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**Research Article**

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# *Effect of Smokeless Tobacco (Mishri) Application on Periodontal Health and Correlation to the Duration of Use*

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## ABSTRACT

*Mishri is a form of smokeless tobacco used as a dentifrice in rural areas of central India. Mishri is applied to teeth and gums to clean the oral cavity. Mishri use has ill effects on oral health and periodontal tissues. The present study assessed the ill effect of mishri application periodontal tissues, and its correlation to the duration of use. A total of 300 subjects who used mishri as a dentifrice were considered. The enrolled subjects were categorized into three subgroups depending on the years of mishri usage. Age, gender, education level, socioeconomic status (SES), and body mass index (BMI), were recorded. Periodontal clinical parameters i.e. plaque index, gingival index, clinical attachment loss, and probing pocket depth were assessed. The data were statistically correlated with the duration of mishri usage with the Chi-square test and Analysis of variance. Out of the 300 subjects, 162 (54%) were males and 138 (46%) were females. SES and BMI had no association with mishri use but education level played a significant role in the avoidance of mishri use (P - 0.041). All the periodontal clinical parameters deteriorated with the duration of mishri use (P - 0.0001). It was concluded that mishri use was common in both genders. There was a deterioration of periodontal health and the progressive destruction of periodontal tissues with years of mishri use. The Dentist and community health workers should educate about the ill effects of tobacco use and mishri, as a dentifrice among the rural population.*

**Key words:** *Clinical attachment loss, Gingival health, Mishri, Periodontal disease, Smokeless tobacco*

## INTRODUCTION

The use of smokeless tobacco in different forms is rampant throughout India. Betel quid chewing and smokeless tobacco use is a socially accepted practice and has become part of cultural and religious customs. Smokeless tobacco is available throughout India in different forms like chewing, snuffing, application to teeth and gums, Paan, Khaini, Zarda, Mishri, Gutkha, Toombak etc. Oral smokeless tobacco products are placed in the mouth, cheek or lip and sucked or chewed [1]. Smokeless tobacco (SLT) is defined as a product that contains tobacco, is not smoked or burned at the time of use, and is commonly consumed orally or nasally [2].

India harbors about 70% of the world's SLT users, which has the potential to cause premalignant, malignant cancers and poor reproductive outcomes [3]. Mishri is a form of SLT that is used as a dentifrice to clean teeth in the central part of India. Mishri is mostly a homemade preparation, by roasting tobacco leaves on a hot metal plate

till it becomes black uniformly, then powdered and packed. Mishri is also commercially available locally in different trade names [4]. Various studies have proved the ill effects of SLT on dental and periodontal tissues like gingival recession, loss of attachment, discolouration of teeth, tooth abrasion, halitosis and dental implant failures [5-8]. There is a need to study the ill effects of mishri application on the periodontal tissues. With this background, the present study was designed to assess the ill effect of mishri use on periodontal tissues, and its correlation to the duration of use.

## MATERIALS AND METHODS

This cross-sectional study was conducted at the department of Periodontology, School of Dental Sciences, Karad, Maharashtra, India. A total of 300 subjects who used mishri as a dentifrice to clean their teeth were enrolled in the study by simple random purposive sampling technique. Institutional ethical clearance was obtained from Krishna Institute of Medical Sciences Deemed to be University (KIMSDU) before commencing the study (Letter No: KIMSDU/IEC/03/2018). The objective of the study was explained to all the enrolled subjects, and written informed consent was obtained from each of them. Demographic data (education level, occupation and socioeconomic status) were recorded in a structured proforma.

Subjects aged 19 -72 years with the presence of at least 20 permanent teeth, were considered for the study. Pregnant and lactating women and subjects suffering from any systemic diseases or using any other form of tobacco, and also those who had undergone periodontal therapy within the last six months were excluded from the study.

The enrolled subjects were categorized into three subgroups depending on the years of mishri usage. Group 1: Subject using mishri for less than 5 years, Group 2: Subject using mishri from 5 to 10 years, and Group 3: Subjects using mishri for more than 10 years.

A detailed history of mishri usage from each participant was recorded, which included, the number of mishri applications per day and years of usage. The socioeconomic status (SES) of the participants was assessed by the Modified Kuppuswamy SES scale 2021 and divided into five categories 1 - Lower, 2 - Upper Lower, 3 - Lower Middle, 4 - Upper Middle, and 5 – Upper [9, 10]. The body mass index of the participants was calculated using the formula BMI = $kg/m^2$ and graded as 1 - underweight BMI <18.5 $kg/m^2$, 2 - normal weight BMI = 18.5 to 23, 3 - overweight BMI = 23 to 25 and 4 - obesity BMI >25 [11]. The education level of the participants was enquired and divided into seven grades 1 - Illiterate, 2 – Primary school certificate, 3 – Middle school certificate, 4 – High school certificate, 5 – Post high school diploma, 6 – Graduate or postgraduate and 7 – Professional degree [11].

Clinical examination of the periodontal tissues was carried out by a single trained calibrated operator. All the subjects enrolled in the study were subjected to periodontal analysis which included the Gingival index, and Plaque Index [12, 13]. Probing pocket depth (PPD) and Clinical attachment level (CAL) were recorded to the nearest millimetre with a periodontal probe (Williams periodontal probe Hu-Friedy, Rotterdam, Netherland) at six sites (mesiobuccal, buccal, distobuccal, mesiolingual, lingual and distolingual) of all teeth excluding the third molars [14].

The data obtained were compiled and entered into Microsoft Excel 2010. The Chi-square test and analysis of variance (ANOVA) were used to find the association and significance. Statistical analyses were performed using statistical software IBM SPSS Statistics for Windows, version 20.0 (IBM Corp., Armonk, N.Y., USA), and a P value <0.05 was considered statistically significant.

## RESULTS AND DISCUSSION

A Total of 300 subjects who used mishri as a dentifrice were included in the study, consisting of 162 males (54%) and 138 females (46%)**.** The mean age of the participants was 40.6 ± 4.2 years **(Table 1)**.

**Table 1.** Gender and age of the study subjects.

| Gender | N [%] | Age Mean±SD |
|---|---|---|
| Male | 162 (54%) | 40.62±3.84 |
| Female | 138 (46%) | 40.57±4.82 |
| Total | 300 (100%) | 40.60±4.20 |

The participants were categorized into three groups on the duration of the mishri usage in years: group 1: under five years, group 2: six to ten years, and group 3: more than ten years. There was no association found between gender and duration of mishri usage P-value: 0.99 **(Table 2)**.

**Table 2.** Study subjects categorized according to gender and duration mishri usage

| Groups | Duration of Mishri Use | Males N (%) | Females N (%) | Total N (%) | $\chi^2$ Value | p-value |
|---|---|---|---|---|---|---|
| Group 1 | under 5 years | 74 (45.68%) | 67(48.55%) | 141 (47.00%) | 0.25 | 0.99 |
| Group 2 | 6-10 years | 56 (34.57%) | 45(32.61%) | 101 (33.67%) | | |
| Group 3 | more than 10years | 32 (19.75%) | 26 (18.84%) | 58 (19.33%) | | |
| | Total | 162 (100%) | 138 (100%) | 300 (100%) | | |

The education level, socioeconomic status, and Body Mass Index of the participants were recorded and the Chi-square test was used to find the association between the mishri uses. The education level had a significant association with mishri use P-value: 0.0413. The socioeconomic status P-value: 0.42 and BMI of the subjects had no association with mishri use P-value: 0.072 **(Table 3)**.

**Table 3.** Education level, socioeconomic status, and body mass index of the participants.

| Groups | Group 1 N (%) | Group 2 N (%) | Group 3 N (%) | $\chi^2$ Value | p-value |
|---|---|---|---|---|---|
| **Education level** | | | | | |
| 1 – Illiterate | 01 (0.33) | 02 (0.67) | 01 (0.33) | 21.68 | 0.0413* |
| 2 – Primary school certificate | 13 (4.33) | 17 (5.67) | 18 (6.00) | | |
| 3 – Middle school certificate | 12 (4.00) | 15 (5.00) | 18 (6.00) | | |
| 4 – High school certificate | 41 (13.67) | 28 (9.33) | 35 (11.67) | | |
| 5 – Post high school diploma | 29 (9.67) | 21 (7.00) | 19 (6.33) | | |
| 6 – Graduate or postgraduate | 18 (6.00) | 04 (1.33) | 02 (0.67) | | |
| 7 – Professional degree | 03 (1.00) | 02 (0.67) | 01 (0.33) | | |
| **Socioeconomic status** | | | | | |
| 1 – Lower | 51 (17.00) | 38 (12.67) | 36 (12.00) | 8.09 | 0.42 |
| 2 - Upper lower | 22 (7.33) | 16 (5.33) | 24 (8.00) | | |
| 3 - Lower middle | 11 (3.67) | 16 (5.33) | 18 (6.00) | | |
| 4 - Upper middle | 10 (3.33) | 13 (4.33) | 10 (3.33) | | |
| 5 -Upper | 09 (3.00) | 11 (3.67) | 15 (5.00) | | |
| **BMI** | | | | | |
| 1 - Underweight | 16 (5.33) | 18 (6.00) | 18 (6.00) | 11.55 | 0.072 |
| 2 - Normal | 71 (23.67) | 62 (20.67) | 41 (13.67) | | |
| 3 - Overweight | 17 (5.67) | 14 (4.67) | 10 (3.33) | | |
| 4 – Obese | 10 (3.33) | 25 (8.33) | 08 (2.67) | | |

*Significant p<0.05

The periodontal status of the study subjects was assessed using the following clinical parameters plaque index, gingival index, clinical attachment loss, and probing pocket depth. ANOVA was used to correlate the periodontal status with the duration of mishri use. All the clinical parameters had a statistically significant correlation with the duration of mishri use with a P-value of <0.0001 **(Table 4)**.

**Table 4.** Periodontal clinical parameters of the study subjects.

| Groups | Group 1 Mean±SD | Group 2 Mean±SD | Group 3 Mean±SD | ANOVA F-value | p-value |
|---|---|---|---|---|---|
| Plaque index | 1.03±0.21 | 1.50±0.45 | 1.74±0.54 | 218.12 | <0.0001* |
| Gingival index | 1.27±0.34 | 1.40±0.09 | 1.52±0.38 | 52.48 | <0.0001* |

| | | | | | |
|---|---|---|---|---|---|
| Clinical attachment loss (mm) | 2.45±0.74 | 3.23±0.46 | 4.27±0.18 | 947.9 | <0.0001* |
| Probing pocket depth (mm) | 2.08±0.45 | 2.78±0.46 | 3.95±0.08 | 1910.5 | <0.0001* |

*Significant p<0.05

The negative effect smoked form of tobacco on general and periodontal health has been extensively researched, documented and proven. Cigarette smoke induces oxidative stress and is involved excessive inflammatory response of human pulmonary artery smooth muscle cells, and sexual dysfunction through testicular damage [15-17]. The literature regarding the ill effects of a smokeless form of tobacco on periodontal tissues is sparse. The present cross-sectional study was designed to assess the ill effect of smokeless tobacco (mishri) use on periodontal tissues and its correlation to the duration of use.

The use of mishri as a dentifrice was mostly observed in the rural population with a mean age of 40.6 ± 4.2 years. The results of our study are similar to the previous studies by Katturi *et al*., who found that 20 to 40 years of age subjects used tobacco in a smoked and smokeless form. The age difference of the higher age group in our study may be due to, we have considered subjects only using mishri as a dentifrice for our study, and excluded other forms of SLT users [18].

The use of Mishri as a dentifrice was almost equal in both gender, males (54%) and females (46%). The results were similar to the study conducted in Bangladesh which found the smokeless form of tobacco use was equally prevalent in males and females [19]. Shah *et al*., the study concluded that SLT use among Indian females is equally prevalent as the male population [20].

The use of Mishri as a dentifrice for years was observed in many individuals. There was no correlation seen statistically (P-value: 0.99) according to the duration of use of mishri. It was evident that the study subjects used mishri for more than ten years without the knowledge and awareness of its ill effects on the periodontium and oral cavity.

The education level of the study subjects played a key role in the use of mishri in the study population. Subjects with higher education i.e. post high school diploma, graduate and professional degree refrained from using mishri as a dentifrice (P-value: 0.0413). The results of our studies in accordance with previous literature, that education level played an important role in smokeless tobacco use [21, 22]. A cohort study on the Sweden population, concluded that tobacco product users were less educated compared to non-users [23].

The association between socioeconomic status and BMI with the mishri use was not statistically significant (P-value: 0.42). The data from our study show that even upper and upper-middle-class subjects used mishri as a dentifrice in the Maharashtra region. The results of our study are in accordance with Jodalli PS, Panchmal GS Study on the Indian population, who concluded that socioeconomic status did not correlate with tobacco use [24]. The BMI had no association with mishri use in our study (P-value: 0.072), which is in accordance with the previous research conducted on the Indian population [25]. The present study subjects were mostly rural populations from farming backgrounds who were physically active and were not obese.

All the periodontal clinical parameters in our study population increased with the years of mishri use denoting that periodontal disease status deteriorated with years of mishri use, which is in accordance with previous research on the use of SLT [26, 27]. The plaque levels and gingival inflammation increased in our study subjects with the duration of mishri use. The results are similar to previous research by Offenbacher S and Weathers DR study [28, 29]. The CAL and PPD increased with the duration of the mishri use in our study which was statistically significant. The results of our study are similar to previous studies, where they found progressive destruction of periodontal tissues in SLT users [30-32].

Quitting the use of tobacco is difficult, and not an easy task for a regular users, due to its addictive properties [33]. Tobacco conselling with the guidance from physician, dentist, health workers and family members can help the tobacco user to quit the tobacco habit. There is clear and urgent need by all the countries to reduce the prevalence of tobacco use, both in smoked and smokeless forms, by passing strong evidence based policies, which will benefit the general population at large [34].

## CONCLUSION

The results of our study denote that the use of mishri as a dentifrice was common among middle age and older individuals in both male and female gender. The level of education played a key role in the avoidance of mishri use as a dentifrice. There was a deterioration of periodontal health and the progressive destruction of periodontal tissues with years of mishri use.

The Dentist and community health workers should educate the general population about the ill effects of tobacco use and mishri as a dentifrice. Tobacco cessation and health education promotions should be carried out at the rural level for benefit of the general population.

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