Introduction

Tobacco is one of the main causes of premature death worldwide. Globally, tobacco kills more people each year around the world than AIDS, drug abuse, and road traffic accidents. By the year 2030, according to current trends, it is assumed that this number will increase to 10 million with 70% of deaths occurring in low and middle income countries. In India, different forms of tobacco are being consumed. Cigarettes and bidis (hand rolled cigarettes that contain unprocessed tobacco) are the two most common forms of tobacco smoked. The most common form of Smokeless tobacco (ST) used is misri, a black powder obtained by roasting and powdering tobacco, which is then applied to the gum by using fingers. Another most common form of ST is chewing of betel quid, a combination of betel leaves, areca nut, slaked lime, tobacco, and condiments; combination of ingredients is altered according to individual preferences.[1]

According to Global Adult Tobacco Survey 2 (GATS 2) in Uttar Pradesh (2016-17), 23.1% of men, 3.2% of women, and 13.5% of men used oral tobacco products. In a study conducted in India, the prevalence of oral health problems was found to be higher in tobacco users compared to non-users [2].

Background: Tobacco dependence is a major public health problem that results in significant morbidity and mortality. Approximately, 5 million people are killed annually by tobacco use.

Aim: To assess the oral health status among adult tobacco and non-tobacco users attending outreach activities in Ghaziabad District, Uttar Pradesh.

Methods: A cross-sectional study was conducted on 800 subjects from all the 4 blocks of Ghaziabad district visiting the outreach activities. A pre-tested questionnaire was used to assess the demographic variables and oral hygiene practices. Oral health status was assessed using WHO (World Health Organization) 2013 Oral Health Assessment Form and the Smith and Knight Tooth wear index was used to assess the degree of tooth wear. Statistical analysis was done by the Statistical Package for Social Sciences (SPSS) version 20.0.

Result: The mean age of the tobacco users in the study was 40.94 (13.83) years. The prevalence of dental caries and tooth wear was 88.0% and 89.2%, respectively. Majority of tobacco users consumed a smokeless form of tobacco 67.5%, followed by smoke 21.5% and followed by both form 11.0%.

Conclusion: The present study concluded that adult population of Ghaziabad lack the knowledge and awareness regarding consumption of areca nut, gutka, and tobacco smoking. Hence, there is an urgent need to take effective steps, especially on launching community awareness programs for the adult population and public to educate them about the consequences of tobacco use, and on assessing their effectiveness in curbing the problem.

Keywords: Nicotine dependence, oral health, smokeless tobacco, smoking tobacco and dental caries
all adults currently smoke tobacco. Also, 42.6% of men, 15.2% of women, and 29.4% of all adults currently use smokeless form of tobacco and 52.1% of men, 17.7% of women, and 35.5% of all adults either smoke tobacco or use smokeless tobacco. In any form tobacco consumption is still high as in contrast with neighboring states.\(^5\)

In recent years, oral cancer is a common health hazard, with approximately 300378 new patients and 2.7 per 100000 mortality worldwide in 2012 and the incidence increased in young and middle-age population groups.\(^6\) Tobacco has been established as a risk factor for the development of premalignant disorders (PMDs) of oral mucosa. According to various studies, the prevalence of oral sub mucous fibrosis (OSMF) in India varies between 0.03% and 3.2%. The most important consideration is the relation between the use of tobacco and related products and the development of lesions. The buccal (cheek) mucosa is the most common site for oral cancer in all regions.\(^7\)

The prevalence of periodontal disease ranges from 78.5%\(^8\) to 100%\(^9\) in some reports. Furthermore, high prevalence of tooth wear of 86.8%\(^3\) has been reported among tobacco users.

Oral diseases such as dental caries or periodontal disease are highly prevalent and their consequences are not only physical; they are also economic, social, and psychological.\(^6\) The negative health effects of tobacco on oral soft tissue including premalignancy and malignancy are well documented; however, research on its effect on oral hard tissues especially on tooth wear is lacking. Tooth wear may be defined as the gradual loss of tooth substance due to repetitive physical contacts or chemical dissolution (Smith and Knight, 1984). Studies have shown that the effect of chewing tobacco on the occurrence of tooth wear is high, with users having many times the risk of nonusers. Thus, tooth wear is a composite term and includes non carious tooth surface loss by attrition, abrasion, and erosion.\(^9\)

Worldwide tobacco use among the adult is associated with a high risk of oral health problem. The adult groups are conceded as the important population of the country and prevalence of tobacco use particularly, in recent year, had an increasing trend in this age group especially among the adult population. There is a scarcity of data regarding tobacco use among the age group of 18 years and above in Ghaziabad. Keeping this in mind, the present age and gender-matched study was conducted to assess and compare the oral health status among adult tobacco and non-tobacco users of Ghaziabad district of Uttar Pradesh.

**Material and Methods**

A descriptive cross-sectional study was conducted to assess oral health status among adult tobacco and non-tobacco users in Ghaziabad district of Uttar Pradesh.

Ghaziabad district is a largely suburban district of Western Uttar Pradesh in National Capital Region of India. Ghaziabad district has 4 blocks namely Razapur block, Muradnagar block, Bhojpur block, and Loni Block. An official Census 2011 detail of Ghaziabad released by Directorate of Census Operations in Uttar Pradesh states that Ghaziabad had population of 4,681,645 of which male and female were 2,488,834 and 2,192,811, respectively.

The present study was conducted in 4 blocks of Ghaziabad where the tobacco and non-tobacco users who had access to preventive, diagnostic, and curative services in the outreach activities.

**Source of data**

A total sample of 800 subjects aged above 18 years were selected randomly from 10 villages of each block where outreach activities were conducted by the institute 10 tobacco and 10 non tobacco users. 200 each individual were taken from the four blocks of Ghaziabad.

**Sample size determination and sampling procedure**

The sample size for the present study was calculated based on the data obtained from the pilot study conducted in 4 blocks of Ghaziabad who were not the part of the study.

The total sample of 400 tobacco users was proportionately selected in each block where an outreach activity was conducted by the institute.

**Inclusion criteria**

1. All the subjects who were in the age group of 18 years or above and willing to participate in the survey.
2. Tobacco users were considered as the one who were current users of the tobacco for the period of more than 6 months or had quit the habit for last 3 months.
3. Age and Gender matched study subject’s not taking tobacco in any form were included as the non-users.

**Exclusion Criteria**

1. Patients with chronic systemic diseases like diabetes, hypertension, and epilepsy.
2. Pregnant or lactating females.
3. Alcohol users or any other drug abuse.

**Data collection**

The study protocol was approved by the Institutional Ethical Committee and Review Board, Ghaziabad on Nov 05’ 2018. Official permission to conduct the study was obtained from higher authorities of respected places where the study was conducted and written Informed consent was obtained from all the study participants. The data was collected over a period of 6 months from December 2018 to June 2019.

**Questionnaire**

A pretested questionnaire was interviewer-administered to the tobacco and non-tobacco users to know the demographic variables and oral hygiene practices.
An assessment of per capita income classified according to Modified Kuppuswamy socioeconomic scale[10] for the socioeconomic status was used.

Clinical examination
Tobacco and non-tobacco users were examined for oral health status and degree of tooth wear. Oral health status was assessed using the WHO Oral Health Assessment Form (2013)[11] Tooth wear was assessed using Tooth Wear Index and was recorded according to the criteria given by Smith and Knight in 1984.[9]

Statistical analysis
Data was analyzed using SPSS 20.0 software package. Descriptive statistics such as mean, standard deviation, and percentage were used. Association was evaluated using Chi-square. Any P value less than 0.05 was considered significant.

Result
Demographic characteristics
The studied population was primarily classified into two groups as tobacco users, who used smoking, chewing or both tobacco and non-tobacco users, who never used tobacco in any form. The majority 89.8% of the respondents were male tobacco users. The mean age of the tobacco users was 40.94 ± 13.83 years and that of non-tobacco users was 42.10 ± 12.86 years.

Majority of the tobacco users, 33.5% belonged to upper lower class, whereas among non-tobacco users, 43.0% belonged to upper-middle class. Majority of the tobacco users, 44.8% were not using any aid to clean their teeth, whereas non-tobacco users, only 18.8% were not using any aid to clean their teeth. Among tobacco users, 38.5% were underweight, whereas, among non-tobacco users, only 9.5% were underweight.

Among 400 tobacco users 270 consumed a smokeless form of tobacco, followed by 86 smokers and followed by 44 both forms. Of the 270 tobacco chewers, 58.5% were highly dependent on the smokeless form of tobacco followed by 33.7% who had moderate dependence and only 7.8% had low dependence. Of the 86 Smokers, majority 52.3% had high dependence followed by 31.4% who had moderate dependency and 16.3% had low dependence on smoking form of tobacco. Among 44 dual users, the majority of the 54.5% had high dependence [Table 1].

Oral health
High prevalence of oral mucosal lesions was found among tobacco users. Among these, 41.5% users had leukoplakia followed by tobacco pouch keratosis seen in 20.5% of the subjects and among non-tobacco users only 6.2% had oral mucosal lesions (leukoplakia). Prevalence of caries, periodontal disease, loss of attachment, and tooth wear was found to be significantly higher among tobacco users when compared to non-tobacco users (P ≤ 0.05).

Table 1: Distribution of study population according to different parameters with tobacco and non-tobacco users

| Parameters                  | Tobacco users n (%) | Non-tobacco users n (%) |
|-----------------------------|---------------------|-------------------------|
| Gender                      |                     |                         |
| Male                        | 359 (89.8)          | 342 (85.5)              |
| Female                      | 41 (10.2)           | 58 (14.5)               |
| Age Group (Years)           |                     |                         |
| 18-27                       | 100 (25.0)          | 70 (17.5)               |
| 28-37                       | 73 (18.2)           | 60 (15.0)               |
| 38-47                       | 69 (17.2)           | 88 (22.0)               |
| 48-57                       | 88 (22.1)           | 81 (20.2)               |
| >58                         | 70 (17.5)           | 101 (25.3)              |
| Socioeconomic status        |                     |                         |
| Upper (I)                   | 2 (0.5)             | 2 (0.5)                 |
| Upper Middle (II)           | 108 (27.0)          | 172 (43.0)              |
| Lower Middle (III)          | 85 (21.2)           | 114 (28.5)              |
| Upper Lower (IV)            | 134 (33.5)          | 109 (27.2)              |
| Lower (V)                   | 71 (17.8)           | 3 (0.8)                 |
| Oral hygiene practices      |                     |                         |
| No aid                      | 179 (44.8)          | 75 (18.8)               |
| Neem Stick                  | 26 (6.5)            | 33 (8.2)                |
| Charcoal                    | 19 (4.8)            | 17 (4.2)                |
| Finger &tooth Powder        | 95 (23.7)           | 44 (11.0)               |
| Tooth Brush &Tooth Paste    | 81 (20.2)           | 231 (57.8)              |
| Location                    |                     |                         |
| Urban                       | 57 (14.2)           | 85 (21.2)               |
| Rural                       | 343 (85.8)          | 315 (78.8)              |
| BODY MASS INDEX (BMI)       |                     |                         |
| Underweight                 | 157 (38.5)          | 38 (9.5)                |
| Normal                      | 150 (37.9)          | 180 (45.0)              |
| Overweight                  | 64 (16.0)           | 110 (27.5)              |
| Obesity Class I             | 6 (1.5)             | 21 (5.3)                |
| Obesity Class II            | 16 (4.0)            | 26 (6.5)                |
| Obesity Class III           | 8 (2.1)             | 25 (6.2)                |
| Tobacco Consumption          |                     |                         |
| Smokers                     | 86                  | 21.5                    |
| Smokeless                   | 270                 | 67.5                    |
| Dual-Users                  | 44                  | 11.0                    |
| Level of Nicotine Dependence|                     |                         |
| Smokeless                   |                      |                         |
| High Dependence             | 158                 | 58.5                    |
| Moderate Dependence         | 91                  | 33.7                    |
| Low Dependence              | 21                  | 7.8                     |
| Smokers                     |                      |                         |
| High Dependence             | 45                  | 52.3                    |
| Moderate Dependence         | 27                  | 31.4                    |
| Low Dependence              | 14                  | 16.3                    |
| Dual-Users                  |                      |                         |
| High Dependence             | 24                  | 54.5                    |
| Moderate Dependence         | 12                  | 27.3                    |
| Low Dependence              | 8                   | 18.2                    |

Among tobacco users, 88.0% had dental caries, whereas, among non-tobacco users, 81.2% had dental caries. Among tobacco users, 92.5% had gingival bleeding, whereas, among non-tobacco users, 45.2% had gingival bleeding. Furthermore, among tobacco users, 58.2% had periodontal pocket, whereas among non-tobacco users, 49.8% had periodontal pocket, and
32.0% tobacco users had loss of attachment seen, whereas among non-tobacco users, 26.5% had loss of attachment were found. Among tobacco users, 89.2% had tooth wear, whereas among non-tobacco users, 69.0% had tooth wear [Table 2].

**Discussion**

Tobacco use is one of the greatest burdens to the health and well-being of male and female. Tobacco kills nearly 6 million people every year, of which nearly 5 million die due to the direct use of tobacco.[9]

The prevalence rate of smoking and chewing tobacco has found to be significantly high among males (89.8%) as compared to females (10.2%) in the present study which is comparable to study done by Sarkar et al where (21.5%) of the women population either smoked or chewed tobacco.[12] Similar results were also found study done by Petkar et al[13] where 92.8% of the tobacco users were males while 7.2% were females. This could be due to that it is not seen socially acceptable for women to consume tobacco in any form.

Socioeconomic status is one of the risk factors for tobacco users and poor oral health outcomes. Majority of tobacco users in the present study were from the upper lower socioeconomic class (33.5%) and upper middle class (27.0%). This is comparable to the study done in Barabanki[14] where study subjects were from the upper lower 25.8% and lower class (39.6%). This could be due to lower socioeconomic class people are more likely tobacco consumption because lack of knowledge and awareness.

In the present study, the majority of tobacco users, (44.8%) did not use any cleaning aid to clean their teeth, which showed that present study individuals had a poor oral hygiene. This is in agreement with the studies done by Verma et al. (68%) gutka chewers showed poor oral hygiene[15] hence; awareness should be created by conducting more oral health education programs about the importance of oral hygiene. Effective self care oral hygiene practices such as tooth brushing, use of interdental cleaning are the key means of preventing and controlling periodontal diseases.

It was observed in the present study that tobacco users had a higher proportion of underweight (38.5%) which means low BMI which is similar to the study done in Delhi[16] which found prevalence of underweight was higher. This could be due to the reason that all forms of tobacco produce free radicals that deplete antioxidants like vitamin C, E and carotenoids and cause oxidative damage to DNA, proteins and lipids.[17]

In the present study the overall prevalence of the oral mucosal lesions were higher among tobacco users (76%) as compared to non-tobacco users (6.2%). This is in accordance with the findings of the epidemiological study carried out by Vellappally[18] in the selected Indian population to access the oral health status in relation to different type of tobacco habits this may be due to smoking and gutka consumption which has betel and tobacco as main ingredient.

The tobacco users had a high prevalence of the dental caries (88.0%) as compared to non-tobacco users. This is comparable to a study done by Vellappally.[18] This is due to fact the decreased buffering effect, possible lower pH of smoker’s saliva and higher number of *Lactobacilli* and *Streptococcus* group may indicate an increased susceptibility to caries in smokers and a biologically reasonable explanation for an association between chewing tobacco use and dental caries may be the presence of high levels of fermentable sugar in chewing tobacco products, which can stimulate the growth of cariogenic bacteria.

In our study, majority of tobacco users showed a higher bleeding on probing (92.5%), periodontal pocket formation (58.2%) and loss of attachment (32%) than non-tobacco users. The increased prevalence of periodontitis could be caused due to poor brushing habits and less use of dental aids in the present study. A study from Goyal et al.[19] CPI score showed that there was statistically significant difference in the findings between smokeless and dual tobacco users and non-users.

The prevalence of tooth wear in the present study was high (89.2%) as compared to non-tobacco users (69.0%). The finding is in accordance with the study by Patil et al.[19] the

| Table 2: Distribution of study population according to oral health status |
|-----------------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Oral mucosal lesion                          | Tobacco user present n (%) | Non-tobacco user present n (%) | Chi-square | P     |
| No abnormal conditions                       | 96 (24.0)        | 375 (93.8)      | 4.074         | <0.001         |
| Leukoplakia                                   | 166 (41.5)       | 25 (6.2)        |               |                |
| Smokerpalate                                  | 16 (4.0)         | 0 (0)           |               |                |
| Leukoplakia with Smokerpalate                 | 26 (6.5)         | 0 (0)           |               |                |
| Tobacco pouch Keratosis                       | 82 (20.5)        | 0 (0)           |               |                |
| Oral Sub mucous Fibrosis                     | 14 (3.5)         | 0 (0)           |               |                |
| Dental Caries                                 | 352 (88.0)       | 325 (81.2)      | 7.004         | <0.001         |
| Periodontal Status                           | Tobacco user present n (%) | Non-tobacco user present n (%) | Chi-square | P     |
| Gingival Bleeding                             | 370 (92.5)       | 181 (45.2)      | 2.083         | <0.001         |
| Periodontal Pocket                            | 233 (58.2)       | 199 (49.8)      | 5.817         | <0.001         |
| Loss of Attachment                           | 128 (32.0)       | 106 (26.5)      | 2.923         | <0.001         |
| Tooth Wear Index                              | 357 (89.2)       | 276 (69.0)      | 49.65         | <0.001         |
mechanism through which tobacco cause tooth wear lesion may be through local frictional and vascular effects.

Within dentistry, clear links exist between tobacco and health (both general and oral). Dentists routinely come into contact with patients who use tobacco in order to provide the primary care in dental issues; they can contribute to tobacco control programmes through a range of public health interventions.

Dentists have a ‘potential target’ while carrying out work on a patient, and as such have an excellent opportunity to advise patients and encourage tobacco cessation. Dentists are the only healthcare professionals who frequently see ‘healthy’ patients and therefore are in a very good position to identify possible tobacco-related problems early. The links between tobacco and oral health provide an ideal opportunity for the dental team to become involved in tobacco cessation strategies. Tobacco use is as much an issue for dentists as it is for other healthcare professionals but, if dental patients are to benefit from tobacco cessation interventions, dentists need to be clear about their roles nationally, locally and within the team in their own practice. If dentists truly want to care for the oral health of their patients, they must take tobacco cessation seriously. According to Final Operational guidelines TCC 2018 the dental health care provider can play an important role in indentifying and motivating the individuals while providing the primary care and later can collaborate with an interdisciplinary team to assist the Individual to quit the habit.

Recommendations

1. Protection of non-smokers from second-hand smoke by designating school transport, premises as “Tobacco-free zone” which will enable the students to adjust and adapt.
2. Implementation of the public health approaches for example mass media campaigns quit and win competitions, and telephone helpline services, which can play effective role in changing societal norms as well as promoting smoking cessation.
3. Ensure sustainability of smoking cessation, government need to incorporate tobacco cessation policies and programmes into other basic health care services.

Conclusion

The present study concluded that adult population lack Knowledge and awareness regarding tobacco consumption. Therefore, the awareness programmes should be planned to educate general public to discourage such habits. It is very important to develop preventive strategies to reduce tobacco consumption. Preventive strategies especially focused towards adult population need to be initiated on emergent basis. This is more important for the developing countries like India, which have become the main targets of advertisement and promotional propaganda of various multinational tobacco companies. Here is a need to collect nationwide data on the use of different forms of tobacco by adult population and the factors leading to initiation of such harmful habits.

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Conflicts of interest

There are no conflicts of interest.

References

1. Training manual for doctors, National Tobacco Control Programme, Directorate General of Health Services, Ministry of Health & Family Welfare, Government of India.
2. Global Adult Tobacco Survey: Fact sheet, India 2016-17. [Last accessed on 2019 Jul 27]. Available from: http://www.who.int/tobacco/surveillance/survey/gats/gats_India_201617_FactSheet.pdf
3. Zhang Y, He J, He B, Huang R, Li M. Effect of tobacco on periodontal disease and oral cancer. Tob Induc Dis 2019;17:1-15.
4. Joshi M, Tailor M. Prevalence of most commonly reported tobacco-associated lesions in central Gujarat: A hospital-based cross-sectional study. Indian J Dent Res 2016;27:405-9.
5. Goyal J, Menon I, Singh RP, Gupta R, Sharma A, Bhagia P. Prevalence of periodontal status among nicotine dependent individuals of 35-44 years attending community dental camps in Ghaziabad district, Uttar Pradesh. J Family Med Prim Care 2019;8:2456-62.
6. Mohamed S, Janakiram C. Periodontal status among tobacco users in Karnataka, India. Indian J Public Health 2013;57:105-8.
7. Ahuja N, Ahuja N. Prevalence of tooth wear and its associated risk factors among industrial workers in Daman, India: A cross-sectional study. Int J Community Med Public Health 2017;4:4445-51.
8. CB N, Srivastava BK, Eshwar S, Jain V. Comparison of quality of life among dental caries and periodontal patients using EuroQoL-5D in KLE society’s institute of dental sciences, Bangalore: A cross-sectional study. Int J Appl Dent Sci 2018;4:4-8.
9. Fares J, Shirdaria S, Chiu K, Ahmad N, SherriF M, Barlett DA. A new index of tooth wear. Reproducibility and application to a sample of 18-30 year-old university students. Caries Res 2009;43:119-25.
10. Wani RT. Socioeconomic status scales-modified Kuppuswamy and Udai Pareekh’s scale. J Family Med Prim Care 2019;8:1846-9.
11. World Health Organization. Oral Health Surveys-Basic Methods. 5th ed. Geneva, Switzerland: World Health Organization; 2013.
12. Sarkar A, Roy D, Nongpiur A. A Population-based study on tobacco consumption in urban slums: Its prevalence, pattern and determinants. J Family Med Prim Care 2019;8:892-8.
13. Petkar P, Bhambhani G, Singh V, Thakur B, Shukla A. Assessment of nicotine dependence among the tobacco users in outreach programs: A questionnaire based survey. Int J Oral Care Res 2015;2:34-8.
14. Ahmad S, Shukla M. Epidemiological study of alcohol and tobacco consumption among adults in a rural population of
15. Verma SK, Kumar BD, Singh S, Kumari P, Agarwal A, Singh TK, et al. Effect of gutka chewing on periodontal health and oral hygiene of peoples in Delhi NCR region of North India: A cross-sectional multicentered study. J Family Med Prim Care 2019;8:564-7.

16. Chhabra P, Chhabra KS. Distribution and determinants of body mass index of non-smoking adults in Delhi, India. J Health Popul Nutr 2007;25:294-301.

17. Pednekar MS, Gupta CP, Shukla H, Hebert JR. Association between tobacco use and body mass index in urban Indian population: Implications for public health in India. Int J Biomed Sci 2008;4:89-96.

18. Vellappally S, Jacob V, Smejkalová J, Shriharsha P, Kumar V, Fiala Z. Tobacco habits and oral health status in selected Indian population. Cent Eur J Public Health 2008;16:77-84.

19. Patil P, Vibhute N, Baad R, Kadeshetti V. Assessment of tooth wear among tobacco chewers in the rural population of Karad, Maharashtra, India: A cross sectional study. Int J Curr Res 2015;7:16098-101.