J. Pharm Pract Comm Med, 2026; 12(1):39-44.
www.jppcm.org

Original Article

Impact of Nicotine Replacement Therapy on Academic Performance Among Student Smokers in Mangalore

Priyanka Kalanad*, Muhammad Shahir N, Muhammed Musthafa N, Muhammed Shazin, Muhammed Udaifa T

Department of Pharmacy Practice, Shreedevi College of Pharmacy, Airport Road, Kenjar, Mangaluru, Karnataka, INDIA.

ABSTRACT

Background: Tobacco smoking among college students contributes to nicotine dependence, adverse health effects, and poor academic outcomes. Nicotine withdrawal symptoms such as impaired concentration, stress, and mood changes may negatively affect grades and attendance. Nicotine Replacement Therapy (NRT) may mitigate these effects. **Objectives:** To assess nicotine dependence, utilization of NRT, and its impact on academic performance among student smokers in Mangalore. **Materials and Methods:** A cross-sectional survey was conducted among 75 student smokers aged 18-28 years using a structured online questionnaire. Nicotine dependence was assessed using the Fagerström Test for Nicotine Dependence. Academic performance and attendance before and after NRT use were compared. Data were analyzed using SPSS version 26.0 with χ^2 tests. **Results:** Most participants were aged 21-24 years (70.7%), and 87.0% were male. Moderate nicotine dependence was observed in 41% of students. NRT was used by 75%, predominantly nicotine gum, 59%. Good academic performance increased from 14.3% before NRT to 46.4% after NRT (χ^2=13.78, p<0.01), while poor performance decreased from 19.6 to 10.7%. Attendance also improved significantly (χ^2=8.26, p=0.016). NRT users demonstrated better academic performance than nonusers (89.3 vs. 36.8%, p<0.001). **Conclusion:** NRT use was significantly associated with improved academic performance and attendance. Pharmacist-led tobacco cessation interventions may benefit student health and academic success.

Keywords: Academic Performance, Fagerström test for nicotine dependence, Grade Point Average, Nicotine Dependence, Nicotine Replacement Therapy, Tobacco smoking.

Correspondence:
Priyanka Kalanad
Department of Pharmacy Practice, Shreedevi College of Pharmacy, Airport Road, Kenjar, Mangaluru, Karnataka, INDIA.
Email: drpriyankakalanad@gmail.com

INTRODUCTION

Tobacco smoking continues to be a significant global public health issue, with a notably high prevalence among adolescents and young adults, particularly those in higher-education institutions. The transition to higher education is frequently associated with increased academic demands, psychosocial stress, peer influence, and greater autonomy, all of which may contribute to the initiation and persistence of smoking behaviors (Arnett, 2000; World Health Organization, 2023). In India, tobacco use among young adults presents a substantial challenge due to its long-term health consequences, economic burden, and detrimental effects on quality of life and productivity (Tata Institute of Social Sciences, Ministry of Health and Family Welfare, and Government of India, 2018).

Nicotine dependence is a chronic, relapsing condition that negatively impacts both physical and psychological health. Among students, smoking has been associated with impaired concentration, heightened stress, anxiety, mood disturbances, and sleep-related issues, which may adversely affect academic engagement, attendance, and learning outcomes (Pasch *et al.*, 2010a; Taylor *et al.*, 2014a). Several studies have identified a significant correlation between smoking and poorer academic performance, including reduced Grade Point Average (GPA), decreased motivation, and impaired cognitive functioning (Bradley and Greene, 2013; Latvala *et al.*, 2014).

Nicotine Replacement Therapy (NRT) is an evidence-based smoking cessation strategy that delivers controlled doses of nicotine without exposure to harmful tobacco combustion products. Commonly used forms include nicotine gum, transdermal patches, lozenges, inhalers, and nasal sprays (Stead *et al.*, 2012). By alleviating nicotine withdrawal symptoms such as irritability, restlessness, and difficulty concentrating, NRT has been shown to support mood stability and cognitive performance during cessation attempts (Heishman *et al.*, 2010). While the effectiveness of NRT in promoting smoking cessation is well established, limited research has explored its potential impact on academic performance among student smokers.

Academic performance is a multifactorial outcome influenced by mental health status, lifestyle behaviors, substance use, and overall

OPEN ACCESS

Manuscript TECHNOMEDIA

DOI: 10.5530/jppcm.20260712

physical well-being. Although international studies suggest that smoking cessation may improve cognitive and functional outcomes, evidence examining the relationship between nicotine dependence, NRT use, and academic performance remains scarce, particularly in the Indian context (Singh *et al.*, 2019). Region-specific data are essential to understand local patterns of tobacco use and cessation practices among students.

Mangalore is a prominent educational hub in southern India with a diverse student population. Assessing smoking behavior, nicotine dependence, and utilization of NRT among students in this region is crucial for designing effective tobacco cessation strategies. Furthermore, pharmacists play a vital role in tobacco cessation through patient education, counseling, and appropriate guidance on NRT use, underscoring the relevance of pharmacy practice-based research in this area. Therefore, the present study was undertaken to generate evidence that may support student-focused tobacco control interventions and strengthen the role of pharmacists in smoking cessation services.

The main aim of the study is to assess nicotine dependence, utilization of nicotine replacement therapy, and its impact on academic performance among student smokers in Mangalore. There is a significant association between nicotine dependence and academic performance, and the use of nicotine replacement therapy is associated with improved academic performance among student smokers.

MATERIALS AND METHODS

Study Design and Study Population

A survey-based cross-sectional study was conducted to evaluate the impact of NRT on academic performance among student smokers in Mangalore, Karnataka, India. The study population included undergraduate and postgraduate students aged 18-28 years who were self-reported smokers and currently pursuing their academic programs in institutions located in Mangalore. Students younger than 18 years or older than 28 years, self-reported nonsmokers, and those unwilling to provide informed consent were excluded from the study.

Sample Size

The sample size for the study consisted of 75 student smokers, selected based on feasibility and voluntary participation among eligible students in Mangalore.

Study Materials and Data Collection

Participants were enlisted online after they expressed their consent to join the study. Data collection was carried out using a structured and prevalidated questionnaire, crafted to align with the study's goals and distributed through Google Forms. The questionnaire included sections on demographic details such as age, gender, course, and year of study, as well as smoking history and nicotine dependence, which was measured using the Fagerström Test for Nicotine Dependence. Additionally, information on smoking cessation was gathered, covering reasons for quitting, use of supplementary cessation resources, and specifics about NRT, including past or current use, types of NRT products used, motivation for starting NRT, and nicotine withdrawal symptoms along with their perceived severity. Academic performance was evaluated through self-reported or documented GPA and attendance records. Furthermore, smoking-related health parameters, such as perceived stress levels, mental health status, and overall health status, were assessed.

Statistical Analysis

The collected data were entered into Microsoft® Excel and analyzed using the Statistical Package for the Social Sciences version 26.0. Descriptive statistics were summarized as frequencies and percentages. The χ^2 test was employed to assess associations between categorical variables and to compare academic performance and attendance before and after the use of nicotine replacement therapy. All statistical analyses were two-tailed, and a p-value of less than 0.05 was considered statistically significant.

Ethical Approval

Ethical approval for the study was obtained from the Institutional Ethics Committee of the Shreedevi college of Pharmacy (SDCP/IEC/2024/06). Participation was voluntary, confidentiality and anonymity of participant information were strictly maintained throughout the study.

RESULTS

Sociodemographic Characteristics of Participants

A total of 75 student smokers participated in the study. Most participants were in the 21-24 years age group (70.7%), followed by 18-20 years (21.3%) and 25-28 years (8%). Regarding gender distribution, 65 (87.0%) participants were male and 10 (13.0%) were female.

Academic Background of Study Participants

The academic background of the participants showed representation from multiple health-science disciplines. Among the 75 participants, the highest proportion belonged to the medical Course 23 (31%), followed by pharmacy 20 (26%) and dental 11 (15%). Participants from physiotherapy 9 (12%), nursing 5 (7%), paramedical 2 (3%), and other courses 5 (6%) were also represented. With respect to the year of study, most participants were in their fourth Year 25 (34%), followed by interns 19 (25%). Participants from the second and third years each accounted for 10 (13%), while first-year 6 (8%) and fifth-year students 5 (7%) constituted smaller proportions of the study population.

Smoking Behavior and Nicotine Dependence

Stress relief was the most commonly reported reason for smoking among Participants 30 (40%), followed by peer Pressure 14 (19%) and Curiosity 13 (17%), mental health Issue 8 (11%) and other reasons 10 (13%). Assessment of nicotine dependence using Fagerström Test for Nicotine Dependence revealed that a majority of students had moderate dependence 31 (41%), while 24 (32%) exhibited low-to-moderate dependence. High and low nicotine dependence were observed in 10 (13%) of participants.

NRT Usage

Among the 75 participants, 56 students (75%) reported using nicotine Replacement Therapy, while 25% did not use any form of NRT. Among NRT users, nicotine gum was the most commonly used Product 33 (59%), followed by patches 11 (20%), lozenges 10 (18%) and Inhaler 2 (4%). The predominant motivation for initiating NRT was improvement in academic Performance 39 (70%), followed by improvement in overall Health 10 (18%) (See Table 1).

Comparison of academic performance before and after NRT use

Table 2 shows the comparison of academic performance among students before and after the use of NRT. Before initiation of NRT, most students had average academic Performance 37 (66.1%), while only 8 (14.3%) demonstrated good performance and 11 (19.6%) had poor performance. After NRT use, the proportion of students with good academic performance increased to 26 (46.4%), and those with poor performance decreased from 6 (19.6-10.7%). This improvement in academic performance after NRT use was found to be statistically significant (χ^2=13.78, p<0.01).

Comparison of attendance levels before and after NRT use

Table 3 depicts the comparison of attendance levels among students before and after the use of NRT. Before NRT use, more than half of the students 30 (53.6%) had poor attendance, whereas only 9 (16.1%) had good attendance. Following the initiation of NRT, the proportion of students with good attendance increased to 19 (33.9%) and those with poor attendance decreased to 16 (28.6%). The observed improvement in attendance levels after NRT use was statistically significant (χ^2=8.26, p=0.016).

Association Between NRT Usage and Academic Performance Category

Table 4 illustrates the association between NRT usage and academic performance category among the study participants. A higher proportion of NRT users 50 (89.3%) demonstrated good to average academic performance compared to 7 (36.8%) among non-NRT users. Poor academic performance was reported in 6 (10.7%) NRT users and 12 (63.2%) non-NRT users (χ^2 = 21.41, d_f =1, p<0.001).

Health and Psychological Outcomes of Study Participants

Table 5 summarizes the health and psychological outcomes of the study participants. Smoking-related health problems were reported by 31% of students, while 69% did not report any such conditions. With regard to psychological status, 43% of participants experienced moderate stress and 37% reported high stress levels. Mental-health assessment showed that most students had good to excellent mental health (69%), whereas 17% reported poor mental health. Among students using nicotine Replacement Therapy, 61% reported good to excellent overall health while on NRT.

DISCUSSION

The current research examined the smoking habits, nicotine addiction, and use of NRT among student smokers, as well as their connection to academic performance. Most participants were aged 21-24, with a higher number of males, aligning with the findings of Arnett (2000) and Alqahtani *et al.*, (2023), which suggest that young adulthood is a particularly vulnerable time for

Table 1: Nicotine Replacement Therapy Usage, Type, and Motivation Among Participants.

Variable	Category	Frequency (n)	Percentage (%)
NRT usage status (n=75)	yes	56	75
	no	19	25
Type of NRT used (n=56)	gum	33	59
	inhaler	2	4
	lozenges	10	18
	patch	11	20
Motivation to use NRT (n=56)	improve health	10	18
	improve academic performance	39	70
	socialization	5	9
	others	2	4

Abbreviations: NRT Nicotine Replacement Therapy.

Table 2: Comparison of Academic Performance Before and After NRT Use.

Academic performance	Before NRT *n* (%)	After NRT *n* (%)	χ^2 value	d_f	*p*-value
Good	8 (14.3)	26 (46.4)	13.78	2	<0.01*
Average	37 (66.1)	24 (42.9)			
Poor	11 (19.6)	6 (10.7)			

Abbreviations: NRT Nicotine Replacement Therapy.

Table 3: Comparison of Attendance Levels Before and After NRT Use.

Attendance level	Before NRT *n* (%)	After NRT *n* (%)	χ^2 value	d_f	*p*-value
Good	9 (16.1)	19 (33.9)	8.26	2	0.016*
Average	17 (30.4)	21 (37.5)			
Poor	30 (53.6)	16 (28.6)			

Abbreviations: NRT Nicotine Replacement Therapy.

tobacco use, especially among males. Similar demographic trends have been observed in Indian college studies listed in PubMed and Scopus, which highlight gender differences in smoking rates (Singh *et al.*, 2019).

The greater number of students from medical and pharmacy programs in this study is consistent with the research by Al-Haqel *et al.*, (Al-Haqel *et al.*, 2024) and Singh, Pal, Mehta, and Kapil (2019), which showed that health-science students often smoke despite knowing the health risks. Factors such as academic stress, extended study hours, and clinical duties have been identified as significant contributors to this behavior among healthcare students (Pasch *et al.*, 2010b).

In this study, stress relief was the primary reason for smoking, followed by peer influence and curiosity. This is supported by Taylor *et al.*, (2014b), whose meta-analysis found a strong link between smoking, stress management, and mental-health outcomes. Similar findings have been reported in university studies indexed in Google Scholar, where smoking was used as a maladaptive coping mechanism for academic and psychological stress (Patton *et al.*, 2005).

The Fagerström Test for Nicotine Dependence indicated mainly moderate levels of dependence, aligning with the research of Heishman, Kleykamp, and Singleton (2010) and Rath, Villanti, Abrams, and Vallone (2012), who found that young adult smokers typically show low-to-moderate dependence that can be effectively addressed with pharmacological treatments. This degree of dependence offers a chance for early cessation efforts, particularly through the use of NRT.

A significant observation from the study is the high rate of NRT usage, with nicotine gum being the most frequently chosen form. This trend is supported by findings from Stead *et al.* (2012) and Abbas, Al-Qerem, Saadeh, Abughosh, and Alzoubi (2023), who noted that nicotine gum is favored for its convenience and quick alleviation of withdrawal symptoms. The main reason for starting NRT in this study was to enhance academic performance, indicating a growing awareness of how nicotine withdrawal can affect concentration and learning.

The statistically significant improvement in academic performance following NRT use corroborates earlier research by Bradley and Greene (2013), which found that healthier lifestyle choices are linked to better academic success. Neurocognitive research by Barr *et al.* (2011) further elucidates this improvement by showing that nicotine withdrawal hampers attention and working memory, while controlled nicotine delivery via NRT aids in stabilizing cognitive functions. Similarly, attendance rates significantly increased after starting NRT. This result is in line with Latvala *et al.*, (2014), who demonstrated that smoking negatively impacts educational engagement and attendance. The improved attendance among NRT users may be due to reduced withdrawal symptoms, better mood regulation, and enhanced overall functioning. The association analysis showed that NRT users were significantly more likely to achieve good to average academic performance compared to nonusers. This supports evidence from Scopus-indexed studies indicating that unmanaged nicotine dependence negatively affects academic outcomes, while cessation support can mitigate these effects (Alqahtani *et al.*, 2023; Latvala *et al.*, 2014). The findings underscore the importance of incorporating pharmacist-led tobacco cessation services in academic settings.

Regarding health and psychological outcomes, a significant portion of students reported moderate to high stress levels, consistent with Pasch, Laska, Lytle, Moe, and Perry (2010b). However, most NRT users reported good to excellent overall health, supporting evidence from Taylor *et al.*, (2014b) and Stead *et al.*, (2012) that smoking cessation is linked to improved physical and mental health.

Significance of the Study

This study highlights the association between NRT use and improved academic performance and attendance among student smokers. It underscores the importance of addressing nicotine dependence within educational settings and emphasizes the role of pharmacists in tobacco cessation counseling and NRT management.

Table 4: Association Between NRT Usage and Academic Performance Category.

Academic performance	NRT users *n*=56 (%)	Non-NRT Users *n*=19 (%)	χ^2 value	d_f	*p*-value
Good/average	50 (89.3)	7 (36.8)	21.41	1	<0.001*
Poor	6 (10.7)	12 (63.2)			

Abbreviations: NRT Nicotine Replacement Therapy.

Table 5: Health and Psychological Outcomes of Study Participants.

Variable	Category	Frequency (n)	Percentage (%)
Smoking-related health problems (*n*=75)	Present	23	31
	Absent	52	69
Stress level (*n*=75)	High	28	37
	Moderate	32	43
	Low	15	20
Mental health status (*n*=75)	Excellent	22	29
	Good	30	40
	Fair	10	14
	Poor	13	17
Overall health while using NRT (*n*=56)	Excellent	10	18
	Good	24	43
	Fair	16	28
	Poor	6	11

Abbreviations: NRT Nicotine Replacement Therapy.

LIMITATIONS

The cross-sectional design limits causal inference. Self-reported measures of academic performance and health outcomes may introduce recall bias. The relatively small sample size and single-center setting may limit generalizability.

FUTURE DIRECTIONS

Future research should adopt longitudinal or interventional designs with objective academic indicators such as GPA and attendance records. Multicenter studies and evaluation of structured pharmacist-led cessation programs are recommended to assess long-term academic and health outcomes.

This study demonstrates that nicotine dependence is common among student smokers and that the use of nicotine replacement therapy is significantly associated with improved academic performance and attendance. Students using NRT showed better grades, higher attendance, and improved overall health compared to nonusers. These findings suggest that managing nicotine withdrawal through NRT may enhance concentration and academic engagement. Incorporating pharmacist-led tobacco cessation and NRT counseling programs within educational institutions could support both smoking cessation and academic success among students.

ACKNOWLEDGEMENT

We express our heartfelt gratitude to the Almighty for blessing us with good health, wisdom, and strength throughout the course of our project. We extend our sincere thanks to Dr Jagadish V Kamath, Principal of Shree Devi College of Pharmacy, Mangalore, and the Shree Devi Education Trust for their continuous support and encouragement. We are also deeply grateful to the Indiana Hospital and Heart Institute, Mangaluru, for providing the necessary resources and cooperation that made this study possible.

ABBREVIATIONS

NRT: Nicotine Replacement Therapy; **SPSS:** Statistical Package for the Social Sciences; **χ^2:** Chi-Square Test; **GPA:** Grade Point Average; **SDCP**: Shreedevi College of Pharmacy; **IEC:** Institutional Ethics Committee; **WHO:** World Health Organization; **TISS:** Tata Institute of Social Sciences; **GATS-2:** Global Adult Tobacco Survey 2; **MoHFW:** Ministry of Health and Family Welfare; **d_f:** Degrees of Freedom.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

Abbas, M., Al-Qerem, W., Saadeh, R., Abughosh, S., & Alzoubi, K. (2023). Knowledge and perception of NRT among medical students. Journal of Family Medicine and Primary Care, 12(1), 1-7.

Al-Haqel, A. M., Aljohani, N. J., Althubaiti, A., Alshareef, R., Almutairi, S., Alshammari, A. *et al.* (2024). Tobacco and nicotine use among health students. Frontiers in Public Health, 12, 1348370.

Alqahtani, J. S., Aldhahir, A. M., Alanazi, Z., Alsulami, E. Z., Alsulaimani, M. A., Alqarni, A. A., AlAhmari, M. D. (2023). Impact of smoking status and nicotine dependence on academic performance of health sciences students. Substance Abuse and Rehabilitation, 14, 13-24. doi: 10.2147/SAR.S393062, PubMed: 36865699.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. American Psychologist, 55(5), 469-480. doi: 10.1037/0003-066X.55.5.469, PubMed: 10842426.

Barr, M. S., Farzan, F., Rusjan, P. M., Chen, R., Fitzgerald, P. B., & Daskalakis, Z. J. (2011). Nicotine effects on cognition and brain activity. Neuropsychopharmacology, 36(11), 2399-2409.

Bradley, B. J., & Greene, A. C. (2013). Do health and education agencies in the United States share responsibility for academic achievement and health? A review of 25 years of evidence about the relationship of adolescents' academic achievement and health behaviors. Journal of Adolescent Health, 52(5), 523-532. doi: 10.1016/j.jadohealth.2013.01.008, PubMed: 23535065.

Heishman, S. J., Kleykamp, B. A., & Singleton, E. G. (2010). Meta-analysis of the acute effects of nicotine and smoking on human performance. Psychopharmacology, 210(4), 453-469. doi: 10.1007/s00213-010-1848-1, PubMed: 20414766.

Latvala, A., Rose, R. J., Pulkkinen, L., Dick, D. M., Korhonen, T., & Kaprio, J. (2014). Drinking, smoking, and educational achievement: Cross-lagged associations from adolescence to adulthood. Drug and Alcohol Dependence, 137, 106-113. doi: 10.1016/j.drugalcdep.2014.01.016, PubMed: 24548801.

Pasch, K. E., Laska, M. N., Lytle, L. A., Moe, S. G., & Perry, C. L. (2010a). Adolescent sleep, risk behaviors, and depressive symptoms: Are they linked? Journal of Adolescent Health, 47(6), 554-561.

Pasch, K. E., Laska, M. N., Lytle, L. A., Moe, S. G., & Perry, C. L. (2010b). Adolescent sleep, risk behaviors, and depressive symptoms. Journal of Adolescent Health, 47(6), 554-561.

Patton, G. C., Coffey, C., Carlin, J. B., Sawyer, S. M., & Lynskey, M. (2005). Reverse gateways? Frequent cannabis use as a predictor of tobacco initiation and nicotine dependence. Addiction, 100(10), 1518-1525. doi: 10.1111/j.1360-0443.2005.01220.x , PubMed: 16185213.

Rath, J. M., Villanti, A. C., Abrams, D. B., & Vallone, D. M. (2012). Patterns of tobacco use and dual use in young adults. Nicotine and Tobacco Research, 14(6), 699-706.

Singh, V., Pal, H. R., Mehta, M., & Kapil, U. (2019). Tobacco consumption and awareness of tobacco hazards among college students in Delhi. Indian Journal of Community Medicine, 44(2), 131-135.

Stead, L. F., Perera, R., Bullen, C., Mant, D., Hartmann-Boyce, J., Cahill, K., & Lancaster, T. (2012). Nicotine replacement therapy for smoking cessation. Cochrane Database of Systematic Reviews, 11, CD000146. doi: 10.1002/14651858.CD000146.pub4, PubMed: 23152200.

Tata Institute of Social Sciences (TISS), Ministry of Health and Family Welfare, & Government of India (2018). Global adult tobacco survey GATS-2 India 2016-17. New Delhi: MoHFW.

Taylor, G., McNeill, A., Girling, A., Farley, A., Lindson-Hawley, N., & Aveyard, P. (2014a). Change in mental health after smoking cessation: Systematic review and meta-analysis. Addiction, 109(9), 1473-1482.

Taylor, G., McNeill, A., Girling, A., Farley, A., Lindson-Hawley, N., & Aveyard, P. (2014b). Change in mental health after smoking cessation. Addiction, 109(9), 1473-1482.

World Health Organization (2023). WHO report on the global tobacco epidemic 2023: Protect people from tobacco smoke. Geneva: World Health Organization.

Cite this article: Kalanad P, Shahir NM, Musthafa NM, Shazin M, Udaifa TM. Impact of Nicotine Replacement Therapy on Academic Performance Among Student Smokers in Mangalore. J Pharm Pract Comm Med. 2026;12(1):39-44.