Tobacco Use Among College Students Across Various Disciplines in Kerala, India

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ABSTRACT

BACKGROUND: Tobacco use is a major public health concern in India. Its use in young people is linked to increased severity, longer duration, and reduced efforts to seek treatment for tobacco use. A significant proportion of young people are enrolled in colleges, and early prevention during this period has better effectiveness. There is preliminary evidence that prevalence may vary across courses even among students of the same sociocultural background. Hence, we compared the prevalence and correlates of tobacco use among college students enrolled in five common streams of collegiate education (medical, nursing, engineering, arts/science and others, law/fisheries) in Kerala, India.

METHODS: 5784 college students from 58 colleges (medical, nursing, engineering, arts, and law and fisheries) selected by cluster random sampling in the district of Ernakulum, Kerala, completed a self-administered questionnaire incorporating standardized instruments. R software was used for analyses. Lifetime prevalence and severity of tobacco use were determined. Sociodemographic variables of tobacco users and nonusers enrolled in various courses were compared using chi-square test and two-way ANOVA. Furthermore, for each course, factors influencing tobacco use were identified using multivariable logistic regression analysis.

RESULTS: The mean age of the sample was 19.5 ± 1.9 years, with the majority being female (65.3%). Lifetime prevalence of tobacco use varied from 0.5% in nursing students, 4.2% in medical students, 8.2% in students of arts and science, 12.5% in engineering students, and 22.8% among other students (law/fisheries). Approximately two-thirds of all tobacco users across courses showed signs of nicotine dependence. Dependent users also showed variance with none in nursing, 2.6% among medicine, 1.6% among arts and science, 1.9% among engineering, and 6.3% among others. Male gender and alcohol use were consistently associated with tobacco use across courses, whereas other examined psychosocial correlates showed variance.

CONCLUSIONS: To conclude, it appears that among college students, course-level characteristics may influence risk of tobacco use. This has public health importance as it suggests that interventions need to be tailored bearing this in mind. Future research needs to examine campus-level characteristics that may explain variance.

KEYWORDS: College students, correlates, prevalence, tobacco use

Introduction

Tobacco use is causally associated with cancers, coronary artery heart disease, stroke, diabetes, tuberculosis, erectile dysfunction, and various other health problems.[1] More than three-quarters (80%) of tobacco users, worldwide, live in low- and middle-income (LAMI) countries, and hence, these countries bear the highest burden of tobacco-related morbidity and mortality.[2] So, perhaps more than in the west, tobacco use is a major public health concern in India. Tobacco is the commonest substance abused in India with an estimated 42.4% of men, 14.2% of women, and 28.6% (266.8 million) of all adults in India currently using tobacco (smoked and/or smokeless tobacco).[3] The National Mental Health Survey (2016), which examined the prevalence of tobacco use disorders among the general population across India, reported that 12.5% of the 18 to 29 years age group and 20.9% of the entire population have a dependent pattern of use.[4]

The vast majority of tobacco users initiate use early, with 87% starting before 18 years and 98% before 26 years.[5] Just as in many other diseases, early onset of tobacco use has been found to be linked to increased severity, longer duration, and reduced efforts to seek treatment for cessation.[5] There is also consistent evidence that interventions delivered to young people are more successful when delivered before addictive behaviours have become entrenched.[6]

The last decade has witnessed increasing number of young people in India enrolling in colleges, with an estimated 40 million currently at college.[7] The presence of large numbers of young adults converged in this shared space, makes the reach of any college-based intervention programme against tobacco use potentially significant.

Most studies examining tobacco use have considered college students as an aggregate homogeneous group. The largest of

such studies examined 16 953 undergraduate university students from 25 universities in 24 low- and middle-income countries across Asia, Africa, and the Americas, and reported that 13.3% of college students were current tobacco users (22.4% of men and 6.6% of women). The prevalence rates, however, varied across countries ranging from 3.8% (Singapore), to 6.9% (India), to 32.5% in Cameroon.[8] Such varying prevalence has been mostly explained by sociocultural differences across countries.[8] In India, for example, certain sections of the society, specifically those from tribal and disadvantaged sections have higher risk for tobacco use. The type, quantity and age of onset of tobacco use are determined by local practices. Although smoking among females is considered a taboo, there is greater acceptance if used of smokeless tobacco such as tobacco with betel nuts (south India), or pan (north India).[9]

Nevertheless, one aspect that has not been adequately explored so far is the variance in tobacco use among students pursuing different courses within the same country/state. Tobacco use among the Indian subsample of the Global Health Professional Survey (GHPS) was as follows: 3.3% among nursing students, 9.6% among dental students, 11.6% among medical students, and 13% among pharmacy students.[10] There are other Indian studies, from single college/university and with small samples, reporting rates of tobacco use ranging from 6.9% to 55.6% among college students in general[8,11]; 11.6% to 42% among medical students[10,12]; and 32.6% among engineering students.[13] These studies possibly indicate that within the same culture, there are significant variations in tobacco use among students enrolled in different courses. Exploring this aspect will be important as it can help in determining allocation of resources, especially in low-resource settings. In addition, if the variation in prevalence across courses holds true, it would also be important to explore whether the consistently reported correlates of tobacco use such as age, gender, socioeconomic status, religion, family structure, other substance use, psychological distress, and suicidality show variance among students pursuing various courses.[3,4,14,15]

The only study from India that has compared students across courses is the Global Health Professional Survey (GHPS),[10] but it only compared students pursuing various courses in the medical stream. Students from arts and science, and engineering streams who are more in number have not been examined in any head-to-head study. It is against this background that we report the inter-college differences in prevalence, and sociodemographic and clinical correlates of tobacco use. We compared the five common streams of collegiate education in India: that is, medical, nursing, engineering, arts/science, and others (law/fisheries) in the State of Kerala, India. In this article, we present part findings of a much larger study. This study's data were collected as part of a larger initiative that looked at substance misuse and mental health issues among college students.

Methods

We carried out this study in 58 colleges in the district of Ernakulam, Kerala, India. Cluster random sampling was used to select these colleges. First, from the master list of all colleges in the districts, institutions were categorized course-wise into five groups (medical, nursing, engineering, arts and science, and others [law/fisheries]). From each of these five groups, at least 40% of institutions were randomly selected. Permission was received from all the selected colleges for participation in the study. The college administration randomly allocated students of a single class, either odd years or even years (ie, first year and third year, or second year and fourth year) for participation in the study.

Researchers provided students with all relevant information about the study and verbal informed consent was obtained prior to participation. Students were then given paper-and-pencil questionnaires. They were assured about the anonymity of their responses and questionnaires were administered in a classroom setting. We gave no incentives to students for completing the questionnaires.

Basic sociodemographic information was collected using a questionnaire developed specifically for this study. In addition, standardized instruments were used to assess substance use and psychological distress.

The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) was used to assess lifetime use of various psychoactive substances.[16] In this article, we discuss findings related to tobacco use. For all students who reported lifetime tobacco use, ASSIST assessed the frequency of use, urges to use, problems related to use, concerns expressed by friends/family, and attempts to cut back or stop use. Responses to individual questions were scored and the summated score represented the tobacco involvement score. A tobacco involvement score of 0 to 3 indicates abstainers or low risk users (users who may not be currently using or using tobacco occasionally, with no likely harm now or in the future if continuing the same pattern); tobacco involvement score of 4 to 26 indicates hazardous use (a pattern of tobacco use that increases the risk of harmful consequences. The harm may be physical, mental, or social or in various combinations of harm); and a tobacco involvement score of 27 or more indicates dependence (subjects having a pattern of tobacco use with serious problems experienced in various domains; despite which, has difficulty in quitting). The ASSIST was also used to evaluate the use of alcohol but in this article only lifetime use of alcohol is reported. The ASSIST has good test-retest reliability and high discriminative validity.[17]

Kessler Psychological Distress Scale (K10) was used to measure depressive and anxiety symptoms over the past month using a Likert-type scale.[18] Higher total scores indicated greater distress. K10 is a validated tool for screening common mental disorders in India.[19,20]

Furthermore, two questions were asked to assess lifetime suicidality: 'Have you ever thought of committing suicide in your life?' and 'Have you made a suicidal attempt in your lifetime?'.

Ethics

This study received ethical approval from the Government Medical College, Ernakulam (CMC/C1-2022/2011) and

Table 1. College-wise gender breakdown of the sample.

COURSES OFFERED	NUMBER OF INSTITUTIONS SURVEYED	MALE, N (%)	FEMALE, N (%)	SAMPLE SIZE AS A PROPORTION OF THE TOTAL, N (%)
Medical	8	181 (18.9)	775 (81.1)	956 (17.7)
Nursing	8	5 (0.9)	577 (99.1)	582 (10.8)
Arts and science (including undergraduate and postgraduates)	25	784 (35.4)	1434 (64.6)	2218 (41.1)
Engineering (including degree and diploma students)	14	742 (60.0)	495 (40.0)	1237 (22.9)
Others (law/fisheries)	3	166 (40.3)	246 (59.7)	412 (7.6)

Table 2. Prevalence and severity of tobacco use among students across various courses.

COURSES	LIFETIME PREVALENCE		
	MALE, N (%)	FEMALE, N (%)	TOTAL, N (%)
Medical (n = 956)	**33 (17.9)**	**8 (1.0)**	41 (4.2)
Nursing (n = 582)	0	3 (0.5)	3 (0.5)
Engineering (n = 1237)	**148 (19.6)**	**6 (1.2)**	154 (12.5)
Arts and science (n = 2218)	**173 (22.0)**	**16 (1.1)**	189 (8.2)
Others (n = 412)	**71 (42.3)**	**24 (9.6)**	95 (22.8)

Values in bold – male vs female indicate $P < .01$.

administrative approvals from all the relevant college authorities. Students gave verbal informed consent before taking part in the study.

Statistical Analyses

R software was used for analyses.[21] The lifetime prevalence and severity of tobacco use were determined among students in all the five groups. Tobacco-using nursing students were few; hence, the group was excluded from further analyses (N = 3; 0.5%). Tobacco users and nonusers enrolled in the four groups (except nursing) were compared regarding sociodemographic variables using chi-square test for categorical and two-way analysis of variance (ANOVA) with Bonferroni correction for continuous variables. Furthermore, to examine the between-course differences in tobacco use and psychosocial variables, a full model of multivariable logistic regression analysis was done for each of the four courses separately. Odds ratio and 95% confidence intervals (CIs) are reported. The tests were two-tailed and statistical significance was set at $P < .05$.

Results

Although 5784 students completed the questionnaires, only 5405 questionnaires could be included in the analyses (response rate was 93.4%), as the remaining 379 questionnaires either had substantial missing responses or were returned incomplete.

Of the questionnaires analysed, the mean age of the sample was 19.5 ± 1.9 years (range = 18 to 25 years), with the majority being female (N = 3527; 65.3%). The proportion of females in our study sample reflects the pattern of enrolment in colleges of Kerala, which has a higher proportion of females except in engineering courses.[22]

Table 1 provides a breakdown of the various streams, number of institutions, and gender-wise distribution of students surveyed in each of the streams. Medical stream included students enrolled for medical, Ayurveda, homoeopathy, and dental courses; engineering stream included students in both degree and diploma courses; and others included students in law and fisheries courses.

Table 2 gives the prevalence and severity of tobacco use among the sample of college students. The lifetime prevalence of tobacco use varied from 0.5% in nursing students, 4.2% in medical students, 8.2% in students in arts and science, 12.5% in engineering, and 22.8% among others (law/fisheries). As noted, the number of students using tobacco in the nursing course was small (N = 3) and hence no further analysis was done. The prevalence of tobacco use was significantly higher among males in all examined courses ($P < .01$). Severity of tobacco use indicated by mean ASSIST scores was comparable across courses except among those pursuing medicine, in whom it was significantly less (Bonferroni adjusted $P = .011$) (Table 3). Dependent users as categorized by ASSIST scores also showed variance: 2.6%

Table 3. Severity among lifetime users (as per ASSIST Scores).

COURSES	MEAN ASSIST SCORE (SD)[a]	LOW RISK USERS, N (%)[a]	HAZARDOUS USERS, N (%)[a]	DEPENDENT USERS, N (%)[b]
Medicine	6.92 (8.21)	20 (48.7)	19 (48.7)	2 (2.6)
Engineering	9.62 (8.49)	45 (29.3)	106 (68.8)	3 (1.9)
Arts and science	12.00 (9.04)	70 (36.8)	116 (61.6)	3 (1.6)
Others	10.01 (8.56)	26 (27.4)	63 (66.3)	6 (6.3)

Abbreviation: ASSIST, Alcohol, Smoking and Substance Involvement Screening Test.
[a]Bonferroni adjusted $P = .011$ between medical versus others. All other comparisons are nonsignificant.
[b]As a proportion of total users.

Table 4. Sociodemographic correlates of tobacco users in various courses.

	MEDICAL, N (%)	ENGINEERING, N (%)	ARTS AND SCIENCE, N (%)	OTHERS, N (%)	TOTAL SAMPLE, N (%)
Age in years (mean ± SD)	**21.3 ± 1.4**	19.8 ± 1.4	20.1 ± 2.0	19.3 ± 1.4	19.5 ± 1.9
Family structure					
Living with parents	38 (92.7)	139 (88.5)	167 (88.4)	81 (85.3)	4776 (88.3)
Single parent family	2 (3.4)	9 (5.7)	8 (4.2)	6 (6.3)	307 (5.7)
Living with relatives/others	1 (1.7)	9 (5.7)	14 (7.4)	8 (8.4)	327 (6.0)
Religion					
Hindu	23 (56.1)	80 (51.3)	90 (47.6)	61 (68.5)	2480 (46.9)
Christian	12 (29.3)	47 (30.1)	52 (27.5)	14 (15.7)	1874 (33.2)
Muslim	6 (14.6)	**29 (18.6)**	**47 (24.9)**	**14 (15.7)**	1056 (19.9)
Socioeconomic status					
APL (above poverty line)[a]	38 (92.7)	138 (87.3)	153 (81.8)	89 (93.7)	4490 (83.0)
BPL (below poverty line)[a]	3 (7.3)	20 (12.7)	34 (18.2)	6 (6.3)	920 (17.0)
Residence					
Urban	**26 (63.4)**	78 (50.3)	82 (43.6)	76 (80.0)	2291 (42.3)
Rural	**15 (36.6)**	77 (49.7)	106 (56.4)	19 (20.0)	3119 (57.7)

Bold values indicate $P < .05$ for comparison of tobacco users versus nonusers in examined variable/course.
[a]Socioeconomic indicators of Government of India.

among medicine, 1.6% among arts and science, 1.9% among engineering, and 6.3% among others (law/fisheries) (Table 3).

When sociodemographic variables were compared in the full model of multivariable logistic regression analysis, being male indicated a higher risk of tobacco use across all courses, older age and urban residence indicated higher risk among students enrolled in medical courses, and being Muslim indicated higher risk among students in engineering, arts and science, and other courses (law/fisheries) students ($P < .05$) (Table 4).

Specific psychosocial factors correlated with higher risk of tobacco use among students in specific courses included: alcohol use for all courses, having a part-time job and psychological distress with arts and science, academic failures with 'others',

and suicidal thoughts in students pursuing engineering and 'other' streams (Table 5).

Discussion

To the best of our knowledge, this is the largest study to date from India comparing tobacco use among college students enrolled in diverse disciplines. This study found that students from geographically proximal areas with comparable sociocultural backgrounds when concurrently examined had widely varying prevalence of tobacco use across courses. The Indian subsample of the GHPS had found variance in tobacco use when examining students enrolled in various medical courses.[10] Although a direct comparison of our study findings with previous studies is

Table 5. Psychosocial correlates of tobacco use.

TOTAL SAMPLE, N (%)	MEDICAL		ENGINEERING		ARTS AND SCIENCE		OTHERS	
	N (%)	ODDS RATIO (95% CI)	N (%)	ODDS RATIO (95% CI)	N (%)	ODDS RATIO (95% CI)	N (%)	ODDS RATIO (95% CI)
Part-time job 436 (8)								
Nonuser	17 (1.9)	1.0	88 (8.1)	1.0	215 (10.2)	1.0	9 (3.8)	1.0
User	6 (14.6)	2.54 (0.70-9.25)	38 (24.1)	1.64 (0.96-2.81)	52 (27.7)	**1.82 (1.17-2.83)**	11 (6.3)	0.28 (0.06-1.37)
Academic failures (failed in a subject) 967 (17.7)								
Nonuser	220 (24.0)	1.0	325 (29.8)	1.0	75 (3.6)	1.0	5 (1.6)	1.0
User	12 (29.3)	0.98 (0.41-2.36)	218 (37.5)	1.03 (0.67-1.59)	24 (12.7)	1.49 (0.78-2.86)	16 (16.8)	**3.74 (1.08-13.03)**
Lifetime alcohol use 1168 (21.7)								
Nonuser	125 (13.6)	1.0	237 (21.8)	1.0	267 (12.8)	1.0	89 (28.1)	1.0
User	31 (75.6)	**26.61 (9.71-72.85)**	136 (86.1)	**37.09 (17.47-78.72)**	140 (74.5)	**19.52 (11.16-34.12)**	85 (89.5)	**39.02 (14.32-106.25)**
Psychological distress								
Nonuser (Mean ± SD)	18.31 ± 7.96	1.0	17.20 ± 7.87	1.0	16.48 ± 7.11	1.0	19.14 ± 7.45	1.0
User (Mean ± SD)	18.59 ± 9.52	1.02 (0.97-1.06)	18.01 ± 8.62	1.01 (0.98-1.04)	19.32 ± 8.37	**1.03 (1.01-1.06)**	19.28 ± 6.93	0.99 (0.94-1.04)
Suicidal thoughts 1176 (21.5)								
Nonuser	706 (22.4)	1.0	209 (19.2)	1.0	403 (19.2)	1.0	81 (25.6)	1.0
User	7 (17.1)	0.35 (0.09-1.43)	40 (25.3)	1.55 (0.93-2.60)	50 (26.5)	1.35 (0.82-2.20)	33 (34.7)	**2.58 (1.13-5.89)**
Suicidal attempts 224 (4.1)								
Nonuser	37 (4.0)	1.0	34 (3.1)	1.0	76 (3.6)	1.0	21 (6.6)	1.0
User	4 (9.8)	2.19 (0.35-13.78)	3 (1.9)	1.13 (0.26-4.87)	12 (6.3)	1.41 (0.58-3.44)	7 (7.4)	0.62 (0.16-2.40)

Abbreviation: CI, confidence interval.
Figures in bold indicate $P < .05$ for comparison of tobacco users versus nonusers in examined variable/course.

rendered complicated by differing instruments used, varying definitions, and other methodological differences, our study replicates and extends the finding of variation in prevalence of tobacco use among college students when compared across all commonly enrolled college courses in India. The determinants of between-course variation in prevalence were not examined in our study, and there is very little published research in this area. In our view, some of the possible reasons for this include disciplines having their unique subculture, distinctive trade-offs between work, academics and recreation, drug exposure opportunities, peer influences, lenient supervision, and so on.

The prevalence rates of tobacco use in our study varied considerably across courses. Reported use was high in arts and science, and engineering, highest in 'others', with lower rates reported in students in medical and nursing streams. The overall prevalence rates were however lower than those reported in earlier studies, both from the Western world and from India.[8,11,12] Such a reduction in the use of tobacco among young people in Kerala is in keeping with the results reported in other recent studies from Kerala.[23,24] Although the overall prevalence of tobacco use was low, one finding of particular public health concern was that two-thirds of users across courses (except medical) were hazardous users suggestive of the future risk of dependence and the risk of adverse health consequences. The 'other' programme track is the only subset that contains a substantial number of women tobacco users. The high prevalence of women tobacco users in the 'other' track could also be attributed to the urban skew of that particular discipline. Students pursuing medical courses in our study had a lower proportion of hazardous users and lesser severity of use (indicated by mean ASSIST scores). This could be linked to the high awareness medical students may have of the harmful effects of tobacco. This finding linking lesser severity of tobacco use to high awareness of harm has been consistently reported in previous studies.[8,14,15] As our sample was relatively young (mean age of 19.5 years), the absolute number of dependent users in all examined courses was less than 10, limiting any meaningful inferences or comparisons being drawn.

Male gender and alcohol use were correlated with tobacco use among students from all examined courses. More men use tobacco in college in most developing countries including India.[8,10,15] Similarly, there is consistent evidence that use of tobacco increases the risk of use of alcohol and vice versa.[5,8,14,15] In the full model of multivariable logistic regression analysis, students from the Muslim community appeared to have a higher risk of tobacco use, but when the confounding effect of alcohol was controlled, the relationship became nonsignificant. Other examined psychosocial and demographic variables such as age, place of residence, part-time job, poor academic performance, psychological distress, and suicidality were not uniform across all examined academic tracks. Previous studies examining the relationship between tobacco use and these correlates have also reported inconsistent findings.[8,14,15]

Certain limitations of this study need to be borne in mind while interpreting its findings: study findings were based on self-reports and no structured diagnostic interviews were conducted; findings can possibly be generalized only to higher educational systems where students following different academic tracks are in geographically different institutions/campuses; and the cross-sectional study design does not allow for causal inferences to be drawn between tobacco use and the various correlates reported. However, the strengths of our study were: having a large sample of college students from each of the commonly enrolled courses (medicine, nursing, arts and engineering) so findings of this study have greater generalizability within the State; structured and valid instruments having been used to assess tobacco use and psychological distress.

Overall, the results suggest that male gender and alcohol use were consistent predictors of tobacco use across all educational courses. Other examined factors appear to have independent effects in determining tobacco use only among college students pursuing certain courses. These findings have public health importance as they suggest that tobacco control strategies should be more intensive in courses with more males and alcohol users. For greater effectiveness, perhaps, incorporating certain distinctive characteristics of various tracks of academics as reported in the study may be beneficial. These aspects however need replication and future research may need to explore the contextual determinants of tobacco use among students pursuing different courses. A better understanding of this will be critical to the development of more effective programmes and policies for tobacco control. The widely varying prevalence in tobacco use across various courses suggests that in countries like India with low resources both in terms of manpower and funding, students pursuing academic tracks with a higher risk should be given greater focus.

Author Contributions
PGM, BSN and AR were involved in data collection, PGM and SG wrote the first draft, KT the statistical analysis, TSJ conceptualised the study and modified the first draft. All authors contributed to and approved the final draft.

Data
The data relevant to the article are available with the corresponding author for perusal.

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