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Original Research Article

Unmasking Tobacco Dependence & Consumption Patterns: A Comprehensive Analysis of Smoking and Smokeless Tobacco Habits in the Rural Population of Dehgam Taluka, Gujarat, India

Archana Patel[1], Rutvi Vaidya[2], Jaydeepkumar Ghevariya[3], Chintul Shah[4]

[1]Assistant Professor, Community Medicine Department, GMERS Medical college and hospital, Himmatnagar, Gujarat, India

[2]Assistant Professor, Community Medicine Department, GMERS Medical college and hospital, Vadnagar, Gujarat, India

[3]Assistant Professor, Community Medicine Department, GCS Medical College, Ahmedabad, Gujarat, India

[4]Associate Professor of Community Medicine department, B J Medical College Ahmedabad, Gujarat, India

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Corresponding Author: Dr. Archana Patel

Conflict of interest: Nil

Abstract:

Background: The use of smokeless tobacco, which is more common than cigarette smoking in India, especially in rural areas, is a serious public health concern. This study was conducted to investigate the factors associated with tobacco use and nicotine dependency level within the study group.

Materials & Methods: A cross-sectional study was conducted in Dehgam, Gujarat (Mar 2021-Nov 2022); focused on tobacco use among 1,200 participants, aged 15 years and above. Cluster sampling was used to select a total of 30 villages as a cluster, 40 participants were selected from each cluster. Interviews were conducted using google form, and ethical guidelines were followed.

Results: A study of the 1200 participants revealed a prevalence of 12.3% for current smokers, with 69% being daily smokers. Additionally, 29.4% reported current smokeless tobacco use, with 93% engaging in daily consumption. Past tobacco use was reported by 2.6% of the participants. When it comes to smoking, beedis were the preferred choice (67.3%) compared to cigarettes (30.6%). Among smokeless tobacco users, pan masala with tobacco (Mava) held the highest prevalence (74.5%), followed by Miraj (46.7%) and gutkha (42.2%). Our findings show a significant association ($p<0.05$) between age group and duration of tobacco use and nicotine dependency among smokers and smokeless tobacco users.

Conclusions: Despite policy efforts, smokeless tobacco use remains a significant public health issue in India. Smokers' dependence on nicotine and limited access to quit resources highlight the need for stronger tobacco control policies and improved cessation support.

Keywords: Consumption pattern, Smoking and smokeless tobacco, Tobacco dependence, rural population.

Introduction

Tobacco, from the Nicotiana genus, was discovered by Native peoples in Mesoamerica and South America. The name "tobacco" is Spanish and Portuguese. Christopher Columbus introduced it to Europe in 1492 after encountering it in Cuba.[1]

Tobacco, initially used for religious and medicinal purposes, evolved into a popular painkiller and cash crop. Introduced to India by the Portuguese in 1600 AD, its cultural significance waned mid-20th century due to health concerns revealed by scientific studies.[2] The tobacco epidemic is a serious global health crisis, causing over 8 million deaths annually, including more than 7 million from direct use and 1.2 million from second-hand smoke exposure.[3] Shockingly, 80,000 to 100,000 young people start smoking daily, and 500 out of every 1,000 teenage smokers will eventually die from tobacco-related diseases.[4] In India, smoking typically involves inhaling the smoke from burning substances like tobacco, with beedis being the most popular form.[5]

In Gujarat, 7.7% of adults smoke tobacco, with 8.6% smoking daily and 3.1% occasionally. Men (19.0%) smoke more than women (2.0%). In the past 30 days, second-hand smoke exposure occurred at home (38.7%), workplaces (30.2%), government buildings (5.3%), health care facilities (5.6%), restaurants (7.4%), and public transporta-

tion (13.3%).[6] Smokeless tobacco is consumed orally or nasally without heating or burning and includes products like Paan, Gutkha, Khaini, and Snus. In India, popular forms such as khaini, gutka, and betel quid are widely used, with pan masala and gutka produced on an industrial scale. Smokeless tobacco use is more prevalent than cigarette smoking, with 21.4% of Indians (29.6% of men and 12.8% of women) using it. In Gujarat, the prevalence is 19.2%.[6] Nicotine dependence is a major global health issue, causing over 8 million deaths annually, characterized by a compulsive need for nicotine, loss of control, and withdrawal symptoms. Understanding its neurobiological adaptations is key to managing this chronic disease, though assessing it, especially in developing nations, remains challenging.[7] The Fagerström Test for Nicotine Dependence (FTND) is a widely accepted self-reporting tool that evaluates physiological and behavioral symptoms. Comprising six components, it measures smoking frequency, dependence, and consumption amount, yielding scores ranging from 0 to 10. Higher scores indicate greater physical dependence.[8–10]

Total Score	Categories
0 to 2	Very Low Dependence
3 to 4	Low Dependence
5	Medium Dependence
6 to 7	High Dependence
8 to 10	Very High Dependence

The Heaviness of Smoking Index (HSI), a condensed version of the FTND based on the time of the first cigarette and daily consumption, categorizes dependence on a six-point scale, but its validity in non-clinical populations may be limited due to floor effects among lighter smokers.[11] Despite challenges, FTND and HSI are valuable for assessing nicotine dependence and guiding treatment, but further research is needed to improve their accuracy and applicability across different contexts. Tobacco use is a major global health issue, causing millions of deaths annually.

In India, a diverse and large population faces complex tobacco consumption patterns, with smokeless tobacco being a significant concern, especially in rural areas. This research examines tobacco use specifically in the rural Dehgam Taluka of Gujarat.

Materials and Methods

An observational Cross-sectional study was conducted in Dehgam taluka, Gujarat, from March 2021to November 2022, focusing on tobacco use. This study included individuals aged 15 and above from a population of 225,930, as per the 2011 census. Those who didn't give consent or couldn't be reached were excluded. The study included 1,200 participants, as determined by a formula. Cluster sampling was employed, selecting 30 villages out of 92. Each cluster was divided into Sheri/mohalla, and the 40 samples were distributed proportionally among them.

Within each Sheri/mohalla, household samples were selected using systematic random sampling. Current tobacco users are defined as individuals who have used tobacco at least once in the 30days preceding the survey. Past smokers (former/ex-smokers) are defined as individuals who have not smoked in the last month.

The study involved face-to-face interviews via Google Forms, following ethical approval. A structured questionnaire covering demographics, tobacco use, nicotine dependence, cessation, media influence, and tobacco advertising was used. Data analysis was conducted using Excel and chi-square tests to examine relationships between variables. Ethical approval was obtained from the Institutional Ethics Committee, and verbal informed consent was collected as per ICMR Ethics guidelines (2017), with strict adherence to ethical principles throughout the study.

Results

Table 1: Prevalence of tobacco use in the study population. (N=1200)

Prevalence	No. (%)
Current Tobacco users	426 (35.5%)
Current tobacco smokers (occasional + daily)	147 (12.3%)
Current smokeless tobacco users	353 (29.4%)
Use of both forms of tobacco	74 (6.2%)
Former tobacco users	31 (2.6%)
Never Tobacco users	743 (61.9%)

The table shows that 12.3% of study participants were current tobacco smokers, 29.4% were smokeless tobacco users, 6.2% reported using both forms of tobacco. In contrast, most participants (61.9%) had never used

tobacco, emphasizing a substantial proportion of non-users. Additionally, 2.6% of participants were classified as former tobacco users.

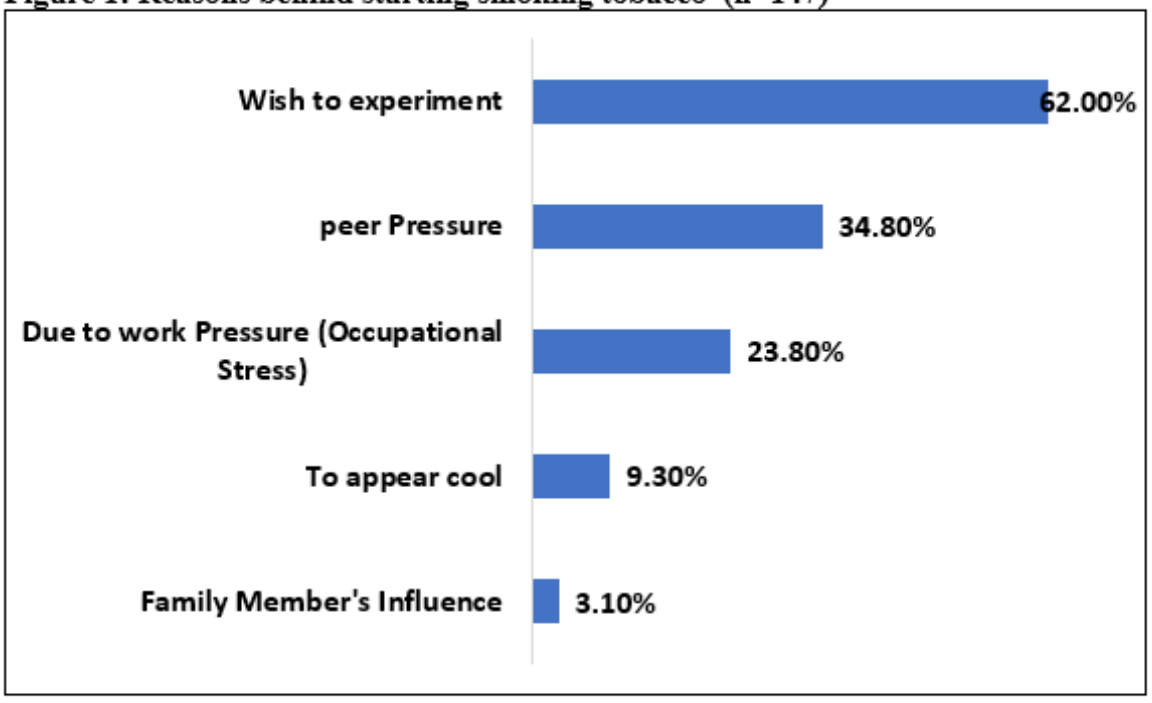
Table 2: Responses to various questions put across the study population in tobacco smokers only. (N=147)

Questions	Smoking tobacco [no. (%)]			
Type of tobacco used*	Cigarette	Beedi	Cigarette + Beedi	Chalam
	45 (30.6%)	99 (67.3%)	02 (1.4%)	01 (0.7%)
Age at which started	5-14 year	15-24 year	25-34 year	35 years & above
	1 (0.7%)	118 (80.3%)	20 (13.6%)	8 (5.4%)
Duration of tobacco use	≤ 5year	6-10 year	11-20 year	20 years & above
	19 (12.9%)	15 (10.2%)	62 (42.2%)	51 (34.7%)
How many days of tobacco used in the last 30 days?	1-10 days	11-29 days	All 30 days	
	14 (9.5%)	32 (21.8%)	101 (68.7%)	
In the last 30 days on average, how many items were used / day?	≤ 10/ day	11-20/day	21-30/day	≥ 31/day
	96 (65.3%)	41 (27.9%)	10 (6.8%)	00 (0.0%)
Where do you usually smoke? *	At home	At social events	At Workplace	In public spaces (e.g., parks, shopping centres, street corners)
	53 (36.1%)	36 (24.5%)	74 (50.3%)	21 (14.3%)

*** Multiple answers**

Among smokers, majority (67.3%) used beedis while 30.6% used cigarettes. Most of them (80.3%) started smoking between the ages of 15 to 24 years, most of the smokers (42.2%) had been smoking for 11-20 years and 34.7% had been smoking for more than 20 years. Approximately two thirds (68.7%) of smokers smoke daily, while the majority (65.3%) smoke less than ten times per day. They usually smoke at the workplace (50.3%) or at home (36.1%).

Figure 1: Reasons behind starting smoking tobacco*(n=147)



* Multiple answers

Figure 1: Reasons behind starting smoking tobacco* (n=147)

Figure 1 shows that the main reason behind starting to smoke tobacco was their wish to experiment (62.0%) followed by peer pressure (34.8%) while few of them (3.1%) were influenced by family members' habits.

Table 3: Responses to various questions put across the study population in smokeless tobacco users only. (N=353)

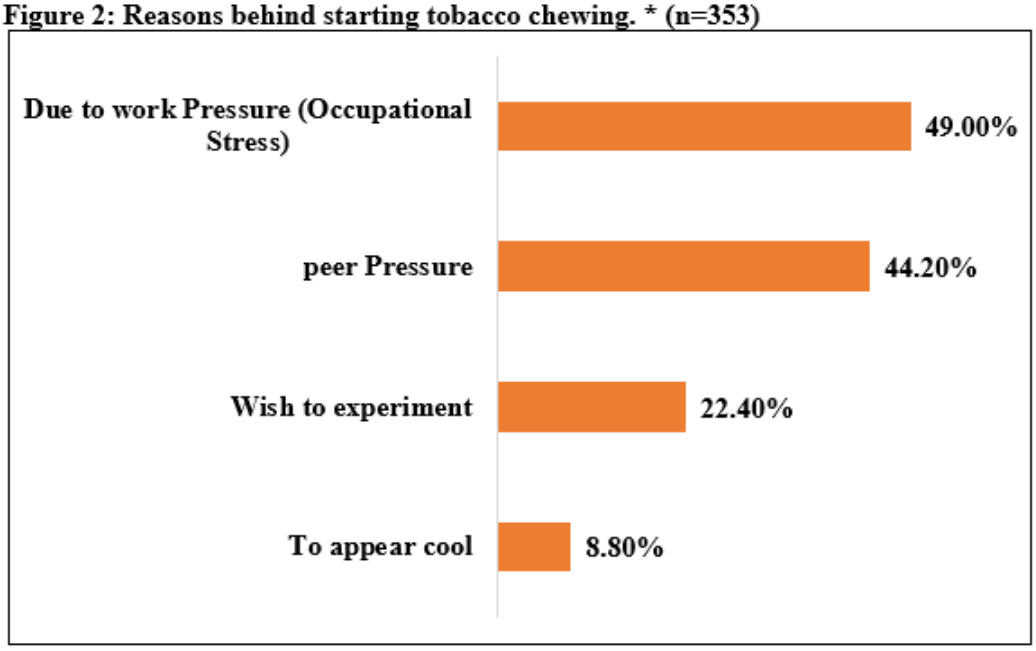
Questions	Smokeless tobacco (%)			
Type of tobacco used*	Pan masala with tobacco	Gutkha	Miraj	Mishri other
	263 (74.5)	149 (42.2)	165 (46.7)	27 (7.6)
Age at which started	5-14 year	15-24 year	25-34 year	35 years & above
	16 (4.5)	250 (70.8)	68 (19.3)	19 (5.4)
Duration of tobacco use	≤ 5year	6-10 year	11-20 year	20 years & above
	69 (19.5)	32 (9.1)	139 (39.4)	113 (32.0)
How many days of tobacco used in the last 30 days?	1-10 days	11-29 days	All 30 days	
	13 (3.7)	11 (3.1)	329 (93.2)	
How many pouches do you use per week?	1		2-3	
	288 (81.6%)		65 (18.4%)	
Where do you usually chew? *	At home	At social events	At Work-place	In public spaces (e.g., parks, shopping centers, street corners)
	205 (58.1)	33 (9.3)	157 (44.5)	40 (11.3)

*** Multiple answers**

Among smokeless tobacco users, about three-fourth (74.5%) used pan masala with tobacco (mava) and around half of them (46.7%) used Miraj followed by gutkha (42.2%). Majority (70.8%) of them started using smokeless tobacco chewing between the age of 15 to 24 years, most of the smokeless tobacco users (39.4%) had been smoking for 11-20 years and 32.0% had been using it for more than 20 years.

93.2 % of users chew on daily basis. usually, chew at home (58.1%) followed by workplace (44.5%).

Figure 2: Reasons behind starting tobacco chewing. * (n=353)

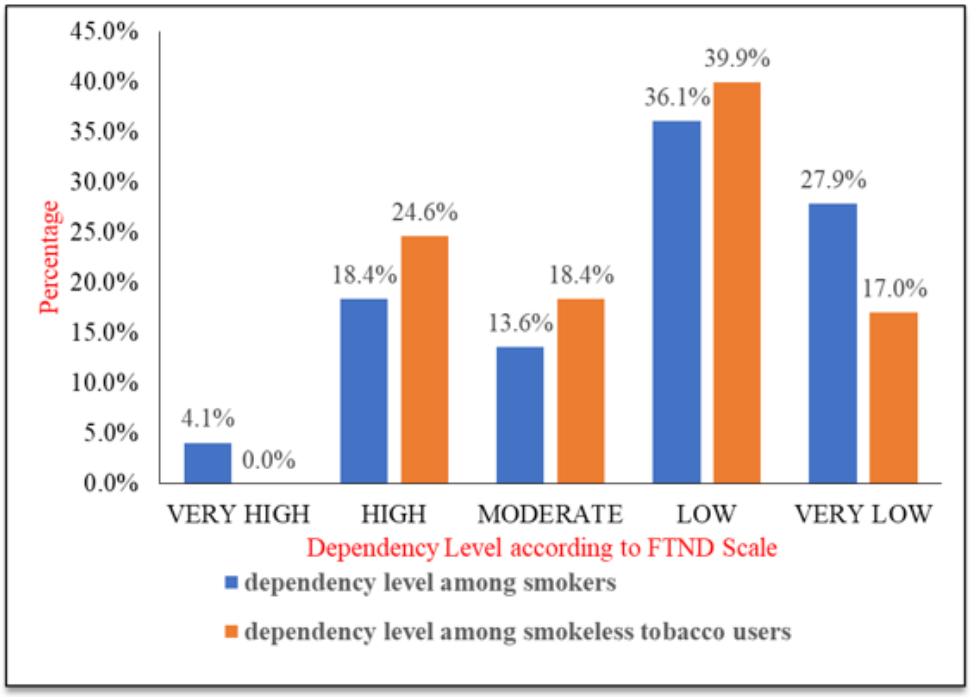


* Multiple answers

Figure 2: Reasons behind starting smoking tobacco* (n=353)

Figure 2 shows Occupational stress (49.0%) was the main reason behind starting smokeless tobacco followed by peer pressure (44.2%). Other reasons behind starting tobacco chewing were wished to experiment (22.4%) and to appear cool (8.8%) in front of others.

Figure 3: Dependency Level according to FTND scale among Smokers and smokeless tobacco users.



Score: 0-2 very low dependency, 3-4 low dependency, 5 moderate dependency, 6-7 high dependency, 8-10 very high dependency

Figure 3: Dependency level according to FTND scale among smokers and tobacco users.

In figure 3, Low dependency was seen among 39.9% and 36.1% smokeless and smoking tobacco users respectively while high dependency was seen among 24.6% and 18.4% smokeless and smoking tobacco users respectively. The overall mean FTND Score among smokers was 3.17 ± 2.21 (Range=0-8), Mean FTND Score among smokeless users was- 4.27 ± 1.62 (Range=0-7)

Table 4: Distribution of level of nicotine dependence among smokers according to a different variable (n=147)

Basic Characteristics	Among Smokers		Test value. (df)	P value
	Low dependence [a] (n=114, 77.5%)	High dependence [b] (n= 33, 22.5%)		
	n (%)	n (%)		
Age group				
15-34	22 (19.3%)	0 (0.00%)	X^2-65.8 (df=2)	<0.0001**
35-54	53 (46.5%)	11 (33.3%)		
55 & above	39 (34.2%)	22 (66.7%)		
Duration of tobacco use (in a year)				
≤5 year	18 (15.8%)	1 (3.0%)	X^2-50.5 (df=3)	<0.0001**
6-10 year	14 (12.3%)	1 (3.0%)		
11-20 year	49 (43.0%)	13 (39.4%)		
>20 year	33 (28.9%)	18 (54.5%)		
Age at initiation (in a year)				
5-14 year	1 (0.9%)	0 (0.00%)	Fisher's exact test -6.87 (df=3)	0.072
15-24 year	89 (78.1%)	29 (87.9%)		
25-34 year	18 (15.8%)	2 (6.1%)		
35 & above	6 (5.3%)	2 (6.1%)		

[a] cut-off point <6 is classified as Low dependence, [b] cut-off point ≥6 is classified as high dependence, ** very highly significant.

Among smokers, in the age group 55 years & above, 66.7% were found to have high dependency while 46.5% belonging to the age group 35-54 years were found to have a low dependency. Among those using tobacco for >20 years, 54.5% were found to have high dependency while those using tobacco for 11-20 years 43.0% were found to have a low dependency. 87.9% high dependency and 78.1% low dependency was found in those who started smoking between 15-24 years of age. There was a highly significant difference between nicotine dependency levels among smokers and their age group, and duration of tobacco use in a year. (p=<0.05)

Table 5: Distribution of level of nicotine dependence among smokeless tobacco users according to different variables (n=353)

Basic Characteristics	Among Smokeless users		Test value. (df)	P value
	Low dependence [a] (n=266, 75.4%)	High dependence [b] (n=87, 24.6%)		
	n (%)	n (%)		
Age group				
15-34	94 (35.3%)	0 (0.00%)	13.89 (df=2)	0.001**
35-54	124 (46.6%)	38 (43.7%)		
55 & above	48 (18.0%)	49 (56.3%)		
Duration of tobacco (in a year)				
≤5 year	69 (25.9%)	0 (0.00%)	Fisher's exact test 10.28 (df=3)	0.017*
6-10 year	32 (12.0%)	0 (0.00%)		
11-20 year	98 (36.8%)	41 (47.1%)		
>20 year	67 (25.2%)	46 (52.9%)		
Age at initiation (in a year)				
5-14 year	11 (4.1%)	5 (5.7%)	Fisher's exact test 2.52 (df=3)	0.551
15-24 year	191 (71.8%)	59 (67.8%)		
25-34 year	46 (17.3%)	22 (25.3%)		
35 & above	18 (6.8%)	1 (1.1%)		

[a] cut-off point <6 is classified as Low dependence, [b] cut-off point ≥6 is classified as high dependence, ** very highly significant, *Highly significant.

Among smokeless tobacco users in the age group, 55 years & above 56.3% were found to have high dependency while 46.6% belonging to the age group 35-54 years were found to have a low dependency. Among those using tobacco for >20 years, 52.9% were found to have high dependency while those using tobacco for 11-20 years 36.8% were found to have a low dependency. 67.8% high dependency and 71.8% low dependency was found in those who started smoking between 15-24 years of age.

There was a highly significant difference between nicotine dependency levels among smokeless users and their age group and duration of tobacco use in a year. (p=<0.05)

Discussion

The high prevalence of beedi smoking (over 67%) in our study surpasses even Sinha et al.'s [12] observations (over 80%), emphasizing the regional specificity of smoking preferences. Conversely, our data shows bidi as the dominant smoking form, contrasting with study done by ~~by~~ Bhattacharya et al. [13] where cigarettes were most common (76%) followed by bidi (24%). This reinforces the need for regional disaggregation when analyzing smoking patterns. Our study found pan masala with tobacco (mava) to be the most prevalent smokeless tobacco product (74.5%), followed by gutkha (42.2%). This aligns with Joshi et al. [14] who reported similar trends (mava masala-63.7% Gutka-57.6%). However, it differs from Sinha et al. [12] and Bhattacharya et al.[13] Who found raw tobacco leaves (57%) and khaini (39%), respectively, to be more common. These variations highlight the significant geographic variability in smokeless tobacco preferences across different regions. While our study identified pan masala with tobacco (mava) as the dominant smokeless product regionally, it is crucial to acknowledge the national picture presented by the GATS-2 report [15] which highlights gutka as the most common smokeless tobacco product nationally (12.8%), showcasing the importance of complementing regional analyses with nationally representative studies.

We have seen in our study that smokers usually smoke at the workplace (50.3%) followed at home (36.1%) while according to the GATS-2 report [15] exposure to second-hand smoke among all adults was at home (37.9%) followed by workplace (20.9%). This underscores the urgency and importance of addressing smoking in the workplace and home. Our findings are consistent with research by Bhattacharya et al.[13] In highlighting the prominent role of experimentation (62.0%) and peer pressure (34.8%) as drivers for tobacco initia-

tion among our study population. However, the relative influence of these factors appears to differ. While Bhattacharya et al. [13] Reported peer pressure as the leading motivator (50%), our data suggests experimentation holds a stronger influence. Occupational stress (49.0%) was the main reason behind starting smokeless tobacco followed by peer pressure (44.2%). Other reasons behind starting tobacco chewing were wished to experiment (22.4%) and to appear cool (8.8%) in front of others. Addressing occupational stress in tobacco control measures is crucial for reducing smokeless tobacco use in high-pressure work environments.

Our finding that most smokers (80.3%) and smokeless tobacco users (70.8%) initiated use between 15-24 years is consistent with study done by Ali FRM et al, they reported that Prevalence of onset of regular smoking before age 18, at age 18 to 20, and at age 21 or older were 50.1%, 33.1%, and 16.8%, respectively.[16] The high prevalence of individuals smoking (42.2%) and chewing smokeless tobacco (39.4%) for 11-20 years and over 20 years reflects the chronic and persistent nature of tobacco use, highlighting the need for effective interventions to promote cessation. In our study High dependency, 22.5% was seen among smokers and this was on the lower side as compared to a study conducted by parkar sujal et al (43.5%) [11] and islam et al (27.3%)[17] but higher then clemente jimenez et al (3.3%)[18] As this study was conducted among school-aged smokers. Furthermore, the overall mean score of FTND among smokers in our study was 3.17± 2.21 (range=0-8), which is lower than the mean score of 4.71 ± 2.74 reported by Parker Sujal et al. [11]

Conclusion

This descriptive cross-sectional study, conducted from March 2021 to November 2022 in the villages of Dehgam taluka, Gujarat, India, examined tobacco usage patterns among individuals aged 15 years and older. The study found that many smokers preferred beedis, while most smokeless tobacco users favored pan masala with tobacco. Most participants in both groups began using tobacco between the ages of 15 and 24 and had been using it for 11-20 years. Smokers typically smoked daily and less than ten times per day. The primary reasons for starting smoking were a desire to experiment, while smokeless tobacco use was mainly attributed to occupational stress and peer pressure. Although many participants expressed a desire to quit, few were successful. The study highlights that tobacco users start at a young age, underscoring the need for preventive measures, such as anti-tobacco education, beginning in primary school. It also concludes that current smokers exhibit high levels of nicotine dependence, which is significantly associated with their age group and the duration of tobacco usage.

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