J. Pharm Pract Comm Med, 2026; 12(2):105-110.
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, 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, Grade point average, Nicotine dependence, Nicotine replacement therapy, Tobacco smoking.

Correspondence:
Priyanka Kalanad
Department of Pharmacy Practice, Shreedevi College of Pharmacy, Kenjar, Mangaluru-574142, Karnataka, INDIA.
Email: drpriyankakalanad@gmail.com

INTRODUCTION

Tobacco smoking remains a major public health concern globally, with a high prevalence among adolescents and young adults, particularly college and university students. The transition into higher education is often associated with increased academic demands, psychosocial stress, peer influence, and greater autonomy, all of which may contribute to the initiation and continuation of smoking behaviors (Arnett, 2000; World Health Organization, 2023). In India, tobacco use among young adults poses a significant challenge due to its long-term health consequences, economic burden, and negative impact 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 adversely affects both physical and psychological health. Among students, smoking has been linked to impaired concentration, increased stress, anxiety, mood disturbances, and sleep-related problems, which may negatively influence academic engagement, attendance, and learning outcomes (Pasch *et al*., 2010a; Taylor *et al*., 2014a). Several studies have reported a significant association 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 provides 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 influence on academic performance among student smokers.

Academic performance is a multifactorial outcome influenced by mental health status, lifestyle behaviors, substance use, and overall physical well-being. Although international studies suggest

DOI: 10.5530/jppcm.20260015

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 were 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 recruited through an online mode after obtaining their willingness to participate. Data were collected using a structured, prevalidated questionnaire designed in accordance with the study objectives and administered via Google Forms.

The questionnaire consisted of sections covering demographic characteristics (age, gender, course, and year of study), smoking history, and nicotine dependence, which was assessed using the Fagerström Test for Nicotine Dependence. Information related to smoking cessation was also collected, including reasons for quitting, use of additional cessation resources, and details regarding nicotine replacement therapy such as prior or current use of NRT, type of NRT products used, motivation for initiating NRT, and nicotine withdrawal symptoms along with their perceived severity.

Academic performance was assessed using self-reported or documented GPA and attendance records. Additionally, smoking-related health parameters, including perceived stress level, mental health status, and overall health status, were evaluated.

Statistical Analysis

The collected data were entered into Microsoft® Excel and analyzed using the Statistical Package for 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 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 most 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 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%) (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. About 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 present study assessed smoking behavior, nicotine dependence, use of NRT, and their association with academic performance among student smokers. The predominance of participants in the 21-24-year age group and the higher proportion of males are consistent with findings reported by (Arnett, 2000;

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

NRT: Nicotine Replacement Therapy.

Table 2: Comparison of Academic Performance Before and After NRT Use (*n*=56).

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)			

NRT: Nicotine Replacement Therapy.

Table 3: Comparison of Attendance Levels Before and After NRT Use (*n*=56).

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)			

NRT: Nicotine Replacement Therapy.

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)			

NRT: Nicotine Replacement Therapy.

Alqahtani *et al.*, 2023), which indicate that emerging adulthood is a high-risk period for tobacco use, particularly among males. Similar demographic patterns have been reported in Indian college-based studies indexed in PubMed and Scopus, highlighting gender-based differences in smoking prevalence (Singh *et al.*, 2019).

The higher representation of students from medical and pharmacy courses observed in this study aligns with evidence reported by Al-Haqel *et al.*, (Al-Haqel *et al.*, 2024; Singh *et al.*, 2019) who demonstrated that health-science students frequently engage in smoking despite awareness of its health risks. Academic stress, long study hours, and clinical responsibilities have been identified as key contributors to this behavior among healthcare students (Pasch *et al.*, 2010b).

Stress relief was the most common reason for smoking in the present study, followed by peer pressure and curiosity. This finding is supported by Taylor *et al.*, (2014b) whose meta-analysis demonstrated a strong association between smoking, stress regulation, and mental-health outcomes. Similar observations have been reported in university-based studies indexed in Google Scholar where smoking was used as a maladaptive coping strategy for academic and psychological stress (Patton *et al.*, 2005).

Assessment of nicotine dependence using the Fagerström Test revealed predominantly moderate dependence, consistent with findings by (Heishman *et al.*, 2010; Rath *et al.*, 2012) who reported that young adult smokers often exhibit low-to-moderate dependence levels that are amenable to pharmacological interventions. This level of dependence presents an opportunity for early cessation strategies, particularly the use of NRT.

A key finding of the study is the high utilization of NRT, with nicotine gum being the most commonly used formulation. This pattern mirrors evidence from (Stead *et al.*, 2012; Abbas *et al.*, 2023) who reported that nicotine gum is widely preferred due to its ease of use and rapid relief of withdrawal symptoms. The primary motivation for initiating NRT in the present study was improvement in academic performance, suggesting increased awareness of the impact of nicotine withdrawal on concentration and learning.

The statistically significant improvement in academic performance after NRT use supports earlier findings by Bradley and Greene (2013) who reported that healthier lifestyle behaviors are positively associated with academic achievement. Neurocognitive studies by Barr *et al.*, (2011) further explain this improvement by demonstrating that nicotine withdrawal impairs attention and working memory, while controlled nicotine delivery through NRT helps stabilize cognitive function.

Similarly, attendance levels improved significantly after NRT initiation. This finding is consistent with Latvala *et al.*, (2014) who showed that smoking negatively affects educational engagement and attendance. Improved attendance among NRT users may be attributed to reduced withdrawal symptoms, better mood regulation, and improved overall functioning.

The association analysis revealed that NRT users were significantly more likely to demonstrate good to average academic performance compared to nonusers. This supports evidence from Scopus-indexed studies indicating that unmanaged nicotine dependence adversely affects academic outcomes, while cessation support may mitigate these effects (Alqahtani *et al.*, 2023; Latvala

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

NRT: Nicotine Replacement Therapy.

et al., 2014). The findings reinforce the importance of integrating pharmacist-led tobacco cessation services in academic institutions.

Regarding health and psychological outcomes, a substantial proportion of students reported moderate to high stress levels, consistent with findings from 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 associated with 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.

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 non-users. 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.

CONCLUSION

The conclusion of the study indicates that nicotine dependence is a prevalent issue among student smokers, with the use of Nicotine Replacement Therapy (NRT) being significantly associated with positive shifts in both academic performance and attendance. Students who utilized NRT demonstrated better grades, higher rates of attendance, and improved overall health outcomes when compared to non-users. The researchers suggest that by managing nicotine withdrawal symptoms through NRT, students may experience enhanced concentration and greater academic engagement. Ultimately, the study advocates for the implementation of pharmacist-led tobacco cessation and NRT counseling programs within educational institutions to bolster both smoking cessation efforts and the academic success of 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; **GPA:** Grade Point Average; **SPSS:** Statistical Package for the Social Sciences; $\mathbf{d_f}$**:** Degrees of freedom; $\boldsymbol{\chi^2}$**:** Chi-squared test; **p:** *p*-value; **n:** Frequency or number of participants; **U.G.:** Undergraduate; **IEC:** Institutional Ethics Committee.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

Abbas, M., Al-Qerem, W., Saadeh, R., Abughosh, S., and 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., and Daskalakis, Z. J. (2011). Nicotine effects on cognition and brain activity. *Neuropsychopharmacology*, *36*(11), 2399-2409.

Bradley, B. J., and 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., and 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., and 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., and 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., and 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., and 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., and 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., and 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., and 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, and 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., and 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., and 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(2):105-10.