had 3-fold increased risk of chewing tobacco (AOR=3.48; 95% CI: 2.27–5.34) and smoking (AOR=2.90; 95% CI: 1.79–4.7). Emotional experience of feeling worthless increased the risk of chewing tobacco by almost 2-fold (AOR=1.73; 95% CI: 1.03–2.89) and smoking tobacco by 4-fold (AOR=4.19; 95% CI: 2.78–6.32). Goodness-of-fit analysis for chewing tobacco and smoking tobacco for the final multivariate model revealed a chi-squared p = 0.0789 and 0.2367, respectively, with respective area under the curve of 0.7691 and 0.8371 (Table 3).

Table 1. Sociodemographic and behavioral characteristics of beneficiaries attending YSKs in Karnataka, 2017–2020 (N=10340)

Characteristics	Chewing tobacco			Smoking			
	Yes	No	p*	Yes	No	p*	Total
	n (%)	n (%)		n (%)	n (%)		n (%)
Age (years)							
15–19	93 (29.9)	5518 (55.0)		67 (30.2)	5544 (54.8)		5611 (54.3)
20–24	87 (28.0)	2593 (25.9)	<0.001	70 (31.5)	2610 (25.8)	<0.001	2680 (25.9)
25–29	71 (22.8)	1170 (11.7)	<0.001	48 (21.6)	1193 (11.8)	<0.001	1241 (12.0)
30–35	60 (19.3)	748 (7.5)	<0.001	37 (16.7)	771 (7.6)	<0.001	808 (7.8)
Gender							
Female	76 (24.4)	4503 (44.9)		15 (6.8)	4564 (45.1)		4579 (44.3)
Male	235 (75.6)	5526 (55.1)	<0.001	207 (93.2)	5554 (54.9)	<0.001	5761 (55.7)
Occupation							
Student	136 (43.7)	7210 (71.9)		102 (45.9)	7244 (71.6)		7346 (71.0)
Unemployed	67 (21.5)	1803 (18.0)	<0.001	49 (22.1)	1821 (18.0)	<0.001	1870 (18.1)
Business/salaried	49 (15.8)	394 (3.9)	<0.001	40 (18.0)	403 (4.0)	<0.001	443 (4.3)
Other	59 (19.0)	622 (6.2)	<0.001	31 (14.0)	650 (6.4)	<0.001	681 (6.6)
Marital status							
Unmarried	226 (72.7)	9105 (90.8)		170 (76.6)	9161 (90.5)		9331 (90.2)
Married	80 (25.7)	881 (8.8)	<0.001	50 (22.5)	911 (9.0)	<0.001	961 (9.3)
Other	5 (1.6)	43 (0.4)	0.001	2 (0.9)	46 (0.5)	0.241	48 (0.5)
Education level							
Illiterate/less than primary	21 (6.8)	254 (2.5)		15 (6.8)	260 (2.6)		275 (2.7)
Primary/less than middle	26 (8.4)	468 (4.7)	0.19	18 (8.1)	476 (4.7)	0.238	494 (4.8)
Middle/less than secondary	50 (16.1)	1650 (16.5)	<0.001	28 (12.6)	1672 (16.5)	<0.001	1700 (16.4)
High school and above	214 (68.8)	7657 (76.3)	<0.001	161 (72.5)	7710 (76.2)	<0.001	7871 (76.1)
Residence							
Urban	45 (14.5)	3317 (33.1)		84 (37.8)	3278 (32.4)		3362 (32.5)
Rural	266 (85.5)	6712 (66.9)	<0.001	138 (62.2)	6840 (67.6)	0.088	6978 (67.5)
Total	311 (3.0)	10029 (97.0)		222 (2.1)	10118 (97.8)		10340 (100)

*p<0.05, chi-squared test for significance of association for categorical variables.

Table 2. Personal issues of beneficiaries attending YSKs in Karnataka, 2017–2020 (N=10340)

Personal issues	Chewing tobacco			Smoking			
	Yes	No	p*	Yes	No	p*	Total
	n (%)	n (%)		n (%)	n (%)		n (%)
Health and lifestyle issues							
Sleep issues	58 (18.6)	1308 (13.0)	0.004	52 (23.4)	1314 (13.0)	<0.001	1366 (13.2)
Physical illness	38 (12.2)	810 (8.1)	0.009	28 (12.6)	820 (8.1)	0.016	848 (8.2)
Psychological health	25 (8.0)	696 (6.9)	0.454	29 (13.1)	692 (6.8)	<0.001	721 (7.0)
Personality issues							
Low self-awareness	59 (19.0)	1787 (17.8)	0.601	42 (18.9)	1804 (17.8)	0.675	1846 (17.9)
Low self-esteem	41 (13.2)	984 (9.8)	0.051	31 (14.0)	994 (9.8)	0.042	1025 (9.9)
Emotional issues	34 (10.9)	979 (9.8)	0.494	31 (14.0)	982 (9.7)	0.036	1013 (9.8)
Lack of skills to handle negative emotions	8 (2.6)	309 (3.1)	0.609	10 (4.5)	307 (3.0)	0.212	317 (3.1)
Education and academic issues							
Goal setting	98 (31.5)	3373 (33.6)	0.435	67 (30.2)	3404 (33.6)	0.28	3471 (33.6)
Concentration/memory	80 (25.7)	3410 (34)	0.003	55 (24.8)	3435 (33.9)	0.005	3490 (33.8)
Time-management	77 (24.8)	2192 (21.9)	0.224	44 (19.8)	2225 (22.0)	0.44	2269 (21.9)
Exam-anxiety	28 (9.0)	1388 (13.8)	0.016	13 (5.9)	1403 (13.9)	0.001	1416 (13.7)
Education stress/fear of failure	22 (7.1)	1693 (16.9)	<0.001	17 (7.7)	1698 (16.8)	<0.001	1715 (16.6)
Bullying/ragging/fear	2 (0.6)	207 (2.1)	0.098	2 (0.9)	207 (2.0)	0.244	209 (2.0)
Relationship issues							
Relationship with parents	46 (14.8)	973 (9.7)	0.003	39 (17.6)	980 (9.7)	<0.001	1019 (9.9)
Inter-generation issues	12 (3.9)	274 (2.7)	0.235	11 (5.0)	275 (2.7)	0.048	286 (2.8)
Marital/romantic relationship	17 (5.5)	267 (2.7)	0.004	16 (7.2)	268 (2.6)	<0.001	284 (2.7)
Peer relationship	8 (2.6)	172 (1.7)	0.258	11 (5.0)	169 (1.7)	<0.001	180 (1.7)
Virtual relationship	2 (0.6)	59 (0.6)	0.901	4 (1.8)	57 (0.6)	0.024	61 (0.6)
Communication issues	3 (1.0)	204 (2.0)	0.195	5 (2.3)	202 (2.0)	0.788	207 (2.0)
Suicidality							
Suicidal ideation/attempts	14 (4.5)	293 (2.9)	0.109	14 (6.3)	293 (2.9)	0.004	307 (3.0)
Family member attempting suicide	15 (4.8)	445 (4.4)	0.745	16 (7.2)	444 (4.4)	0.046	460 (4.4)
Friend attempting suicide	17 (5.5)	480 (4.8)	0.581	20 (9.0)	477 (4.7)	0.004	497 (4.8)
Gender, sex and sexuality							
Gender discrimination issue	6 (1.9)	70 (0.7)	0.017	8 (3.6)	68 (0.7)	<0.001	76 (0.7)
Gender-based violence	4 (1.3)	73 (0.7)	0.266	7 (3.2)	70 (0.7)	<0.001	77 (0.7)
Relationship with family members							
Good	289 (92.9)	9471 (94.4)		189 (85.1)	9571 (94.6)		9760 (94.4)
Average	17 (5.5)	505 (5.0)	0.699	26 (11.7)	496 (4.9)	<0.001	522 (5.0)
Not good	5 (1.6)	53 (0.5)	0.017	7 (3.2)	51 (0.5)	<0.001	58 (0.6)
Relationship with relatives							
Good	270 (86.8)	9106 (90.8)		183 (82.4)	9193 (90.9)		9376 (90.7)
Average	37 (11.9)	858 (8.6)	0.036	34 (15.3)	861 (8.5)	<0.001	895 (8.7)
Not good	4 (1.3)	65 (0.6)	0.159	5 (2.3)	64 (0.6)	0.004	69 (0.7)

Continued

Table 2. Continued

Personal issues	Chewing tobacco			Smoking			
	Yes	No	p*	Yes	No	p*	Total
	n (%)	n (%)		n (%)	n (%)		n (%)
Relationship with friends							
Good	285 (91.6)	9309 (92.8)		198 (89.2)	9396 (92.9)		9594 (92.8)
Average	24 (7.7)	681 (6.8)	0.515	20 (9.0)	685 (6.8)	0.171	705 (6.8)
Not good	2 (0.6)	39 (0.4)	0.478	4 (1.8)	37 (0.4)	0.002	41 (0.4)
Relationship with neighbors							
Good	258 (83.0)	8807 (87.8)		167 (75.2)	8898 (87.9)		9065 (87.7)
Average	50 (16.1)	1096 (10.9)	0.005	49 (22.1)	1097 (10.8)	<0.001	1146 (11.1)
Not good	3 (1.0)	126 (1.3)	0.724	6 (2.7)	123 (1.2)	0.025	129 (1.2)
Emotional experiences							
Feel anxious	62 (19.9)	2167 (21.6)	0.48	82 (36.9)	2147 (21.2)	<0.001	2229 (21.6)
Feel depressed	25 (8.0)	742 (7.4)	0.672	29 (13.1)	738 (7.3)	0.001	767 (7.4)
Not interested in doing any work	18 (5.8)	808 (8.1)	0.148	26 (11.7)	800 (7.9)	0.04	826 (8.0)
Feel tired or helpless	18 (5.8)	881 (8.8)	0.067	25 (11.3)	874 (8.6)	0.171	899 (8.7)
Worry about problems	20 (6.4)	796 (7.9)	0.333	20 (9.0)	796 (7.9)	0.533	816 (7.9)
Feel like lost everything in life	10 (3.2)	426 (4.2)	0.374	13 (5.9)	423 (4.2)	0.222	436 (4.2)
Incapable to make decisions	13 (4.2)	893 (8.9)	0.005	26 (11.7)	880 (8.7)	0.118	906 (8.8)
Feel lonely	27 (8.7)	598 (6.0)	0.049	49 (22.1)	576 (5.7)	<0.001	625 (6.0)
Unable to trust anyone	15 (4.8)	277 (2.8)	0.033	10 (4.5)	282 (2.8)	0.13	292 (2.8)
Forgetfulness	9 (2.9)	327 (3.3)	0.72	12 (5.4)	324 (3.2)	0.7	336 (3.2)
Difficulty in concentrating	12 (3.9)	338 (3.4)	0.639	13 (5.9)	337 (3.3)	0.42	350 (3.4)
Feel like running away	9 (2.9)	173 (1.7)	0.127	14 (6.3)	168 (1.7)	<0.001	182 (1.8)
Feel like committing suicide	5 (1.6)	118 (1.2)	0.492	8 (3.6)	115 (1.1)	0.002	123 (1.2)
Feels like it would have been good if I had died	4 (1.3)	116 (1.2)	0.834	6 (2.7)	114 (1.1)	0.036	120 (1.2)
Angry with people around	10 (3.2)	394 (3.9)	0.523	18 (8.1)	386 (3.8)	0.001	404 (3.9)
Failed in managing responsibility	9 (2.9)	293 (2.9)	0.977	9 (4.1)	293 (2.9)	0.313	302 (2.9)
Feel guilty	5 (1.6)	476 (4.7)	0.014	20 (9.0)	461 (4.6)	0.002	481 (4.7)
Feel worthless	20 (6.4)	363 (3.6)	0.011	37 (16.7)	346 (3.4)	<0.001	383 (3.7)

*p<0.05, chi-squared test for significance of association for categorical variables.

Table 3. Multiple logistic regression analysis for factors associated with chewing tobacco and smoking among beneficiaries attending YSKs in Karnataka, 2017–2020 (N=10340)

Variables	Chewing tobacco				Smoking			
	OR (95% CI)	p*	AOR (95% CI)	p**	OR (95% CI)	p*	AOR (95% CI)	p**
Age (years)								
15–19 (Ref.)	1		1		1		1	
20–24	1.99 (1.48–2.67)	<0.001	1.59 (1.16–2.18)	0.004	2.21 (1.58–3.11)	<0.001	1.77 (1.23–2.54)	0.002
25–29	3.6 (2.62–4.93)	<0.001	1.76 (1.21–2.56)	0.003	3.32 (2.28–4.84)	<0.001	1.59 (1.01–2.49)	0.044
30–35	4.75 (3.4–6.64)	<0.001	1.74 (1.13–2.67)	0.013	3.97 (2.63–5.97)	<0.001	1.33 (0.78–2.26)	0.297

Continued

Table 3. Continued

Variables	Chewing tobacco				Smoking			
	OR (95% CI)	p*	AOR (95% CI)	p**	OR (95% CI)	p*	AOR (95% CI)	p**
Gender								
Female (Ref.)	1		1		1		1	
Male	2.51 (1.93–3.27)	<0.001	2.49 (1.89–3.28)	<0.001	11.34 (6.7–19.18)	<0.001	12.89 (7.5–22.14)	<0.001
Occupation								
Student (Ref.)	1		1		1		1	
Unemployed	1.97 (1.46–2.65)	<0.001	1.34 (0.96–1.88)	0.086	191 (1.35–2.69)	<0.001	1.41 (0.95–2.1)	0.086
Business/salaried	6.59 (4.68–9.28)	<0.001	3.48 (2.27–5.34)	<0.001	7.04 (4.82–10.29)	<0.001	2.90 (1.79–4.7)	<0.001
Other	5.02 (3.66–6.89)	<0.001	2.69 (1.75–4.13)	<0.001	3.38 (2.24–5.10)	<0.001	2.10 (1.22–3.62)	0.007
Marital status								
Unmarried (Ref.)	1		1		1		1	
Married	3.65 (2.8–4.76)	<0.001	1.64 (1.14–2.38)	0.008	2.95 (2.14–4.08)	<0.001	1.72 (1.1–2.69)	0.018
Other	4.68 (1.83–11.93)	0.001	3.41 (1.27–9.17)	0.015	2.34 (0.56–9.73)	0.241	3.14 (0.71–13.88)	0.132
Locality								
Urban (Ref.)	1		1		1		1	
Rural	2.92 (2.12–4.01)	<0.001	2.86 (2.06–3.95)	<0.001	0.78 (0.59–1.03)	0.088	0.69 (0.51–0.92)	0.011
Health and lifestyle								
Sleep issues			-	NA	2.04 (1.49–2.81)	<0.001	1.70 (1.21–2.39)	0.002
Education and academic issues								
Education stress/ fear of failure	0.37 (0.24–0.58)	<0.001	0.51 (0.33–0.8)	0.003			-	NA
Exam-anxiety			-	NA	0.38 (0.22–0.67)	0.001	0.43 (0.24–0.77)	0.005
Relationship with relatives								
Good (Ref.)	1		1				-	NA
Average	1.45 (1.02–2.06)	0.036	1.50 (1.04–2.17)	0.03			-	NA
Not good	2.07 (0.75–5.73)	0.159	2.19 (0.75–6.37)	0.151			-	NA
Relationship with family members								
Good (Ref.)			-	NA	1		1	
Average			-	NA	2.65 (1.74–4.03)	<0.001	1.60 (0.96–2.67)	0.072
Not good			-	NA	6.95 (3.11–15.51)	<0.001	3.79 (1.38–10.44)	0.01
Relationship with neighbors								
Good (Ref.)			-	NA	1		1	
Average			-	NA	2.37 (1.72–3.29)	<0.001	1.76 (1.19–2.6)	0.005
Not good			-	NA	2.59 (1.12–5.98)	0.025	1.54 (0.56–4.22)	0.404
Emotional experiences								
Incapable to make decisions	0.44 (0.25–0.78)	0.005	0.30 (0.16–0.56)	<0.001			-	NA
Unable to trust anyone	1.78 (1.04–3.03)	0.033	2.00 (1.09–3.68)	0.025			-	NA
Feel worthless	1.83 (1.14–2.91)	0.011	1.73 (1.03–2.89)	0.037	5.64 (3.9–8.16)	<0.001	4.19 (2.78–6.32)	<0.001

AOR: adjusted odds ratio. *p<0.10, **p-value <0.05, for significance of association. Certain cells are left blank since the corresponding variable did not qualify to be included in the final multivariate model. Goodness-of-fit for chewing tobacco and smoking tobacco (area under the curve) = 0.7691 and 0.8371; Hosmer-Lemeshow χ^2= 14.11 and 10.42; p= 0.0789 and 0.2367, respectively. NA: not applicable.

DISCUSSION

This cross-sectional case-record analysis across all 30 districts of the state of Karnataka revealed that the prevalence of chewing tobacco and smoking among beneficiaries was 3% and 2.1%, respectively. Increasing age, being male, being married and occupational categories other than student, were associated with increased risk of chewing and smoking tobacco. Beneficiaries from rural areas, beneficiaries who had relationship issues with relatives, and who were unable to trust anyone, had an increased risk of chewing tobacco. Interestingly, beneficiaries who had education stress and fear of failure and those who reported being incapable of making decisions were associated with lower risk of chewing tobacco. Beneficiaries from urban areas, who had relationship issues with family and neighbors, were associated with increased risk of smoking. Another interesting finding was that beneficiaries who reported exam-anxiety had reduced risk of smoking. The odds of chewing tobacco were found to be highest with ever married and business/salaried beneficiaries (about 3.5 times compared to never married and to students, respectively). Odds of smoking tobacco were very high among males (12.9 times) followed by the emotional experience of feeling worthless (about 4 times), beneficiaries who reported having poor relationship with family members (3.8 times), and business/salaried beneficiaries (about 3 times). The strength of association of males with smoking was higher compared to those who reported chewing tobacco (about 2.5 times).

Our estimates of prevalence of chewing tobacco and smoking in Karnataka were much lower when compared to prevalence reported by some community surveys[16,24]. Setting-based sample and difference in the age composition of subjects (15–35 years vs ≥15 years) might be the reason this. Our data are from case records of a youth mental health promotion program with nearly half of the beneficiaries being ≤19 years (legal age for tobacco products use is ≥18 years in India)[25], this might have contributed to the observed lower prevalence estimates. Additionally, social desirability associated with self-reporting might have influenced this observation[26,27]. We report chewing tobacco and smoking to be higher in males compared to females, similar to Indian and global statistics[28,29]. The reasons might be the usual false perceptions that a smoking man: is 'successful, intelligent and macho', 'risk-taking', and has 'strong masculinity', and that chewing tobacco leads to 'better athletic performance' and 'rule-breaking risks'[30]; in contrast to females who are perceived as culturally unacceptable in Indian societies if they smoke or chew tobacco[31].

Several studies show that increasing age amongst youth is known to increase the odds of chewing tobacco and smoking, as seen in our study[24,28]. Compared to the younger age group (15–19 years), beneficiaries aged ≥20 years had higher odds of chewing tobacco as well as smoking. This could be due to the fact that the youngest legal target age group is targeted for promotion by tobacco marketing companies[32-34]. During transition from adolescent to young adulthood, this age group also faces major changes in life in terms of education and lifestyle, making them vulnerable to initiation of tobacco use[33]. Interestingly, disparities lie between the type of tobacco use in rural and urban settings[35]. We found rural beneficiaries had nearly three times higher odds of chewing tobacco and 31% reduced odds of smoking. This pattern is in contrast to that of a large community survey[13], where both chewing tobacco and smoking were reported to be higher in rural areas[13]. A possible explanation might be that societal controls within rural communities are stronger compared to urban communities, the possible stricter enforcement of the tobacco control Act in rural areas, or the prevalence simply did decrease. However, this disparity needs to be further explored. The odds of chewing tobacco and smoking varied in occupational groups. Business/salaried individuals were highly associated with both chewing tobacco and smoking. Workplace being a social setting where people spend a large part of the day together, may influence their health beliefs and behaviors[36]. Furthermore, economic empowerment and affordability among this group of beneficiaries are known to have a positive association with tobacco use[37]. Both chewing tobacco and smoking were highly associated with ever married beneficiaries. The spousal relationship is also reported to influence tobacco use behavior. Having a partner who smokes can influence the spouse's initiation of smoking, or relapse to smoking after a previous quit attempt;

similarly, other studies have also reported higher odds of chewing tobacco if one of the partners is a tobacco user[38-40]. Sleep issues were associated with an increased risk of smoking in our study, in line with other studies[41]. However, sleep issues and smoking are complex associations. Smoking tobacco components like nicotine are known to increase sleep disorders, but *vice versa* is also true[42]. Association between smoking tobacco and difficulties in sleep initiation, and difficulties staying asleep[43], are largely attributed to the effects of nicotine present in all tobacco products, which stimulates the release of neurotransmitters namely acetylcholine, dopamine, serotonin, and glutamate, which influences the sleep-wake cycle[44].

Exam stress and anxiety are part of overall anxiety, which is positively related to tobacco use[45]. Interestingly, we found exam stress and anxiety had an inverse relation with tobacco chewing and smoking, respectively. It could possibly relate to the non-availability or non-accessibility of tobacco products near educational premises[25]. Additionally, the legal age for tobacco product buying and using is >18 years in India, and nearly 50% of beneficiaries in our study belonged to the legally prohibited age group for tobacco product use. This would have limited the beneficiaries to buy or consume such products[25].

We recommend understanding the heterogeneity observed in our findings of relationship status with family, neighbors, and relatives, which needs further exploration. Emotional experiences such as feeling worthless was positively associated with increased risk of chewing tobacco and smoking. Few studies have looked into similar associations. These studies look at feeling worthless as a component of psychological distress such as depression and generalized anxiety[46]. Further, more details regarding frequency, duration and severity of such emotions would provide more insight into understanding this association, which was not available with the current data. Suicidality and gender-based violence are known to increase psychological distress. Such issues have consistent associations with increased risk of tobacco use[47]. However, these were not significantly associated in our findings. Such associations might be influenced by age, gender, and other factors like emotional experiences, and can further manifest in the later part of life. However, these need to be further investigated.

Strengths and limitations

The current study is a case-record analysis of clinic-based data, and despite its limitations on generalizability, it has considerable scope for generalizability due to its large sample and large geographical coverage across the 30 districts of Karnataka. This is a major strength of our study. Although data collected is for programmatic purposes, data collection utilizing a structured format and management through a standardized CMIS with specific quality assurance components[48] ensures the overall quality of the data utilized in this study. The many variables included in the contextual framework to assess possible associations for evidence, is another strength of this study. Some unique and rarely explored behavioral and emotional variables included in this study provide scope for in-depth insight to better understand the factors associated with chewing tobacco and smoking among young adults.

There are certain limitations that need to be mentioned. First, the cross-sectional design of the study cannot demonstrate temporality of chewing tobacco and smoking to associated factors. Duration and date of initiation would provide a hint of temporality. However, such data were not available. Second, the data collected have sensitive information like substance use, reporting of emotions, suicidality etc., which are known to be associated with social desirability, especially among young adults. It is likely to be minimal as the data were collected by personnel trained[48] in building rapport, collecting such information, maintaining confidentiality, and ensuring the privacy of beneficiaries. However, such bias cannot be ruled out. Third, inclusion of factors such as age of initiation, duration, frequency, and amount of tobacco use, would have enriched the study for the better understanding of associated factors, but these were not available in the current data.

CONCLUSIONS

The present study provides new insights into the risk factors of chewing tobacco and smoking, which have not been frequently assessed. Chewing tobacco and

smoking have profound public health implications in terms of cardiovascular diseases, cancers and neurological disorders that create a burden on the individual, family, society, and economy. Health promotion, prevention and early intervention strategies may produce the greatest impact on health and well-being of individuals. Thus, looking at factors associated with smoking/chewing amongst young adults, as done in our study, while they are at the prime of their health, will play vital role on their overall development, leading to a healthy and productive life. This study has implications for health promotion interventions in young adults, focusing on risk factors of tobacco use especially in India and similar countries worldwide.

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CONFLICTS OF INTEREST

The authors have each completed and submitted an ICMJE Form for Disclosure of Potential Conflicts of Interest. The authors declare that they have no competing interests, financial or otherwise, related to the current work. S. C. Lakshminarayan and S. Rajneesh report being part of the funding agency.

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ETHICAL APPROVAL AND INFORMED CONSENT

This study was approved by the Institutional Ethics Committee at NIHMANS, Bangalore vide letter No. NIMH/DO/ETHICS COMMITTEE MEETING/2018, Dated 10 January 2019. All participants provided written informed consent.

DATA AVAILABILITY

Data sharing is not applicable to this article as no new data were created.

AUTHORS' CONTRIBUTIONS

Conceptualization: PB, GM, AB, GG, VD and SN; Methodology: PB; Software: PB, SV,VD and SN; Validation: PB and SV; Formal analysis: PB, GM, AB and SV; Investigation: PB, LG, VHG and MA; Resources: PB; Data curation: SV; Writing/preparation of original draft: PB, VD, SN, SV, VHG, VN, MA, LG and GG; Writing/reviewing: SC, SR and editing; PB, SN, VD, SB, and visualization PB and SV; Supervision: PB and SB; Project administration: PB, GM, AB, SR and SC; Funding acquisition: PB and GG. All authors have read and agreed to the published version of the manuscript.

PROVENANCE AND PEER REVIEW

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