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Tobacco use among college students in Kerala, India

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***Background & objectives*: Despite tobacco use among college students being a major health concern, data remain sparse from India. It is in this background that this study aimed to report the prevalence of tobacco use and its psychosocial correlates among college students in the State of Kerala, India.**

***Methods*: A total of 5784 students from 58 colleges from Ernakulam district, Kerala, selected by cluster random sampling and were provided with self-administered questionnaire. In addition to socio-demographic profile, the questionnaire incorporated alcohol, smoking, and substance involvement screening test (ASSIST, for assessing tobacco use and its severity, lifetime use of other substances); Kessler's scale (psychological distress) and Barkeley's scale (attention deficit hyperactivity disorder symptoms). Screening questions were used for assessing lifetime suicidality and sexual abuse.**

***Results*: The lifetime prevalence of tobacco use was 8.6 per cent (21.5% males and 1.4% female). Among users, hazardous and dependent use defined using ASSIST scores was 63.3 and 2.9 per cent, respectively. Tobacco use was associated with older age, being male, urban residence, having a part-time job, use of alcohol and illicit drugs and academic failures.**

***Interpretation & conclusions*: Although the prevalence of tobacco use in our study was relatively low, the proportionately higher rates of hazardous use and its association with the negative correlates suggest that more needs to be done to prevent its deleterious consequences.**

Key words College students - correlates - India - Kerala - prevalence - tobacco

Tobacco use is a major public health concern owing to its high prevalence and its deleterious effects on health[1]. Smoking is now thought of as a causally associated with cancers, coronary artery heart disease, stroke, diabetes, tuberculosis and many other negative health outcomes[1]. Worldwide, it is estimated that more than seven million deaths annually may be attributed to tobacco use[2]. Among persons using tobacco globally, 87 per cent started before the age of 18 yr and 98 per cent before 26 yr[3]. Early onset is correlated with prolonged duration, increased severity, reduced efforts to seek treatment and premature death[4].

It is estimated that one in four young adults (18-23 yr) in India attend colleges/universities[5]. Students in colleges often have a unique combination of multiple social, cultural, biological and psychosocial factors that increase the risk of initiation and persistence of substance use including tobacco[6].

A recent study reporting on current tobacco use among students of 25 universities from 24 countries across Asia, Africa and the Americas found the overall prevalence to be 13.3 per cent[6]. India's Global Health Professions Student Survey (GHPSS), which examined patterns of tobacco use among a large group of health professional students, reported rates of use to be 9.6, 11.6, 13.0 and 3.3 per cent among dental, medical, pharmacy and nursing students, respectively[7]. Other studies reporting on tobacco use among college students in India are small and restricted to a few institutions or those offering specialized courses and have reported a wide variance in prevalence ranging between 6.9 and 55.6 per cent[8,9].

Many socio-demographic factors have been robustly shown to be risk factors for tobacco use among college students. Male gender, older age, rural background, access to disposable income including having a part-time job, disruption in family structure, and being followers of certain religions *etc*. are reported to increase the risk of tobacco use[6-9]. Tobacco-using college students have been reported to experience numerous negative correlates, such as poor academic performance and have a higher risk of using other substances compared to non-users[4,6,8]. The association between tobacco use and psychological distress/suicidality among young people however has been contradictory[10-12]. Features of attention deficit hyperactivity disorder (ADHD) and sexual abuse have also been correlated with increased tobacco use[13,14].

In spite of high prevalence and multiple negative correlates described, most studies among college students in India have a small size and often limited to single or few institutions. That this study has been carried out to report on the prevalence and correlates of tobacco use among a large sample of college students.

This paper reports part findings of a study on the common psychological issues among college students in Kerala, India.

Material & Methods

The study was conducted after receiving institutional ethical approval from the Government Medical College, Ernakulam. Administrative approvals were also received from the individual colleges. Students who took part gave a fully informed individual verbal consent.

Sampling: The survey was conducted in 58 of the 123 colleges selected by cluster random sampling in the district of Ernakulam, Kerala, in 2014-2015 (Supplementary Table I & II). A sample size of 5505 was calculated to be adequate to detect a prevalence of nine per cent with a width of two per cent, 95 per cent confidence interval and design effect of 1.75. From each institution, the college administration allocated students of odd or even years (*i.e*. the 1st and 3rd yr or 2nd and 4th yr). All students who were present in the class on the day of the survey were invited to participate.

Survey administration: The instrument consisted of a self-administered questionnaire which was designed in English but translated into Malayalam as per the standard translation guidelines.

Before the survey, all students were informed that there were no right or wrong answers, the information provided would remain anonymous and answers will not impact their academic grades. Students had the option to answer either the English or Malayalam version of the questionnaire. The survey was supervised by the mental health professionals from the Department of Psychiatry, Government Medical College, Ernakulam. For more details of the methodology please see supplementary materials.

Assessment tools: A check list was used to assess socio-demographic profile (age/sex/economic indicators/area of residence/religion/academic performance).

The instruments used for assessment were as follows:

Tobacco and substance use: The Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) was used to evaluate the tobacco use[15]. Students were assessed for lifetime tobacco use (defined as having smoked/used smokeless tobacco ever in their lifetime). In subjects with lifetime use, the ASSIST was used to assess severity of tobacco use. Three main groups of tobacco users can be distinguished using ASSIST: 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 they continue the same pattern); hazardous users [pattern of tobacco use that increases the risk of harmful consequences (physical/mental/social) for the user] and dependent users (pattern of tobacco use with subjects experiencing serious problems in health, social, financial and relationship domains despite which has difficulty in quitting).

Furthermore, lifetime use of alcohol and illicit drug use (cannabis, solvents and other substances grouped together) was also evaluated. In addition, psychological distress was assessed by Kessler's psychological distress scale (K10)[16]. Two screening questions were used to screen for life time suicidality (have you ever thought of killing yourselfs, have you ever made an attempt to kill yourself?). Four questions from Child Abuse Screening Tool Children's Version[17] were used to assess for lifetime sexual abuse, two questions pertained to non-contact sexual abuse and two to contact sexual abuse. Students were asked to retrospectively report on ADHD features between the ages of 5 and 12 yr using Barkley adult ADHD rating scale-IV – childhood symptoms self-report[18].

Statistical analysis: STATA version 14[19] was used for analysis. The lifetime prevalence and severity of tobacco use were determined. Socio-demographic variables, performance in academics, lifetime use of alcohol and illicit drugs, psychological distress, lifetime suicidal thoughts and attempts, lifetime exposure to sexual abuse and ADHD scores were assessed to identify factors predicting lifetime tobacco use, with the help of a full model of binary logistic regression analysis. The analysis was done after assigning sampling weights for gender, course and year of course. The tests were two-tailed and statistical significance was at $P<0.05$.

Results & Discussion

Of the 5784 students who took part in the survey, 379 (6.6%) returned questionnaires with substantial missing responses, leaving 5405 questionnaires for analysis. The sample was predominantly female [n = 3527 (65.3%)] with a mean age of 19.4 yr (range 18-25 yr, standard deviation = 1.6 yr).

A total of 482 students [8.6%; 95% confidence interval (CI): 7.1-10.01%] reported lifetime use of tobacco with significantly higher use among males [n = 425 (21.5%; 95% CI: 18.50-24.89%)] compared to females [n=57 (1.4%; 95% CI: 0.8-2.5%, $P<0.001$)]. Tobacco lifetime use among the students, increased from 5.5 per cent between 18 and 19 yr to 21.3 per cent by 24-25 yr. The frequency and severity of tobacco use among subjects in the whole sample showed that 33.8 per cent had low risk, 63.3 per cent had hazardous use and dependent use was reported by 2.9 per cent (indicated by collated ASSIST scores - see Supplementary Material for details). Daily use was reported by 167 (3.1%) students.

In the multivariable binary logistic regression analysis using a full model, the variables that were significantly associated with tobacco lifetime use were older age, being male, urban residence, a part-time job, use of alcohol and illicit drugs and poorer academic performance. When compared to students of Hindu community, Muslim students had higher risk and Christian students had a lower risk of tobacco use. The Hosmer–Lemeshow Chi-square test was 5.04 with $P=0.75$, indicating that the model had adequate fit, with the overall percentage predicted being 92.8 per cent (Tables I and II).

The overall prevalence of lifetime tobacco use among university college students in our study was 8.6 per cent (21.5% males and 1.4% females). Although it may not have been appropriate to directly compare our findings with other studies owing to the methodological differences that include socio-cultural differences, criteria for defining cases and assessment methods, the overall prevalence of tobacco use was lower than those reported in most studies[6,8,9,18,20]. The Indian sub-sample of The Global Adult Tobacco Survey-2 reported community prevalence rates among young people (15-24 yr of age) to be 20.3 per cent among males and 3.7 per cent among females[20]. However, findings from some Indian studies among college students have varied between 6 and 55.6 per cent[6,8,9]. The lower prevalence rate reported in this study is in line with recent trends from Kerala which has shown a consistent decrease in tobacco use, with most recent studies reporting prevalence of less than 10 per cent[21].

The higher rates of tobacco use among males found in the present study is a consistent finding with world literature. Worldwide, a wide gender difference is seen in developing countries and narrower gender difference in high-income countries[2,3,6]. In addition, use of tobacco among females is socially stigmatized in Kerala explaining the low prevalence. There was an approximately four-fold increase in tobacco use from 18 to 25 yr. Higher prevalence among older students has been reported, both from India and other countries[6-8]. In our study, the prevalence of tobacco use was more among students with a part-time job. Increased access to disposable income was identified as a risk factor for substance use among university students[6]. In our students, compared to Hindu students, Muslim students had higher risk and Christians had a lower risk of tobacco use, suggesting that, as reported prior, religion and culture play a part

Table I. Socio-demographic correlates of tobacco users (n=5405, 482 tobacco users; 4923 non-users)[#]

Variables	Lifetime tobacco use, n (%)	Non-users, n (%)	Binary logistic regression analysis, OR (95% CI)[α]
Age	19.94±1.75[©]	19.34±1.56[©]	1.1[$] (1.01-1.20)
Sex			
Female	57 (1.4)	3470 (98.6)	1.00
Male	425 (21.5)	1453 (78.5)	12.24 (8.70-17.20)
Family structure			
Living with both parents	427 (8.9)	4352 (91.1)	1.00
Single parent family	24 (7.9)	281 (92.1)	0.85 (0.48-1.49)
Living with relatives/others	31 (9.7)	290 (90.3)	1.03 (0.64-1.65)
Socio-economic category			
Above poverty line	420 (9.3)	4076 (90.7)	1.00
Below poverty line	62 (6.7)	847 (93.3)	0.90 (0.66-1.24)
Religion			
Hindu	257 (9.9)	2282 (90.9)	1.00
Christian	128 (7.0)	1667 (93.0)	0.49 (0.38-0.63)
Muslim	97 (8.8)	974 (91.2)	5.09 (3.22-8.04)
Residence			
Urban	263 (11.4)	2031 (88.6)	1.00
Rural	219 (7.1)	2892 (92.9)	0.77 (0.62-0.96)

[#]Results indicate row percentages; [α]Adjusted for sample weights; [$]Reference category – non-user; [©]Mean±SD. CI, confidence interval; SD, standard deviation; OR, odds ratio

Table II. Psychosocial correlates of tobacco users (n=5405 [482 tobacco users; 4923 non-users])[©]

Variables	Lifetime tobacco use, n (%)	Non-users, n (%)	Binary logistic regression analysis, OR[#] (95% CI)[α]
Part time job	100 (22.8)	385 (7.6)	2.56 (1.72-3.81)
Academic performance			
Failed a year	50 (17.4)	436 (8.4)	1.57 (1.01-2.43)
Substance use			
Alcohol lifetime use	394 (33.6)	780 (2.1)	40.11 (27.47-58.56)
Illicit drug lifetime use	92 (19.2)]	116 (2.3)	5.72 (3.67-8.90)
Psychological distress	18.86±8.31[β]	17.42±7.69[β]	0.99 (0.98-1.01)
Suicidality			
Suicidal thoughts	132 (11.1)	1053 (8.2)	1.02 (0.76-1.38)
Suicidal attempt	27 (12.0)	198 (8.7)	0.85 (0.46-1.57)
ADHD scores	29.41±11.73[β]	26.48±9.92[β]	1.01 (0.99-1.02)
Sexual abuse			
Non-contact sexual abuse	110 (16.2)	568 (7.8)	1.41 (0.91-2.19)
Contact sexual abuse	81 (14.4)	483 (8.2)	0.75 (0.50-1.21)

[©]Results indicate column percentages; [#]Reference group – non-users; [α]Adjusted for sample weights; [β]Mean±SD. CI, confidence interval; SD: standard deviation; OR, odds ratio; ADHD, attention deficit hyperactivity disorder

in tobacco use[6,8,9]. Although there are inconsistent reports pertaining to the association of tobacco use with respect to the place of residence[6], the present study found a higher prevalence of tobacco use among students from urban backgrounds. Lower socio-economic status or family disruption reported before

increased use of tobacco did not correlate among our students. This lack of strong and consistent findings with certain socio-demographic variables may be owing to the significant interactions among several of the characteristics (in the full model of binary logistic regression analysis), which calls into question whether all have independent effects on tobacco use among college students. It is possible that peer influences also determine choices.

Although our cross-sectional design precludes any conclusion regarding causality, our students using tobacco had a number of negative correlates. Students with tobacco use had a significantly higher risk of using alcohol and other illicit drugs, adding to the evidence that use of one substance increases the risk of use of other substances[4,6,8,9]. Those students who used tobacco had poor academic performance supporting findings from most previous studies[6,8]. The reason for this association remains unclear, and it is yet to be determined whether poor academic performance leads to tobacco use or vice versa, or some other factors lead to both.

In our study, retrospective ADHD features did not show any correlation with tobacco use, but prospective studies have reported that subjects with ADHD have higher rates of substance use with earlier onset and greater severity[13]. Psychological distress and suicidality did not correlate with tobacco use among our students with previous studies suggesting contradictory findings[10-12]. Most previous studies have reported that students with substance use have higher rates of sexual abuse which was also not correlated among our students[14]. Sexual abuse and suicidality in this study were assessed using limited queries, which may not have been adequate to assess these constructs. The lack of associations of many of these factors which have been shown to correlate in studies from other countries may also be because not all students in India enter college with a gross enrolment ratio among 18-23 yr olds being 24.5 per cent[22]. Hence, there may be limitations comparing the finding from India with studies from other countries where enrolment in higher education is higher.

This study has several limitations. All aspects were evaluated by self-reported responses, and no evaluation was carried out by mental health professionals. Inference of direction of causality of correlates examined is not possible owing to the cross-sectional design of the study. Suicidality, exposure to sexual abuse and academic performance were examined by limited queries.

To conclude, the overall lifetime prevalence of tobacco use among college students in Kerala is lower in comparison to findings from other regions of India. Despite this, a few aspects remain concerning: use among male students is high; there is a nearly four-fold increase of tobacco use between the ages of 18 and 25 and two of every three male users had hazardous patterns of use. Thus, more needs to be done on a priority basis to prevent the deleterious consequences of tobacco use among young people.

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Supplementary Material

To contextualize the study, the following additional details pertaining to methodology have been added:

Material & Methods

Sampling: The survey was conducted in 58 colleges in the district of Ernakulam, Kerala, in 2014-2015. The district had 123 colleges, offering specialized courses, with approximately 5000 students enrolled. A master list was initially prepared sub-categorizing the colleges into the courses they offer, *i.e*. medical, dental, nursing, engineering, law, arts and sciences, homoeopathy, Ayurveda and fisheries science. The institutions were selected using cluster random sampling. At least 40 per cent of institutions in each subcategory were randomly selected, and for courses in which colleges were few in number (medical, dental, law, homoeopathy, Ayurveda and fisheries science), at least 50 per cent were selected.

A final sample size of 5505 was calculated to be adequate to detect a prevalence of 9 per cent with width of 2 per cent, 95 per cent confidence interval and design effect of 1.75. From each institution, the college administration allocated students of odd or even years (*i.e*. the 1st and 3rd yr, or 2nd and 4th yr). In colleges where there were multiple divisions in a single year, a single division was allocated. All students who were present in the class on the day of the survey were invited to participate.

Survey administration: The instrument consisted of a self-administered questionnaire. The questionnaires were designed in English and translated into Malayalam and back-translated as per the standard translation guidelines.

Before the survey, all students were informed that there were no right or wrong answers, the information they would provide would remain anonymous and answers will not impact their academic grades. Verbal consent was taken individually. Students had the option to answer either the English or Malayalam version of the questionnaire. Both language versions were printed separately, and students had the option to choose any version when the questionnaire was distributed. The survey was supervised by the mental health professionals from the Department of Psychiatry, Government Medical College, Ernakulam. Students were administered the questionnaire in their classes sitting sufficiently apart so that they could fill in their responses without being observed by other students. Students were allocated one hour for the survey, and they took 40-50 min to complete the questionnaire.

Of the 5784 students, 379 (6.6%) returned questionnaires had a substantial number of missing responses, which left 5405 questionnaire for analysis. The substantial missing responses in these questionnaires mostly related to details of socio-demographic profile which precluded any meaningful inferences, and hence, they were discarded.

Ethical considerations: The study received institutional ethical approval from the Government Medical College, Ernakulam (formerly Cochin Medical College). Administrative approvals were also received from the individual colleges. Students who took part gave a fully informed individual verbal consent. Since we took a verbal consent, we additionally employed as many safeguards as reasonably possible: (*i*) All students were informed during the introduction of the psychological domains being assessed; (*ii*) those who did not want to participate were free to leave the classroom (but none did) or not complete the questionnaire (6.6% of questionnaires had substantial missing responses); (*iii*) students were also specifically told that they could leave any part of questionnaire unanswered; (*iv*) the survey was conducted in examination conditions, with students being seated separately, so answers were not revealed/discussed with others; (*v*) only the survey personal were present during survey administration (teachers were not present); (*vi*) assessment of sensitive aspects (suicidality/sexual abuse) was only restricted to few screening questions; (*vii*) contact details of the mental health team were made available to all students taking part in the survey and they were told that they could confidentially contact any of them if required; (*viii*) all students assessed were 18 years and above; (*ix*) verbal consent was individually taken.

Assessment tools: A check list was used to assess socio-demographic profile (age/sex/economic indicators/area of residence/religion/academic performance).

Supplementary Table I. Details of number of colleges and sample surveyed for each specialized course

Courses	Number of colleges	Sample size	Per cent
Medical	2	413	7.1
Nursing	8	620	10.7
Dental	3	216	3.7
Ayurveda	2	208	3.6
Homoeopathy	1	149	2.6
Engineering	11	1018	17.6
Polytechnic	3	292	5.0
UG arts	25	2041	35.3
PG arts	10®	395	6.8
Fisheries	1	86	1.5
Law	2	346	6.0
Total	58	5784	100.0

®PG arts students were drawn from only 10 out of 25 UG arts colleges which are already accounted in total number of college. UG, Undergraduate; PG, Postgraduate

Supplementary Table II. Colleges classified based on administration

Type of College	Subjects surveyed	Per cent
Government	1096	18.9
Government aided	1540	26.6
Government self-financing	836	14.5
Private self-financing	2312	40.0
Total	5784	100.0

The instruments used for assessment were as follows.

Tobacco and substance use: The Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) was used to evaluate tobacco use[1] (*https://www.who.int/substance_abuse/activities/assist/en/*). Students were assessed for lifetime tobacco use (lifetime use for this study is defined as having smoked/used smokeless tobacco ever in their lifetime). In subjects who report lifetime use, the ASSIST was used to assess severity of tobacco use. The questions in ASSIST to assess severity were the following: the frequency of use in the last three months; how often the subject had the strong desire/urge to use tobacco in the last three months; the frequency of health, social, legal or financial problems in the last three months (the options for the three questions being: ever, once or twice monthly, weekly, daily or almost daily). Two further questions assessed whether their friend/relative had expressed concerns about the subjects' tobacco use and whether an attempt to cut down or stop using tobacco had failed. The respondent could answer never or yes. If yes, the options were whether it was in the past three months or earlier. A score is given based on responses to each of these questions. The sum total of scores represents the tobacco involvement score. Three main groups of users can be distinguished based on tobacco involvement score: those with tobacco involvement score of 0-3: 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 they continue the same pattern); tobacco involvement score of 4-26: indicates hazardous use (pattern of tobacco use that increases the risk of harmful consequences for the user. The harm may be physical, mental or social or in various combinations of the three major categories of harm) and tobacco involvement score of 27+: indicates dependence (subjects having a pattern of tobacco use with serious problems experienced in health, social, financial and relationship domains; despite which has difficulty in quitting).

In the same study, ASSIST was used to evaluate the use of alcohol, cannabis, solvents, and other substances; however, for this paper, only lifetime use of alcohol and illicit drug use (cannabis, solvents and other substances grouped together) have been reported.

Psychological distress: Kessler's psychological distress scale (K10)[2] was used to assess psychological distress. The K10 is a screening tool for non-specific psychological distress and has ten questions to elicit the frequency of depressive and anxiety symptoms over the last month. Total psychological distress scores were calculated to compare tobacco users and non-users. The tool has been validated in developing country settings including India.

Assessment of suicidality: Two screening questions were used to screen for life time suicidality: have you ever thought of killing yourself; have you ever made an attempt to kill yourself.

Assessment of sexual abuse: Four questions taken from Child Abuse Screening Tool Children's Version[3], which has been validated in India was used to screen for lifetime exposure to sexual abuse. The questions were the following: (*i*) Has someone misbehaved with you sexually against your will? (*ii*) Has someone forced you to look at pornographic materials against your will? (questions 1 and 2 – Non-contact sexual abuse). (*iii*) Has someone forced you to fondle or fondled you against your will? (*iv*) Has someone forced you into a sexual relationship against your will? (questions 3 and 4 – Contact sexual abuse).

Assessment of attention deficit hyperactivity disorder (ADHD): Students were asked to retrospectively rate their behaviour for ADHD features between the ages of 5-12 yr using Barkley adult ADHD rating scale-IV – childhood symptoms self-report[4]. The scale consists of 18 questions – 9 for features of inattention and 9 for hyperactivity-impulsivity. Each question had four options (scores of 1 to 4) and total ADHD scores were calculated.

References for Instruments

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