OXFORD

Nicotine dependence, quit intentions, and cessation efforts among daily tobacco-using healthcare students, professionals, and staff in Eastern India: insights from a multicentric study

Bijit Biswas[1,†,*], **Saurabh Varshney[2,†]**, **G. Jahnavi[1,†]**, **Venkata Lakshmi Narasimha[3]**, **Santanu Nath[4]**, **Vinayagamoorthy Venugopal[1]**, **Sudip Bhattacharya[1]**, **Arshad Ayub[1]**, **Benazir Alam[5]**, **Ujjwal Kumar[5]**, **Niwedita Jha[5]**, **AIIMS Deoghar Tobacco Control Collaborators for Bihar & Jharkhand (ADTCCBJ)**

[1]Department of Community & Family Medicine, All India Institute of Medical Sciences, Deoghar 814152, Jharkhand, India
[2]Executive Director & Chief Executive Officer, All India Institute of Medical Sciences, Deoghar 814152, Jharkhand, India
[3]Department of Psychiatry, National Institute of Mental Health and Neurosciences, Bengaluru 560029, Karnataka, India
[4]Department of Psychiatry, All India Institute of Medical Sciences, Deoghar 814152, Jharkhand, India
[5]Vital Strategies Tobacco Control Project, All India Institute of Medical Sciences, Deoghar 814152, Jharkhand, India

[†]These authors contributed equally to this work.
[*]Corresponding author. Department of Community & Family Medicine, All India Institute of Medical Sciences, Deoghar 814152, Jharkhand, India. E-mail: drbijitbiswas@gmail.com

Abstract

Background: Tobacco use among healthcare workers compromises their role as cessation advocates. This study focuses on nicotine dependence, quit intentions, and cessation efforts among daily tobacco-using healthcare students, professionals, and staff in Eastern India.

Methods: A multicentric cross-sectional study using a structured questionnaire was conducted in 24 healthcare institutions across Bihar and Jharkhand during July–August 2023, analysing data from 729 daily tobacco users among a total of 7619 participants.

Results: The mean nicotine dependence score was 4.6 ± 2.3, with 49.2% showing moderate dependence, 38.4% low, and 12.3% high. Among daily users, 63.1% expressed quit intentions. Two-thirds (67.9%) attempted to quit in the past year, with 36.6% using nicotine replacement therapy and 62.0% trying unaided. Participants without quit intentions had higher odds of moderate dependence [adjusted odds ratio (AOR) = 9.36] and high dependence (AOR = 28.8). Receiving no cessation advice increased the odds of moderate (AOR = 5.30) and high dependence (AOR = 16.15). Quit intentions were associated with lower nicotine dependence (AOR = 29.9 for low and 4.04 for moderate), receiving quit advice (AOR = 2.03), and awareness of tobacco control laws (AOR = 1.08 per unit). Quit attempts were influenced by quit intentions (AOR = 13.03), lower nicotine dependence (AOR = 2.68 for moderate), and receiving cessation advice (AOR = 2.82).

Conclusions: The study population showed moderate nicotine dependence and substantial quit intentions, emphasizing the need for stronger healthcare-led cessation efforts to enhance success and empower healthcare workers as tobacco control advocates.

Keywords: tobacco use disorder; tobacco use cessation; intention; health personnel; students; India

Introduction

Tobacco use is a pressing global health crisis, causing over 8 million deaths annually, with 80% of these deaths occurring in low- and middle-income countries [1]. In India, the second-largest consumer of tobacco worldwide, 29% of adults use tobacco, including 42.4% of men and 14.2% of women [2, 3]. Nicotine, the highly addictive component in tobacco, drives dependency, making quitting a persistent challenge. Tobacco use contributes not only to non-communicable diseases (NCDs) such as cardiovascular conditions, cancers, and chronic respiratory diseases but also exacerbates susceptibility to communicable diseases like tuberculosis and

respiratory infections, placing an additional burden on public health systems [3–6].

Healthcare professionals (HCPs) are uniquely positioned to lead tobacco control efforts as frontline providers of cessation interventions. The WHO Framework Convention on Tobacco Control emphasizes their role in delivering cessation advice, initiating brief interventions, and motivating patients to quit [7–9]. However, tobacco use among HCPs remains alarmingly high, reaching up to 43.4% in some studies [6, 10–12]. This undermines their credibility as role models, jeopardizes their health and productivity, and diminishes their ability to inspire behavioural change within themselves and the communities they serve. Addressing tobacco use among HCPs is

---

Key Messages

- Moderate nicotine dependence was most common among daily tobacco users
- Stress and peer influence were the main reasons for initiating tobacco use
- Quit intentions and attempts were linked to cessation advice received
- Users with lower nicotine dependence were more likely to quit
- Many tried quitting without assistance; few used nicotine replacement therapy (NRT) or counselling
- Awareness of tobacco laws positively influenced quit motivation

---

essential to empower them as effective advocates for cessation [4, 13–15].

Bihar and Jharkhand, two states in Eastern India, highlight the challenges of low-resource settings in addressing tobacco use. In Bihar, 25.9% of adults use tobacco, with 23.5% preferring smokeless forms. In Jharkhand, tobacco use is even higher at 38.9%, with 35.4% consuming smokeless products like khaini and gutkha [2, 16, 17]. These culturally ingrained habits complicate cessation efforts. Both states lack adequate tobacco cessation services, comprehensive training for HCPs in nicotine dependence management, and widespread public awareness about cessation support. These barriers reflect broader systemic challenges in low-resource settings, where infrastructure for tobacco control is often limited [14, 18–20].

This study investigates nicotine dependence, quit intentions, and cessation efforts among daily tobacco-using healthcare students, professionals, and staff in Bihar and Jharkhand. By exploring this critical yet understudied population, the findings aim to inform targeted interventions that address tobacco use among HCPs, enabling them to act as effective change agents within themselves and the communities they serve.

Methods

Study design and participants

This multicentric, observational, cross-sectional study was conducted in July and August 2023, involving participants from 24 tertiary healthcare institutions across the Eastern Indian states of Bihar and Jharkhand. The study cohort comprised healthcare students, professionals, and support staff. Healthcare students were drawn from medical, dental, and nursing disciplines. HCPs included faculty members, resident doctors (from medical and dental streams), and nursing personnel. The support staff consisted of administrative officers, laboratory technicians, attendants, cleaning staff, security personnel, and other essential workers.

The study was led by investigators from All India Institute of Medical Sciences (AIIMS) Deoghar, a nationally significant institution in Jharkhand committed to advancing healthcare, research, and education. Twenty medical colleges, including AIIMS Deoghar, and four dental colleges participated in the survey. Personalized invitations detailing the methodology were sent to medical and dental colleges in Bihar and Jharkhand. In Bihar, 11 of 21 medical colleges participated, while all nine in Jharkhand were fully engaged. Among dental colleges, two out of six in Bihar and two out of four in Jharkhand took part. After obtaining institutional consent, nodal representatives were appointed to coordinate survey activities, following a detailed briefing on study objectives and procedures.

The study's sample size was based on Naik et al. [5], which estimated that 16.9% (~17%) of the population were daily tobacco users. With a 50% response rate and a design effect of 2, a sample size of 7503 was calculated to estimate this proportion with a 10% relative precision (1.7% absolute precision) at a 95% confidence level. Ultimately, 7619 individuals participated. For this analysis on nicotine dependence and cessation efforts, Naik et al.'s [5] estimate of 50% attempting to quit tobacco was used to calculate a minimum sample size of 384 with a 5% margin of error and 95% confidence. The analysis included data from 729 daily tobacco users, ensuring an adequate sample size. Data collection was conducted via a self-administered, anonymous Google Form available in English and Hindi to ensure inclusivity. No personally identifiable information was collected. A snowball sampling technique was used, wherein nodal representatives distributed the survey link through direct communication and institutional WhatsApp groups. Mass administration sessions were also held in lecture halls for students and offices or canteens for staff. Devices were provided for cleaning and support staff without smartphone access to facilitate independent form completion.

Measures

The questionnaire was systematically developed through a comprehensive literature review and consultations with experts from the Departments of Community and Family Medicine (CFM) and Psychiatry at AIIMS Deoghar [2, 21–25]. The questionnaire was reviewed by investigators from participating medical and dental colleges during a virtual consultative meeting, where face and content validity were established through expert consensus, and refinements were made based on the feedback received. A pilot test was conducted with 30 participants at AIIMS Deoghar, comprising 10 medical students, 10 resident doctors, and 10 staff members. This process provided valuable insights for final revisions. The pilot test assessed the clarity, relevance, and internal consistency of the questionnaire items. Based on participant feedback, minor modifications were made to the wording and sequencing of items. During the pilot phase, the Cronbach's alpha values indicated good internal consistency: 0.904 for the awareness scale (26 items), 0.812 for the Fagerström Test for Nicotine Dependence (FTND) among smokers (6 items), and 0.751 for the FTND among smokeless tobacco users (6 items).

The finalized questionnaire included sections on socio-demographic details (age, sex, religion, caste, marital status, and native state) and socio-economic factors (occupation and yearly family income). Tobacco use status was categorized as former, current, or daily users and usage patterns were detailed, including the type of tobacco product (e.g. cigarettes, bidis, gutka, khaini, zarda, gudhaku, and gul), preferred

method (smoking, smokeless, or both), and mode of use (alone or with friends). Nicotine dependence was assessed using the FTND scale for smoking and smokeless tobacco, with a composite score derived for dual users based on the higher of the two scores [21, 22].

The questionnaire also captured data on tobacco cessation advice received in the past 12 months, quit attempts during the same period, duration of attempts, measures used (e.g. nicotine replacement therapy, counselling, and quit lines), and current quit intentions. Awareness of tobacco control laws was evaluated using 26 items, compliance through 9 items, and perceptions of India's tobacco control measures through 10 items. In the final dataset, the Cronbach's alpha values demonstrated good internal consistency: 0.924 for the awareness scale (26 items), 0.814 for the FTND among smokers (6 items), and 0.747 for the FTND among smokeless tobacco users (6 items). Findings on tobacco use prevalence, awareness, compliance, and perceptions are detailed in a separate manuscript [26].

The study classified tobacco use into three categories: former users, who had ever used tobacco products even once; current users, who had used tobacco products within the past month; and daily users, who consumed tobacco products daily at the time of form submission, irrespective of quantity. Awareness of tobacco control laws was assessed through 26 items, with each correct response scoring 1, and the cumulative score representing overall awareness. Nicotine dependence was measured using the Fagerström Scale separately for smoking and smokeless tobacco (Supplementary Table S1). For dual users, a composite nicotine dependence score was derived by selecting the higher of the two scores, which was then categorized as low (0–3), moderate (4–6), or high (7–10) dependence [21, 22, 25].

Data analysis

Data collected via Google Forms was exported to Microsoft Excel and analysed using JAMOVI software (version 2.3.26) [27]. Qualitative variables were presented as frequencies and percentages, while quantitative variables were expressed as means ± standard deviations (SD). Nicotine dependence scores were compared across participant characteristics using independent samples t-tests or ANOVA, depending on the number of categories. Tukey's post hoc test was used for polychotomous variables to identify specific group differences. Associations between background characteristics and nicotine dependence levels were assessed using the chi-square test. Bivariate and multivariable multinomial logistic regression, with the forced entry method, identified factors associated with moderate and high nicotine dependence compared to low dependence. Logistic regression, both bivariate and multivariable, was performed to determine predictors of quit intentions and the likelihood of a quit attempt, using the forced entry method. Odds ratios (OR) with 95% confidence intervals (CI) quantified associations, with statistical significance set at $P < .05$.

Results

The mean age of participants was 28.4 ± 7.9 years (range: 19–65), with most being male (87.4%) and Hindu (83.1%). Scheduled Caste and Scheduled Tribe individuals comprised 17.9%, while 1.1% were divorced or separated (Supplementary

Table S2). The mean age of tobacco initiation was 18.8 ± 4.8 years (range: 11–45), with stress (48.3%) and peer pressure (28.5%) as key reasons for initiation (Supplementary Fig. S1). Most participants were smokers (70.6%), followed by smokeless tobacco users (20.4%) and dual users (8.9%), with cigarettes (82.9%) being the most common product. Half (52.6%) used tobacco with friends, and 50.8% had received quit advice in the past year. Among participants, 63.1% expressed a desire to quit, with 63.7% aiming to quit within a month, although 36.9% had no quit intentions. Despite this, 67.9% attempted to quit, with 62.0% unaided and 36.6% using nicotine replacement therapy (Table 1).

The mean knowledge score on tobacco control legislation was 19.0 ± 7.5, and the mean nicotine dependence score was 4.6 ± 2.3. Females had lower nicotine dependence compared to males (3.8 ± 2.0 vs. 4.7 ± 2.4, $P < .001$) (Fig. 1a). Nicotine dependence scores varied significantly across occupations ($P < .001$), with students having lower dependence compared to professionals (3.9 ± 1.9 vs. 4.9 ± 2.7, $P < .001$) and staff (3.9 ± 1.9 vs. 6.6 ± 2.1, $P < .001$). Professionals also showed lower dependence compared to staff (4.9 ± 2.7 vs. 6.6 ± 2.1, $P < .001$) (Fig. 1b). Age of tobacco initiation was significantly associated with nicotine dependence ($P < .001$). Those initiating at <15 years showed higher dependence compared to those starting at 19–21 years (5.3 ± 2.4 vs. 3.7 ± 2.2, $P < .001$) and ≥22 years (5.3 ± 2.4 vs. 4.3 ± 2.3, $P < .001$). Similarly, initiation at 15–18 years was linked to higher dependence than initiation at 19–21 years (4.9 ± 1.9 vs. 3.7 ± 2.2, $P < .001$) (Fig. 1c). Nicotine dependence also differed by preferred tobacco products ($P < .001$). Smokeless tobacco users had higher dependence than smokers (6.7 ± 2.1 vs. 3.8 ± 1.9, $P < .001$). Dual users were more dependent compared to smokers (6.3 ± 1.9 vs. 3.8 ± 1.9, $P < .001$) (Fig. 1d). A significant relationship existed between knowledge of tobacco control legislation and nicotine dependence ($P < .001$). Those with a knowledge score <15 had higher dependence compared to scores of 15–19 (5.4 ± 2.5 vs. 4.2 ± 2.4, $P < .001$), 20–24 (5.4 ± 2.5 vs. 4.2 ± 2.1, $P < .001$), and ≥25 (5.4 ± 2.5 vs. 4.0 ± 2.1, $P < .001$) (Fig. 1e). Those advised by healthcare providers to quit tobacco had lower dependence than others (3.7 ± 2.1 vs. 5.5 ± 2.3, $P < .001$) (Fig. 1f). Quit intentions also influenced dependence, with those not interested in quitting showing significantly higher dependence compared to those intending to quit someday (6.3 ± 2.1 vs. 3.4 ± 1.7, $P < .001$), within 1 month (6.3 ± 2.1 vs. 3.8 ± 1.9, $P < .001$), or within 12 months (6.3 ± 2.1 vs. 3.1 ± 1.9, $P < .001$) (Fig. 1g). The duration of the last quit attempt was significantly associated with dependence ($P < .001$). Those with quit durations <24 hours had higher dependence compared to those with durations of days (5.6 ± 2.6 vs. 3.3 ± 2.1, $P < .001$), weeks (5.6 ± 2.6 vs. 3.8 ± 1.9, $P < .001$), or months (5.6 ± 2.6 vs. 3.9 ± 1.7, $P < .001$) (Fig. 1h). Moderate dependence was most common (49.2%), followed by low (38.4%) and high (12.3%). Common barriers to quitting included fear of withdrawal (34.2%), reliance on stress relief (22.1%), and lack of determination (21.9%) (Supplementary Fig. 2).

In multivariable multinomial logistic regression analysis, individuals using tobacco products exclusively, those who had not received quit advice from a doctor or healthcare provider, and those without quit intentions were more likely to exhibit higher nicotine dependence. Conversely, an older age of initiation and being native to Bihar were found to be protective

Table 1. Characteristics of tobacco use, quit intentions, and cessation efforts among study participants (*N* = 729).

Variable	*n*	%, 95% CI
Tobacco use characteristics		
At what age did you begin using tobacco products? (in years)		
<15	159	21.8, 18.9–24.9
15–19	243	33.3, 30.0–36.8
20–24	240	32.9, 29.6–36.4
≥25	87	11.9, 9.8–14.5
By which form do you prefer to take tobacco products daily?		
Only smoking	515	70.6, 67.2–73.8
Only SLT	149	20.4, 17.7–23.5
Both smoking and SLT	65	8.9, 7.1–11.2
Which of the following tobacco products do you take daily? (multiple response)		
Cigarette	604	82.9, 79.9–85.4
Khaini	227	31.1, 27.9–34.6
Gutka	225	30.9, 27.6–34.3
Bidi	125	17.1, 14.6–20.1
Zarda	86	11.8, 9.6–14.3
Gudhaku	64	8.8, 6.9–11.1
Gul	52	7.1, 5.5–9.2
How do you normally use tobacco products?		
Alone	347	47.6, 44.0–51.2
With friends	382	52.4, 48.8–56.0
Quit intention		
Which of the following best describes your thinking about quitting tobacco use?		
Not interested	269	36.9, 33.5–40.5
Quit someday	98	13.4, 11.2–16.1
Quit within next 1 month	293	40.2, 36.7–43.8
Quit within next 12 months	69	9.5, 7.5–11.8
Cessation efforts		
During past 12 months have you tried to stop tobacco use?		
No	234	32.1, 28.8–35.6
Yes	495	67.9, 64.4–71.2
Thinking about last time you tried to quit tobacco, how long did you stop tobacco use?		
Did not try	62	8.5, 6.7–10.7
Less than 24 hours	248	34.0, 30.7–37.5
Days	45	6.2, 4.6–8.2
Weeks	97	13.3, 11.0–15.9
Months	277	38.0, 34.5–41.6
In the past 12 months did you use any of the following services to try to stop tobacco use? (multiple response)		
Counseling, including at a tobacco cessation clinic	171	23.5, 20.5–26.7
Nicotine replacement therapy, such as the patch or gum	267	36.6, 33.2–40.2
Traditional medicines, for example Ayurvedic, Homeopathic, Unani	123	16.9, 14.3–19.8
Switching to smokeless tobacco	120	16.5, 13.9–19.3
Try to quit without assistance	452	62.0, 58.4–65.4
A quit line or a tobacco telephone support line	94	12.9, 10.6–15.5

CI, confidence interval; SLT, smokeless tobacco.

factors against higher dependence. The model accounted for 51% of the variability and achieved a predictive accuracy rate (PAR) of 71.9% (Table 2 and Supplementary Table S3). In multivariable logistic regression analysis, quit intentions were positively associated with being a student, having greater knowledge of tobacco control legislation, initiating tobacco use at an older age, using a single form of tobacco, social use of tobacco, receiving quit advice, and lower levels of nicotine dependence. This model explained 48.6% of the variability in quit intentions, with a PAR of 79.8% (Table 3). For quit attempts, multivariable logistic regression identified significant associations with being a student, possessing greater
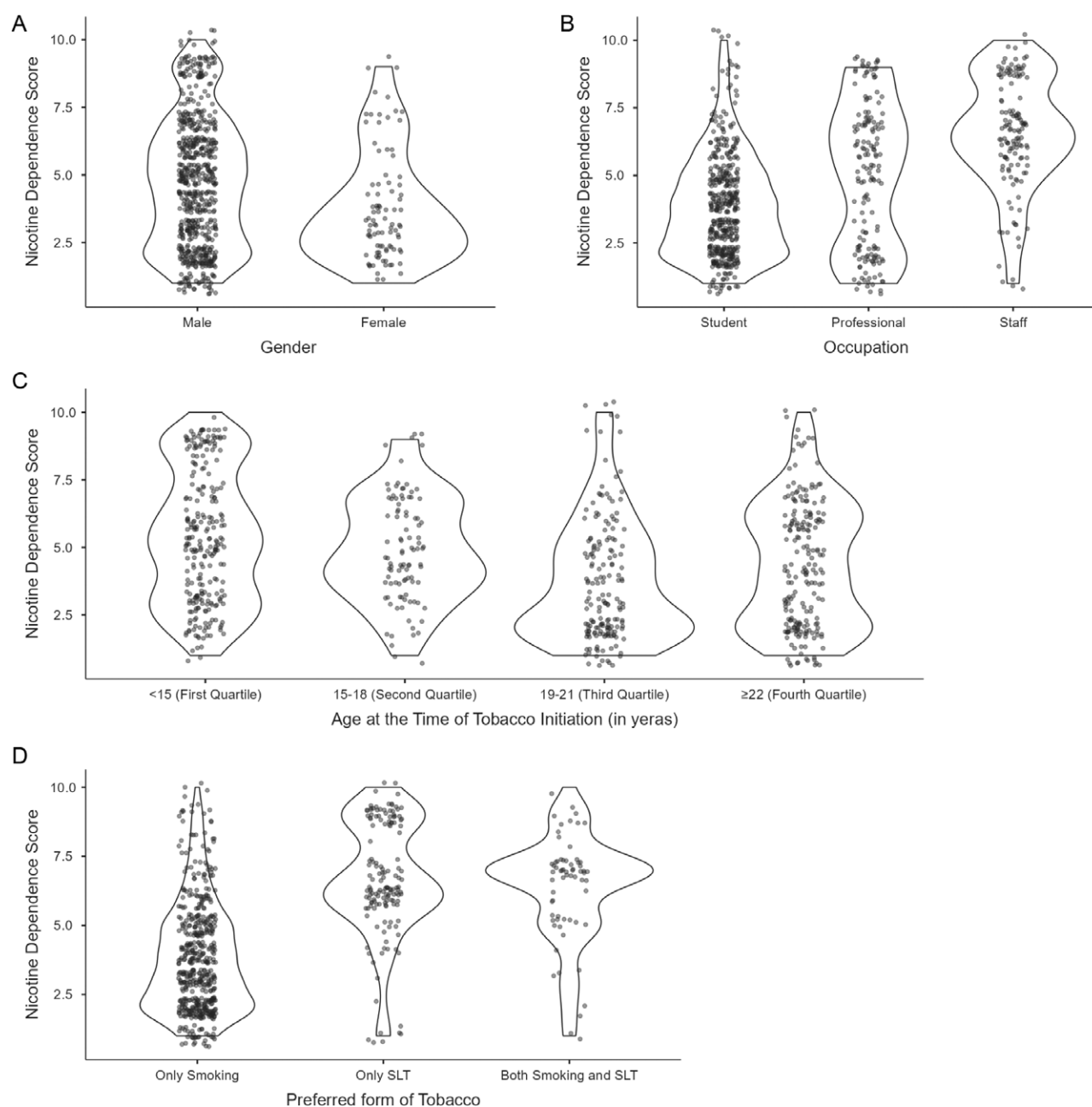
Figure 1. Violin plots showing the distribution of nicotine dependence score as per background characteristics of the study participants (*n* = 729). (a) Gender and Nicotine Dependence Score; (b) Occupation and Nicotine Dependence Score; (c) Age at the time of tobacco initiation and Nicotine Dependence Score; (d) Preferred form of tobacco and Nicotine Dependence Score; (e) Knowledge score regarding tobacco-related legislations and Nicotine Dependence Score; (f) Doctor or healthcare provider asked to quit and Nicotine Dependence Score; (g) Tobacco quit intention and Nicotine Dependence Score; (h) Last tobacco quit attempt duration and Nicotine Dependence Score. SLT: Smokeless tobacco.

knowledge of tobacco control legislation, using a single form of tobacco, receiving quit advice from a healthcare provider, exhibiting lower nicotine dependence, and demonstrating a positive intention to quit. The model accounted for 55.0% of the variability in quit attempts and achieved a PAR of 85.3% (Table 4).

Discussion

This multicentric cross-sectional study examined tobacco use, dependence, and cessation efforts among daily tobacco users from healthcare students, professionals, and staff in Bihar and

Jharkhand, Eastern India. About 1 in 10 respondents were daily tobacco users, with nearly half initiating use during adolescence, primarily due to stress and peer pressure. Social use was common among daily users, while one-fifth preferred smokeless tobacco. Moderate nicotine dependence was most prevalent, followed by low and high dependence, with one-third showing no intention to quit. Early initiation, lack of cessation advice, absence of quit intentions, and solitary use were associated with higher dependence. Two in every three surveyed participants reported making a quit attempt in the past year. Quit attempts were more likely among those who received cessation advice, had quit intentions, used tobacco
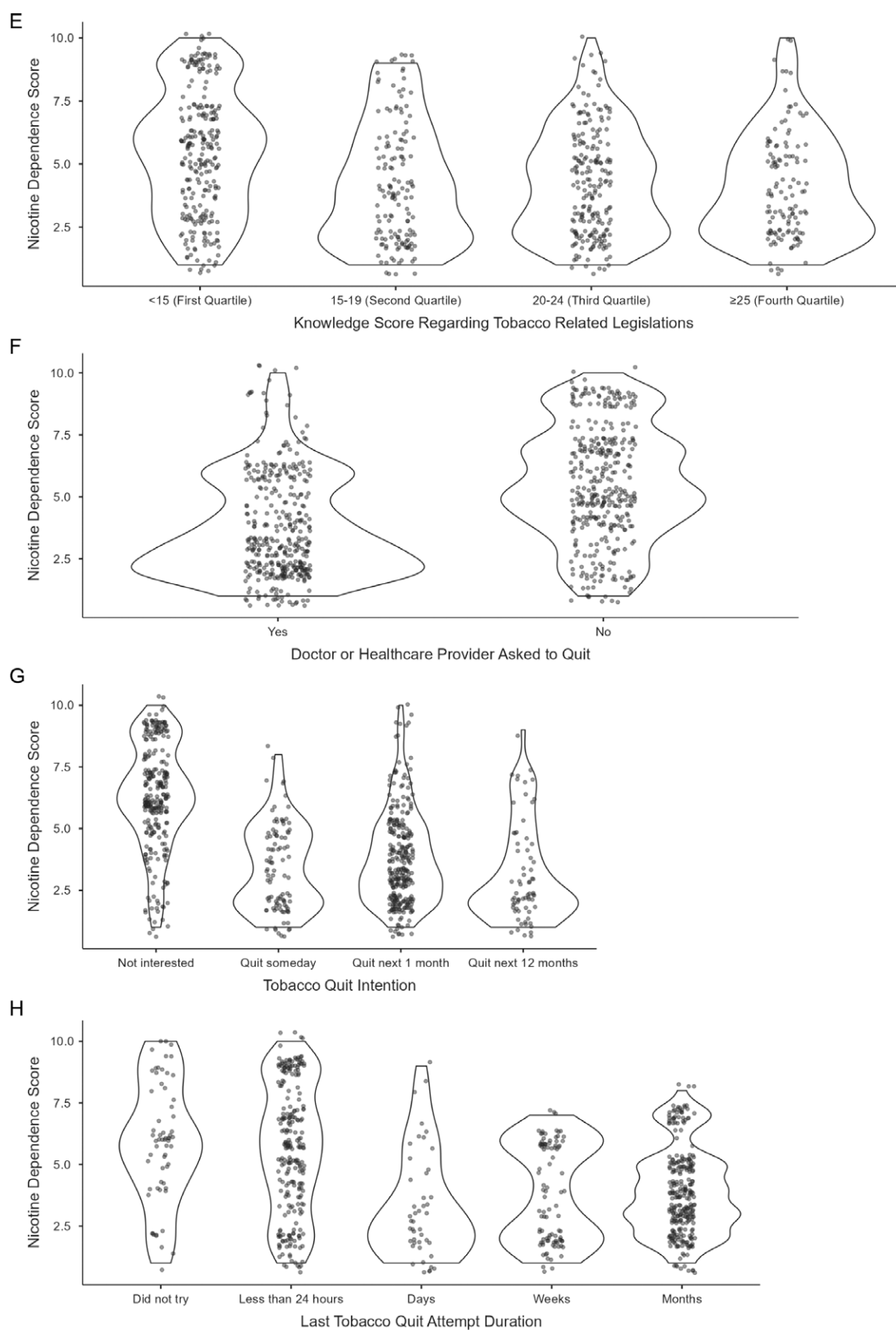
Figure 1. Continued

Table 2. Univariate and multivariate multinomial logistic regression analysis showing predictors of nicotine dependence among the study participants (*n* = 729).

Variable	Nicotine dependence[a]			
	Moderate		High	
	OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Age (in completed years)	**1.03 (1.00–1.05)**	1.00 (0.96–1.05)	**1.08 (1.05–1.11)**	1.04 (0.98–1.11)
Sex				
Male	**2.11 (1.33–3.35)**	1.58 (0.90–2.76)	**3.88 (1.49–10.03)**	1.43 (0.44–4.67)
Females	Ref.	Ref.	Ref.	Ref.
Religion				
Hindu	1.09 (0.73–1.64)	0.98 (0.60–1.61)	2.05 (0.97–4.35)	1.12 (0.44–2.87)
Others	Ref.	Ref.	Ref.	Ref.
Caste				
SC/ST	1.35 (0.88–2.09)	0.91 (0.50–1.64)	**3.18 (1.83–5.55)**	1.85 (0.80–4.27)
Others[a]	Ref.	Ref.	Ref.	Ref.
Marital status				
Currently married	**1.93 (1.33–2.79)**	1.29 (0.59–2.84)	**5.86 (3.51–9.79)**	1.91 (0.62–5.83)
Others	Ref.	Ref.	Ref.	
Occupation				
Staff	**5.93 (3.26–10.79)**	1.64 (0.64–4.21)	**30.60 (14.30–65.48)**	2.12 (0.54–8.34)
Professionals	1.33 (0.89–1.98)	1.01 (0.45–2.26)	**5.32 (2.80–10.09)**	0.95 (0.27–3.39)
Student	Ref.	Ref.	Ref.	Ref.
Yearly family income in USD				
<6012	**1.78 (1.30–2.44)**	1.33 (0.86–2.05)	**2.01 (1.24–3.28)**	1.02 (0.44–2.39)
≥6012	Ref.	Ref.	Ref.	Ref.
Native state of the participants				
Bihar	1.20 (0.75–1.91)	0.87 (0.4–1.5)	**0.46 (0.24–0.89)**	**0.35 (0.14–0.90)**
Jharkhand	**2.01 (1.19–3.39)**	1.54 (0.79–2.96)	1.56 (0.79–3.08)	0.63 (0.21–1.90)
Others	Ref.	Ref.	Ref.	Ref.
Knowledge score related to tobacco control legislations	**0.96 (0.94–0.98)**	0.99 (0.96–1.02)	**0.91 (0.88–0.94)**	0.99 (0.94–1.04)
Age at the time of initiation of tobacco use (in completed years)	0.97 (0.94–1.01)	**0.95 (0.90–0.99)**	**0.88 (0.83–0.93)**	**0.86 (0.79–0.93)**
Preferred form of tobacco				
Both smoking and SLT	**5.87 (2.61–13.21)**	1.85 (0.71–4.80)	**5.43 (2.04–14.47)**	1.98 (0.60–6.43)
Only smoking or SLT	Ref.	Ref.	Ref.	Ref.
Preferred mode of tobacco us				
Alone	**2.04 (1.48–2.81)**	**1.72 (1.13–2.63)**	**2.66 (1.63–4.33)**	1.63 (0.81–3.28)
With friends	Ref.	Ref.	Ref.	Ref.
Doctor or healthcare provider asked to quit within 12 months				
No	**4.64 (3.29–6.54)**	**5.30 (3.44–8.18)**	**11.21 (6.31–19.90)**	**16.15 (7.47–34.94)**
Yes	Ref.	Ref.	Ref.	Ref.
Tried to quit tobacco use within 12 months				
No	**1.52 (1.06–2.19)**	0.58 (0.33–1.04)	**9.87 (5.72–17.05)**	1.32 (0.53–3.29)
Yes	Ref.	Ref.	Ref.	Ref.
Tobacco quit intention				
No	**7.36 (4.76–11.39)**	**9.36 (5.18–16.90)**	**43.28 (22.04–84.96)**	**28.80 (11.29–73.45)**
Yes	Ref.	Ref.	Ref.	Ref.

[a]Low Nicotine Dependence is the Reference Category (not shown on the table). AOR, adjusted odds ratio; CI, confidence interval; OR, odds ratio; SC, Scheduled Caste; SLT, smokeless tobacco; ST, Scheduled Tribe; USD, United States Dollar. All statistically significant odds ratios are presented in bold.

socially, exhibited lower nicotine dependence, and had greater awareness of tobacco control laws.

In this study, moderate nicotine dependence was most common (49.2%), followed by low (38.4%) and high dependence (12.3%). These findings align closely with Chahar et al. [28] in Delhi, where moderate dependence was reported in 48.5% of patients at a cessation centre. However, their higher rate of high dependence (29.7%) compared to

Table 3. Univariate and multivariate multinomial logistic regression analysis showing predictors of tobacco quit intention among the study participants (*n* = 729).

Variable	Tobacco quit intention (Yes) *n* (%)	OR (95% CI)	AOR (95% CI)
Age (in completed years)	460 (63.1)	**0.96 (0.94–0.98)**	0.97 (0.93–1.01)
Sex			
Male	394 (61.9)	Ref.	Ref.
Females	66 (71.7)	1.57 (0.97–2.53)	0.91 (0.49–1.67)
Religion			
Hindu	372 (61.4)	**0.63 (0.41–0.97)**	0.84 (0.49–1.43)
Others	88 (71.5)	Ref.	Ref.
Caste			
SC/ST	63 (48.1)	**0.47 (0.32–0.68)**	0.81 (0.46–1.41)
Others*	397 (66.4)	Ref.	Ref.
Marital status			
Currently married	106 (47.5)	**0.39 (0.28–0.53)**	1.29 (0.63–2.65)
Others	354 (70.0)	Ref.	Ref.
Occupation			
Staff	34 (25.0)	Ref.	Ref.
Professionals	97 (60.6)	**4.62 (2.80–7.62)**	1.96 (0.92–4.19)
Student	329 (76.0)	**9.49 (6.07–14.83)**	**3.97 (1.79–8.77)**
Yearly family income in USD			
<6012	215 (54.4)	Ref.	Ref.
≥6012	245 (73.4)	**2.31 (1.68–3.15)**	1.55 (0.96–2.49)
Native state of the participants			
Bihar	277 (67.9)	Ref.	Ref.
Jharkhand	117 (53.9)	**0.55 (0.39–0.77)**	1.40 (0.85–2.31)
Others	66 (63.5)	0.82 (0.52–1.29)	0.82 (0.45–1.48)
Knowledge score related to tobacco control legislations:	460 (63.1)	**1.11 (1.09–1.14)**	**1.08 (1.06–1.12)**
Age at the time of initiation of tobacco use (in completed years	460 (63.1)	**1.04 (1.01–1.08)**	**1.05 (1.00–1.10)**
Preferred form of tobacco			
Both smoking and SLT	25 (38.5)	Ref.	Ref.
Only smoking or SLT	435 (65.5)	**3.04 (1.79–5.14)**	**2.77 (1.38–5.52)**
Preferred mode of tobacco use			
Alone	209 (60.2)	Ref.	Ref.
With friends	251 (65.7)	1.26 (0.94–1.71)	**1.65 (1.09–2.50)**
Doctor or healthcare provider asked to quit within 12 months			
Yes	251 (67.8)	**1.51 (1.12–2.05)**	**2.03 (1.28–3.22)**
No	209 (58.2)	Ref.	Ref.
Nicotine dependence			
Low	251 (89.6)	**43.28 (22.04–84.96)**	**29.9 (13.37–67.24)**
Moderate	194 (54.0)	**5.88 (3.25–10.63)**	**4.04 (2.05–7.98)**
High	15 (16.7)	Ref.	Ref.

AOR: adjusted odds ratio; CI: confidence interval; OR: odds ratio; SC: Scheduled Caste; SLT: smokeless tobacco; ST: Scheduled Tribe; USD: United States Dollar. All statistically significant odds ratios are presented in bold. *Includes both OBC and General categories.

this study may reflect the clinical population actively seeking support, whereas this study included a more general sample. Similarly, Gupta et al. [29] in Lucknow reported moderate dependence in 43.0% and high dependence in 22.5%, again underscoring the difference between clinical and community settings. In contrast, Parthasarathi et al. [13], studying students, found low dependence to be most common (70.0%), likely due to the younger age and shorter duration of tobacco

use. Parashar et al. [25] among construction workers reported low dependence in 49.0%, moderate in 33.0%, and high in 18.0%, highlighting the role of occupational stress and differing access to healthcare.

Stress was the most common reason for initiation in this study (48.3%), followed by peer pressure (28.5%), contrasting with Janakiram et al. [30] in Kerala, where family influence was predominant (40.0%). This difference may reflect cultural

Table 4. Univariate and multivariate multinomial logistic regression analysis showing predictors of tobacco quit attempt among the study participants (*n* = 729).

Variable	Tobacco quit attempt (Yes) *n* (%)	OR (95% CI)	AOR (95% CI)
Age (in completed years)	495 (67.9)	**0.94 (0.92–0.96)**	**0.95 (0.91–0.99)**
Sex			
Male	423 (66.4)	Ref.	Ref.
Females	72 (78.3)	**1.82 (1.08–3.07)**	1.18 (0.62–2.21)
Religion			
Hindu	398 (65.7)	**0.51 (0.32–0.82)**	0.64 (0.36–1.15)
Others	97 (78.9)	Ref.	Ref.
Caste			
SC/ST	67 (51.1)	**0.42 (0.28–0.61)**	1.06 (0.58–1.90)
Others[*]	428 (71.6)	Ref.	Ref.
Marital status			
Currently married	109 (48.9)	**0.29 (0.21–0.41)**	1.17 (0.55–2.52)
Others	386 (76.3)	Ref.	Ref.
Occupation			
Staff	42 (30.9)	Ref.	Ref.
Professionals	94 (58.8)	**3.19 (1.97–5.16)**	1.33 (0.59–2.98)
Student	359 (82.9)	**10.86 (6.98–16.88)**	**4.67 (1.93–11.30)**
Yearly family income in USD			
<6012	250 (63.3)	Ref.	Ref.
≥6012	245 (73.4)	**1.59 (1.16–2.19)**	1.02 (0.60–1.72)
Native state of the participants			
Bihar	309 (75.7)	Ref.	Ref.
Jharkhand	119 (54.8)	**0.38 (0.27–0.55)**	0.59 (0.35–1.02)
Others	67 (64.4)	**0.58 (0.37–0.92)**	0.67 (0.36–1.26)
Knowledge score related to tobacco control legislations	495 (67.9)	**1.10 (1.08–1.13)**	**1.06 (1.02–1.09)**
Age at the time of initiation of tobacco use (in completed years)	495 (67.9)	**1.04 (1.01–1.08)**	1.05 (0.99–1.10)
Preferred form of tobacco			
Both smoking and SLT	48 (73.8)	Ref.	Ref.
Only smoking or SLT	447 (67.3)	0.73 (0.41–1.29)	**2.28 (1.03–5.00)**
Preferred mode of tobacco use			
Alone	221 (63.7)	Ref.	Ref.
With friends	274 (71.7)	**1.45 (1.06–1.97)**	1.12 (0.73–1.82)
Doctor or healthcare provider asked to quit within 12 months			
Yes	243 (65.7)	0.81 (0.59–1.11)	**2.82 (1.64–4.81)**
No	252 (70.2)	Ref.	Ref.
Nicotine dependence			
Low	219 (78.2)	**9.87 (5.72–17.05)**	1.12 (0.44–2.84)
Moderate	252 (70.2)	**6.45 (3.85–10.88)**	**2.68 (1.23–5.88)**
High	24 (26.7)	Ref.	Ref.
Tobacco quit intention			
Yes	403 (87.6)	**13.60 (9.35–19.78)**	**13.03 (7.42–22.86)**
No	92 (34.2)	Ref.	Ref.

AOR: adjusted odds ratio; CI: confidence interval; OR: odds ratio; SC: Scheduled Caste; SLT: smokeless tobacco; ST: Scheduled Tribe; USD: United States Dollar. All statistically significant odds ratios are presented in bold. [*]Includes both OBC and General categories.

contexts, where family structures play a stronger role in Kerala compared to urban and occupational settings in Bihar and Jharkhand. Similarly, Parashar et al. [25] reported peer pressure as the leading cause of initiation (78.2%) among construction workers, consistent with their social and occupational environments where peer interactions are more prominent. These findings emphasize the need for prevention strategies tailored to socio-cultural and occupational contexts.

Quit intentions were expressed by 63.1% of participants in this study, aligning with Surani et al. [12] (Global Health Professions

Students Survey), where three in five smokers showed willingness to quit. This rate was higher than the 25.0% reported by Mony et al. [15] among healthcare workers in Bangalore but slightly lower than the 70.0% observed by Goyal et al. [24] among Delhi outpatients. The difference may reflect the broader and more diverse demographic in this study compared to healthcare-seeking populations. Additionally, 67.9% reported a quit attempt in the past year, higher than Naik et al.'s [5] 50.0% among HCPs and Gupta et al.'s [29] 59.2% at cessation clinics. These higher rates may reflect better access to resources or greater motivation among participants in this study.

Predictors of nicotine dependence in this study, including early initiation, lack of cessation advice, solitary use, and absence of quit intentions, align with findings from prior research. Early initiation was associated with 2.5 times higher odds of high dependence, consistent with Parashar et al. [25], who reported a similar link between early initiation and severe dependence. Lack of cessation advice increased the odds of high dependence 16-fold, which emphasized the critical role of healthcare guidance in reducing dependence. Solitary tobacco use increased the odds of moderate dependence by 2.3 times, highlighting how reduced social influence may limit opportunities for cessation advice.

For quit intentions, this study identified significant associations with cessation advice, lower dependence, social tobacco use, and awareness of tobacco control laws. Participants receiving cessation advice were 2.8 times more likely to express quit intentions, consistent with Goyal et al. [24] and Koh et al. [19] Lower nicotine dependence was strongly associated with quit intentions, with low dependence showing 30-fold higher odds and moderate dependence 4-fold higher odds compared to high dependence. Social use increased the likelihood of quit intentions by 1.7 times, and each unit increase in awareness of tobacco control laws raised quit intentions by 8%. These comparisons underscore the importance of healthcare advice, social dynamics, and legislative awareness in shaping cessation behaviours.

Participants who received cessation advice from healthcare providers were 2.8 times more likely to quit, highlighting the critical role of healthcare advice. Mono-tobacco users were 2.3 times more likely to quit, aligning with Naik et al. [5], where smokeless tobacco users had 3.3 times higher odds compared to smokers. Moderate nicotine dependence was associated with 2.7 times higher odds of quitting. Quit intentions increased the likelihood of a quit attempt by 13 times, underscoring motivation as the strongest predictor of cessation. Barriers to quitting included withdrawal fears (34.2%), stress reliance (22.1%), and lack of determination (21.9%), similar to Chahar et al. [28], who identified cravings (31.0%) and peer pressure (11.5%) as key relapse factors. These findings highlight psychological and social challenges that need addressing to improve cessation success.

This study underscores the dual role of healthcare students, professionals, and staff as both at-risk individuals and key advocates in tobacco control. The high prevalence of moderate nicotine dependence and substantial proportions of individuals without quit intentions highlight the need for routine screening, tailored early interventions, and motivational strategies. Stress and peer pressure as key triggers for initiation call for targeted stress management and peer-led prevention initiatives. The strong link between cessation advice and both quit intentions and quit attempts emphasizes the importance of integrating routine tobacco counselling into clinical practice.

Greater awareness of tobacco control laws was a significant motivator for quit intentions, underscoring the potential of educational campaigns targeting healthcare providers and the community. Addressing barriers like withdrawal fears, stress reliance, and lack of determination through evidence-based behavioural and pharmacological interventions is critical. Empowering healthcare providers to model tobacco-free behaviours can inspire greater quit intentions and attempts, fostering a culture of cessation aligned with WHO FCTC goals to drive community-wide tobacco control [7, 18].

This study has several limitations that warrant consideration. First, its cross-sectional design precludes causal inferences, capturing data at a single time point. Longitudinal studies are needed to better understand the dynamics of nicotine dependence and cessation behaviours. Second, the reliance on a self-administered Google Form may have introduced response bias, with non-tobacco users potentially overrepresented and tobacco users underreporting their usage. The snowball sampling method, while enhancing participation, may have introduced sampling bias by favouring certain groups through peer referrals. Third, despite assurances of anonymity, social desirability bias may have influenced responses, particularly on sensitive topics like tobacco use and cessation attempts. Fourth, the geographic focus on healthcare institutions in Bihar and Jharkhand limits the generalizability of findings to other regions with varying tobacco use patterns, awareness levels, and cessation behaviours. Fifth, for dual users of smoking and smokeless tobacco, nicotine dependence was assessed using the higher of the two FTND scores. While practical, this method may not fully capture the cumulative effect of concurrent use, potentially underestimating the overall level of dependence in such individuals. Sixth, although a Hindi version of the FTND was included alongside the English version for lower pay-level staff, it has not been formally validated. However, the internal consistency observed suggests that participants interpreted and responded to the items reliably, indicating acceptable comprehension despite the lack of formal validation. Lastly, unmeasured factors such as workplace stress, cultural influences, and family dynamics, which might affect nicotine dependence and cessation efforts, were beyond the scope of this study.

Conclusion

This study highlights the high prevalence of moderate nicotine dependence among healthcare students, professionals, and staff, with stress and peer pressure emerging as key factors for initiation. Quit intentions and attempts were strongly associated with cessation advice, lower nicotine dependence, and awareness of tobacco control laws. However, barriers such as withdrawal fears, reliance on tobacco for stress relief, and lack of determination remain significant challenges. Strengthening healthcare-led cessation efforts and increasing awareness of tobacco control measures could not only help reduce dependence and promote quit attempts but also enable these individuals to become torchbearers for tobacco control within their native communities.

Acknowledgements

study possible. Our gratitude also extends to the healthcare students, professionals, and staff who generously participated in the survey.

Supplementary data

Supplementary data is available at *Family Practice* online.

Authors' contributions

AIIMS Deoghar Tobacco Control Collaborators for Bihar & Jharkhand (ADTCCBJ)

Sweta Suman[1], Rahul Chandra[1], Navin Kumar[1], Sanjay Kumar[2], Geetika Singh[3], Animesh Gupta[3], Madhupriya[3], Soni Rani[4], Arun Kumar Pandey[4], Vikash Chandra Mishra[5], Arpita Rai[6], Amit Vasant Mahuli[7], Anit Kujur[8], Sanjay Kumar[9], Nidhi Prasad[9], Jarina Begum[10], Swati Shikha[10], Abhishek Kumar[10], Deependra Kumar Rai[11], Pramod Kumar[12], Shibajee Debbarma[13], Minti Kumari[14], Rachna Raj[14], Anil Raj[14], Randhir Kumar[15], Sravanthi Malempati[16], Vijay Kumar[17], Sanjay Kumar[18], K. Sri Krishna[19], Ankur Bhargava[20], Nishad Gawali[21], Tulika Singh[22], Prachi Priya[22], Arun Kumar[22], Neha Chaudhary[23], Lovely Kumari[23], Ravi Prakash[23], B.S. Suma[24], Nirmala Kumari[24], Shailendra Kumar[25], Nikhil Nishant[26], Qamrul Khan[26], Mayank Raj[26], Dhananjay Kumar[27], Chandramani Kumar[27], Rakhi Kumari[28], Rishabh Kumar Rana[29], Ravi Ranjan Jha[29], U.K. Ojha[30], Mukesh Kumar[31], Mrinal Ranjan Srivastava[31], Pragyan Das[32], Prakash Ranjan[33], Sukesh Kumar[33], Vikrant Kumar Singh[33], Kashif Shahnawaz[34], Birendra Kumar[35], Ganesh Kumar[35], Naveen Kumar[36], Aman Kishor[37], Rajnish Kumar[38], Abhay Simba[39], Arjun Choudhary[39], Bishnu Deo Goel[39]

[1]Department of Community Medicine, Narayan Medical College & Hospital, Sasaram, Bihar, India; [2]Department of Microbiology, Nalanda Medical College & Hospital, Patna, Bihar, India; [3]Department of Community Medicine, Netaji Subhas Medical College & Hospital, Bihta, Bihar, India; [4]Department of Community Medicine, Katihar Medical College, Bihar, India; [5]Department of Psychiatry, Katihar Medical College, Bihar, India; [6]Department of Oral Medicine and Radiology, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India; [7]Department of Public Health Dentistry, Dental Institute, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India; [8]Department of Community Medicine, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India; [9]Department of Community Medicine, Indira Gandhi Institute of Medical Sciences, Patna, Bihar, India; [10]Department of Community Medicine, Manipal Tata Medical College, Manipal Academy of Higher Education, Manipal, India; [11]Department of Pulmonary Medicine, All India Institute of Medical Sciences, Patna, Bihar, India; [12]Department of Pharmacology, All India Institute of Medical Sciences, Patna, Bihar, India; [13]Department of Community and Family Medicine, All India Institute of Medical Sciences, Patna, Bihar, India; [14]Department of Community Dentistry, Patna Dental College & Hospital, Patna, Bihar, India; [15]Department of Periodontology, Patna Dental College & Hospital, Patna, Bihar, India; [16]Department of Biochemistry, Laxmi Chandravansi Medical College & Hospital, Palamu, Jharkhand, India; [17]Department of Community Medicine, Laxmi Chandravansi Medical College & Hospital, Palamu, Jharkhand, India; [18]Department of Pharmacology, Laxmi Chandravansi Medical College & Hospital, Palamu, Jharkhand, India; [19]Department of Oral Medicine and Radiology, Hazaribag College of Dental Sciences and Hospital, Hazaribag, Jharkhand, India; [20]Department of Oral Pathology, Hazaribag College of Dental Sciences and Hospital, Hazaribag, Jharkhand, India; [21]Department of Community Dentistry, Hazaribag College of Dental Sciences and Hospital, Hazaribag, Jharkhand, India; [22]Department of Community Medicine, Radha Devi Jageshwari Memorial Medical College and Hospital, Muzaffarpur, Bihar, India; [23]Department of Community Medicine, ESIC Medical College & Hospital, Bihta, Bihar, India; [24]Department of Community Dentistry, Buddha Institute of Dental Sciences & Hospital, Patna, Bihar, India; [25]Department of Biochemistry, Buddha Institute of Dental Sciences & Hospital, Patna, Bihar, India; [26]Department of Community Medicine, Medinirai Medical College & Hospital, Palamu, Jharkhand, India; [27]Department of Community Medicine, Sheikh Bhikhari Medical College & Hospital, Hazaribagh, Jharkhand, India; [28]Department of Otorhinolaryngology, Sheikh Bhikhari Medical College & Hospital, Hazaribagh, Jharkhand, India; [29]Department of Community Medicine, Shahid Nirmal Mahato Medical College, Dhanbad, Jharkhand, India; [30]Department of General Medicine, Shahid Nirmal Mahato Medical College,

Dhanbad, Jharkhand, India; [31]Department of Community Medicine, Phulo Jhano Medical College and Hospital, Dumka, Jharkhand, India; [32]Department of Oral Medicine and Radiology, Awadh Dental College and Hospital, Jamshedpur, Jharkhand, India; [33]Department of Community Medicine, Darbhanga Medical College, Darbhanga, Bihar, India; [34]Department of Community Medicine, Jannayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India; [35]Department of General Surgery, Jannayak Karpoori Thakur Medical College and Hospital, Madhepura, Bihar, India; [36]Department of Community Medicine, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Bihar, India; [37]Department of Pharmacology, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Bihar, India; [38]Department of Biochemistry, Bhagwan Mahavir Institute of Medical Sciences, Pawapuri, Bihar, India; [39]Department of Ophthalmology, Anugrah Narayan Magadh Medical College, Gaya, Bihar, India

Conflict of interest

None declared.

Funding

Ethics statement

The study protocol (Ref. 2022-74-EMP-02, dated 30.01.2023) was approved by the Institutional Ethical Committee (IEC) at the All India Institute of Medical Sciences (AIIMS), Deoghar, Jharkhand, India. Prior to participant enrolment, informed consent was obtained online from each individual. Confidentiality and anonymity of participants were strictly maintained during data collection, entry, analysis, and reporting. The study was conducted in full compliance with the principles of the Declaration of Helsinki.

Data availability

The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request. Each request is evaluated individually, based on the rationale provided, the potential benefit to public health and scientific advancement, and compliance with ethical and institutional guidelines.

References

1. *Tobacco*. https://www.who.int/health-topics/tobacco#tab=tab_1. (1 January 2025, date last accessed).
2. *Global Adult Tobacco Survey, Second Round, India 2016-17, Report*. Published online 2018. https://ntcp.mohfw.gov.in/assets/document/surveys-reports-publications/Global-Adult-Tobacco-Survey-Second-Round-India-2016-2017.pdf. (11 June 2023, date last accessed).
3. *The Tobacco Industry Is Targeting the Youth*. https://www.who.int/india/news/feature-stories/detail/the-tobacco-industry-is-targeting-the-youth. (1 January 2025, date last accessed).
4. Ye L, Goldie C, Sharma T, *et al*. Tobacco-nicotine education and training for health-care professional students and practitioners: a systematic review. *Nicotine Tob Res* 2018;**20**:531–42. https://doi.org/10.1093/ntr/ntx072
5. Naik BN, Biswas B, Singh C, *et al*. Tobacco use pattern and quitting behaviour among healthcare professionals during the COVID-19 pandemic: insights from a pan India online survey. *Clin Epidemiol Glob Health* 2021;**12**:100838. https://doi.org/10.1016/j.cegh.2021.100838
6. Doll R, Hill AB. The mortality of doctors in relation to their smoking habits. *BMJ* 1954;**1**:1451–5. https://doi.org/10.1136/bmj.1.4877.1451
7. *WHO Framework Convention for Tobacco Control: Article 12*. Published online 2013. https://fctc.who.int/docs/librariesprovider12/technical-documents/who-fctc-article-12.pdf?sfvrsn=9249246b_57&download=true (11 June 2023, date last accessed).
8. *Smoking Cessation—The Role of Healthcare Professionals and Health Systems*. 2022. https://www.cdc.gov/tobacco/sgr/2020-smoking-cessation/fact-sheets/healthcare-professionals-health-systems/index.html. (5 October 2023, date last accessed).
9. Devonish J, Debnam C, Furgurson E, *et al*. The role of all health-care professionals in cessation. *Tob Induc Dis* 2022;**20**:01. https://doi.org/10.18332/tid/144766
10. Nilan K, McKeever TM, McNeill A, *et al*. Prevalence of tobacco use in healthcare workers: a systematic review and meta-analysis. Glantz SA, ed. *PLoS One* 2019;**14**:e0220168. https://doi.org/10.1371/journal.pone.0220168
11. Prasad N, Singh M, Pal RK, *et al*. Tobacco use among health care workers of tertiary care center of Faridabad, Haryana, India. *Clin Epidemiol Glob Health* 2020;**8**:394–8. https://doi.org/10.1016/j.cegh.2019.09.009
12. Surani N, Pednekar M, Sinha D, *et al*. Tobacco use and cessation counseling in India-data from the Global Health Professions Students Survey, 2005-09. *Indian J Cancer* 2012;**49**:425. https://doi.org/10.4103/0019-509X.107751
13. Parthasarathi A, Shankar M, Madhivanan P, *et al*. Determinants of tobacco use and nicotine dependence among healthcare students and their undergraduate peers. *Curr Respir Med Rev* 2021;**17**:139–50. https://doi.org/10.2174/1573398X17666210713163954
14. La Torre G, Tiberio G, Sindoni A, *et al*. Smoking cessation interventions on health-care workers: a systematic review and meta-analysis. *PeerJ* 2020;**8**:e9396. https://doi.org/10.7717/peerj.9396
15. Mony PK, Vishwanath NS, Krishnan S. Tobacco use, attitudes and cessation practices among healthcare workers of a city health department in Southern India. *J Fam Med Prim Care* 2015;**4**:261–4. https://doi.org/10.4103/2249-4863.154670
16. *Global Adult Tobacco Survey Fact Sheet Bihar 2016-17*. Published online 2018. https://cdn.who.int/media/docs/default-source/searo/india/tobacoo/bihar-gats2-2016-17.pdf?sfvrsn=9f43ca7e_2. (11 June 2023, date last accessed).
17. *Global Adult Tobacco Survey Fact Sheet Jharkhand 2016-17*. Published online 2018. https://www.rctcpgi.org/pdf/Jharkhand-GATS-2-Factsheet.pdf. (11 June 2023, date last accessed).
18. Hoe C, Kennedy RD, Spires M, *et al*. Improving the implementation of tobacco control policies in low-and middle-income countries: a proposed framework. *BMJ Glob Health* 2019;**4**:e002078. https://doi.org/10.1136/bmjgh-2019-002078
19. Koh YS, Sambasivam R, Asharani P, *et al*. Factors influencing smoking cessation: Insights from Singapore's nationwide health and lifestyle survey. *Ann Acad Med Singap* 2024;**53**:608–20. https://doi.org/10.47102/annals-acadmedsg.2024177
20. Farooqui S, Mohammad S, Mehrotra D, *et al*. Study on prevalence and sociocultural aspects of tobacco use in India. *Natl J Maxillofac Surg* 2019;**10**:182–90. https://doi.org/10.4103/njms.NJMS_82_18
21. Ebbert JO, Patten CA, Schroeder DR. The Fagerström Test for Nicotine Dependence-smokeless tobacco (FTND-ST). *Addict Behav* 2006;**31**:1716–21. https://doi.org/10.1016/j.addbeh.2005.12.015

22. Heatherton TF, Kozlowski LT, Frecker RC, *et al*. The Fagerström Test for Nicotine Dependence: a revision of the fagerstrom tolerance questionnaire. *Br J Addict* 1991;**86**:1119–27. https://doi.org/10.1111/j.1360-0443.1991.tb01879.x

23. Manimunda SP, Benegal V, Sugunan AP, *et al*. Tobacco use and nicotine dependency in a cross-sectional representative sample of 18,018 individuals in Andaman and Nicobar Islands, India. *BMC Public Health* 2012;**12**:515. https://doi.org/10.1186/1471-2458-12-515

24. Goyal M, Khokhar A, Lukhmana S, *et al*. Willingness to quit and associated factors among tobacco users attending outpatient departments of a tertiary care hospital in Delhi, India. *Addict Health* 2023;**15**:192–201. https://doi.org/10.34172/ahj.2023.1444

25. Parashar M, Agarwalla R, Mallik P, *et al*. Prevalence and correlates of nicotine dependence among construction site workers: a cross-sectional study in Delhi. *Lung India* 2016;**33**:496–501. https://doi.org/10.4103/0970-2113.188968

26. Biswas B, Varshney S, Jahnavi G, *et al*.; AIIMS Deoghar Tobacco Control Collaborators for Bihar & Jharkhand (ADTCCBJ). Prevalence of tobacco use, legal awareness, and control attitudes among healthcare students, professionals, and staff: a multicentric study in India. *J Public Health (Oxf)* 2025;**47**:fdaf041. https://doi.org/10.1093/pubmed/fdaf041

27. *jamovi desktop - jamovi*. https://www.jamovi.org/download.html. (24 March 2024, date last accessed).

28. Chahar P, Mohanty VR, Aswini YB, *et al*. Correlates of nicotine dependence among patients visiting a tobacco cessation centre in India: a retrospective analysis. *Natl Med J India* 2024;**36**:301–4. https://doi.org/10.25259/NMJI_677_21

29. Gupta VK, Kankane N, Mishra G, *et al*. Assessment of nicotine dependence and readiness to change among patients attending tobacco cessation clinic: a cross-sectional study. *J Indian Assoc Public Health Dent* 2023;**21**:345–51. https://doi.org/10.4103/jiaphd.jiaphd_229_22

30. Janakiram C, Joseph J. Prevalence and dependency of tobacco use in an indigenous population of Kerala, India. *J Oral Hyg Health* 2016;**4**:1000198. https://doi.org/10.4172/2332-0702.1000198