Periodontal Health Status, Oral Mucosal Lesions, and Adverse Oral Habits among Rubber Factory Workers of Bahadurgarh, Haryana, India

Savita Solanki, Ritu Dahiya1, Anshu Blaggana2, Roma Yadav1, Sapna Dalal1, Deepika Bhayana1

Departments of Public Health Dentistry and 1Periodontics, PDM Dental College, Bahadurgarh, 2Department of Oral Medicine and Radiology, Jan Nayak Ch. Devilal Dental College, Sirsa, Haryana, 3Department of Public Health Dentistry, NIMS Dental College, Rajasthan, India

Abstract

Objective: The objective of this study was to assess the prevalence of periodontal disease, oral mucosal lesions, and tobacco usage among rubber factory workers of Bahadurgarh, Haryana, India. Materials and Methods: A descriptive cross-sectional study was conducted on a total sample size of 3290 workers with an age group of 19–60 years old. Tobacco-related habits, periodontal health, and oral mucosal lesions were recorded using the modified World Health Organization pro forma (1997). Descriptive statistics, Pearson Chi-square, and one-way analysis of variance were used. Results: Higher tobacco usage frequency (78.28%) in both forms smoking and smokeless was found. The prevalence of periodontal disease and oral mucosal lesions was 87.4% and 41.24%, respectively, among the study population. The most common oral mucosal lesion found was leukoplakia (10.13%), followed by oral submucous fibrosis (4.67%) among the 50–60 years age group. The most commonly involved site in the present study for the occurrence of oral mucosal lesions is buccal mucosa (30.5%), followed by vestibular region (22.3%), tongue (16.1%), labial mucosa (10.3%), and palate (9.7%), whereas floor of mouth (6.4%) and commissures (4.7%) were the least involved. Conclusions: The findings of this study provided an insight into the periodontal health status, adverse oral habits, and the prevalence of oral mucosal lesions of factory workers, which may be useful in planning oral health programs and free services for tobacco cessation and dental treatment, especially to this industrial sector.

Keywords: Factory workers, oral mucosal lesions, periodontal disease, prevalence, tobacco

Introduction

Dental health is as important as general health, but the irony is; it has not received the same amount of importance as that of the general health. This fact is even more prevalent in the workers,1 who are bound to neglect their oral health because of the busy schedule and stressful life. Factory workers form a major section of our population and studies have shown the clear association between occupational exposure and greater incidence of oral diseases,2–4 and studies have also proven the higher prevalence of oral diseases in rural masses. Majority of these workers live in rural areas and are in need of the medical and dental facilities. These people suffer from poor health and poor working conditions which affect the quality of life.

In addition, there is a high intake of both forms of smoked and smokeless tobacco products in the Indian population which is strongly associated with oral mucosal lesions. Tobacco is a well-documented risk factor for the two most chronic and prevalent disease among adults, i.e., periodontal disease and oral mucosal lesions.

For maintaining good oral health, external environment plays a crucial role. Since majority of people employed in the factories are exposed to a hazardous work environment which further worsens their life.2–4 Medical ailments which can cause morbidity are given more preference which allows them to sustain themselves for higher number of work hours. Contrary to this, oral health is neglected due to overwork, minimal priority, multiple visits, limited availability of
dental services, and financial constraints in developing countries.

Keeping in view the above information, the present study was conducted among workers in the rubber industry in Bahadurgarh, Haryana, to assess the periodontal health, oral mucosal lesions, and to gauge the correlation of tobacco consumption and its ill effects among them.

**Materials and Methods**

**Ethical guidelines**

A cross-sectional descriptive study was approved by the Research Ethics Review Board of the PDM Dental College and Research Institute, Bahadurgarh, Haryana, India. Individuals who volunteered to participate in the study were presented a consent form. It was mandatory for all the study participants to have understood and signed the consent form before being included in the study.

**Eligibility criteria**

The inclusion criteria were as follows: (1) self-reported systemically healthy individuals; (2) only male participants were included to remove the bias of oral mucosal lesion prevalence. The exclusion criteria were as follows: (1) edentulous individuals; (2) individuals who reported having used antibiotics, nonsteroidal anti-inflammatory drugs, and/or steroids within the past 3 months; and (3) individuals who reported to have undergone periodontal treatment within the past 6 months.

**Study participants**

The study was carried out from August 2015 to October 2016. A total of 3290 participants from eight large footwear rubber factories were examined with a minimum age range from 19 to 60 years. For easy handling of the data, the total sample size was divided into four separate age groups, i.e., 19–30 years, 31–40 years, 41–50 years, and 51–60 years to estimate the clinical parameters in depth and to reduce the bias.

**Recording of data**

Single examiner and a recording assistant were trained and calibrated in the Department of Public Health Dentistry of Institute. Modified World Health Organization (WHO) format (1997) was used to collect demographic details, including the adverse oral habit of tobacco usage of all participants along with the periodontal health evaluation and oral mucosal examination. The clinical examination was carried out where the workers were made to sit on the chair in an open hall of their respective factory, and the community periodontal index (CPI) and loss of attachment (LOA) clinical parameters were recorded for the periodontal health evaluation. The oral mucosal examination was performed in the following sequence:

1. Labial mucosa and labial sulci
2. Labial part of the commissure and buccal mucosa
3. Tongue (dorsal and ventral surfaces, margins)
4. Floor of the mouth
5. Hard and soft palate
6. Gingiva.

In case of clinically suspicious lesion, participants were asked to come to college and biopsies were made. The diagnosis with its anatomical location was recorded in the modified WHO pro forma. The examiner used same codes and criteria as given in the pro forma to ensure uniform interpretation for the various diseases and conditions. Prior permission from the managing director of the respective factories was personally taken to conduct the camps on fortnightly basis till all the employees got their complete checkup done. The workers were informed about any oral disease observed during the examination, and they were advised to seek treatment for the same. The study was conducted mainly in the day shift being more convenient, and examination was carried using simple random sampling technique.

**Statistical analysis**

Data were analyzed using SPSS version 20, IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp. Descriptive statistics was used along with a one-way analysis of variance for comparing the mean number of sextants which were affected by periodontal diseases, according to the age groups. Pearson Chi-square test was applied to test the statistical significance of mucosal changes with respect to age. The level of statistical significance was set at \( P \leq 0.05 \).

**Results**

A total of 3290 participants were examined with a minimum age of 19 years, and the maximum was 60 years. The study population was divided into strata based on four age groups: 19–30 years \((n = 728)\), 31–40 years \((n = 983)\), 41–50 years \((n = 702)\), and 51–60 years \((n = 877)\) where majority of workers lies in the age group of 30–40 years.

The prevalence of periodontal disease was 87.4% among the study population and nearly 100% among the 50–60 years age group. Table 1 depicts the CPI scores across the age groups. The results show that the calculus codes for the group 31–40 years were highest, and the difference was statistically significant across the age groups. There was no significant difference in pockets (4–5 mm) and \( \geq 6 \) mm across the age groups.

LOS of 0–3 mm was highest in the 40–50 years of age group and lowest in the 19–30 years age group. The difference was statistically significant across the age group [Table 2].

The frequency of tobacco users in both forms was 2579 (78.38%) among the study population and nontobacco users were 711 (21.62%) [Table 3].

Examination of the oral mucosa revealed the prevalence of oral mucosal lesions is 41.24%. Tobacco-related lesions were the most prevalent among oral mucosal lesions [Table 4].
The most frequently involved intraoral site is the buccal mucosa (30.5%), followed by vestibular region (22.3%), tongue (16.1%), labial mucosa (10.3%), palate (9.7%), floor of mouth (6.4%), and commissures (4.7%).

**DISCUSSION**

Work and the work-related environment play a significant role in determining an individual’s overall health. Increasing trend toward industrialization reflects the growth of nation which is actually only one side of the coin. This side demonstrates the growth and progress while the other side is associated with the increase in occupational health problems and diseases. There are numerous etiological factors behind the onset of periodontal and oral mucosal diseases, and one of the main factors is occupational environment. Due to the stress and working load in the factories, the workers become a victim of oral habits such as gutkha chewing, bidi, and cigarette smoking. Both smoked and smokeless forms of tobacco consumption are detrimental to oral health.

In the present study, periodontal health status was assessed using CPI and LOA, and it was compared within various age groups. Results of the study revealed that only a small percentage 12.6% of factory workers were free from any signs of periodontal disease and the majority of workers were suffering from different stages of periodontal disease. The overall prevalence of periodontal disease was found to be 87.4% which is quite high, and the studies by the Hohlfeld and Bernimoulin, Kumar et al., and Shaikh et al. show a higher prevalence of nearly 100% in adults. It clearly indicates that it is the most prevalent dental disease among adults globally and thereby implicates the need to treat/prevent it with large measures as it can eventually lead to loss of teeth.

The problem of bleeding gums was remarkably higher in lower age group (most in 31–40 years), whereas calculus and deeper periodontal pockets were more widespread in higher age groups. Calculus scores had a preponderance in 41–50 years age group, whereas shallow and deep pockets scores indicating greatest periodontal destruction manifested in 50–60 years of age group. The results of the study were in accordance with the study reported by Pilot et al., Dini et al., and Hetland et al. done on factory workers where authors have reported calculus as the most common score among industrial employees. The increase in the periodontal pocket and attachment loss in higher age group is possibly a result of prolonged exposure to other risk factors over a person’s life creating a cumulative effect over time.

Consumption of tobacco (smokeless or smoking form) was found to be very high (positive in 2579 workers who form 78.38% of total) which was comparatively lower than Ansari et al. and Parashar et al. who reported it to be 85.9% and 91%, respectively. The probable reason for this high frequency of adverse oral habits among the workers may be due to stress and strenuous load associated with their work environment. Furthermore, it was also noticed in the study that the prevalence of oral mucosal lesions among the tobacco users was 52.61% showing association between oral mucosal lesions and tobacco and the same had been illustrated in Aishwarya et al. and Reddy et al. study. In the current study, the overall prevalence of oral mucosal lesions was found to be 41.24%, which was alike to a study done by Mathew et al. (2008) in South Indian
Table 4: Distribution of the study population based on oral mucosal lesions

| OML               | 19-30 years | 31-40 years | 41-50 years | 51-60 years | P    |
|-------------------|-------------|-------------|-------------|-------------|------|
| Leukoplakia       | 18 (2.47)   | 48 (4.88)   | 44 (4.26)   | 95 (10.83)  | 0.002|
| OSMF              | 18 (2.47)   | 27 (2.74)   | 26 (3.70)   | 41 (4.67)   | 0.001|
| Lichen planus     | 5 (0.68)    | 12 (1.22)   | 10 (1.42)   | 11 (1.25)   | 0.003|
| Chever’s mucosa   | 64 (8.82)   | 102 (10.37) | 94 (13.19)  | 46 (5.24)   | 0.001|
| Smoker’s palate   | 41 (5.63)   | 69 (7.01)   | 88 (12.53)  | 104 (11.85) | 0.001|
| Lichenoid reaction| 12 (1.64)   | 19 (1.93)   | 57 (8.11)   | 38 (4.33)   | 0.002|
| Candidiasis       | 13 (1.78)   | 24 (2.44)   | 49 (6.98)   | 71 (8.09)   | 0.001|
| Abscess           | 17 (2.33)   | 38 (3.86)   | 35 (4.98)   | 51 (5.81)   | 0.002|

OML: Oral mucosal lesion, OSMF: Oral submucous fibrosis

population. However, lower prevalence rate was observed in the studies done by Balasubramanian[16] and Vikneshan et al.[17] where the prevalence rate for oral mucosal lesions among the factory workers was 25.8% and 30.39%, respectively.

Out of the various oral mucosal lesions, the premalignant lesion of leukoplakia had the highest prevalence (10.1%), followed by oral submucous fibrosis (4.7%) among the 50–60 years age group and further the prevalence of both the premalignant lesions exhibited a decreasing trend in the lower age groups. A study report by Phookan and Saikia[18] also illustrated leukoplakia as the most common premalignant lesion (20.6%), while percentages of lichen planus and OSMF were reported to be equal frequency (0.62%). Ahmad et al.[19] documented OSMF prevalence to be 3.4%. It was well appreciated that frequency of mucosal lesions in the oral cavity increased with age and was directly correlated with tobacco consumption with similar findings by Shulman et al.[20] and Shenoy et al.[21] On the contrary, the prevalence of oral lichen planus (1.42%) was recorded to be highest in 40–50 years. The reason for such findings can be attributed to the usage of chewing tobacco and smoking habits which was found to be consistently higher in 40–50 years age groups.

In all oral mucosal lesions, tobacco-related lesions were seen to be most common. Of all the tobacco-related lesions, the most prevalent one was cherwer’s mucosa, followed by smoker’s palate and lichenoid reaction to tobacco. All these lesions were significantly higher in 40–50 years as compared to other age groups. In nontobacco-related lesions, oral candidiasis was seen with highest frequency (8.09%) among 50–60 years and was least observed in the 19–30 years age group (1.8%). Intraoral abscess was present in all the age groups, but maximum occurrence was noticed in 40–50 years (4.9%), followed by 50–60 years (4.3%), 30–40 years (3.8%), and least in 19–30 years (2.3%).

As per the site-specific involvement, the oral mucosal lesion had a predilection for buccal mucosa (30.5%), followed by vestibular region (22.3%), tongue (16.1%), labial mucosa (10.3%), and palate (9.7%), whereas floor of mouth (6.4%) and commissures (4.7%) were least involved which was in accordance with Kamble et al.[22] and Ali et al.[23] Buccal mucosa was found to be most commonly involved because this is the area where smokeless form of tobacco products are most frequently kept.

Conclusions

Majority of the factory workers were reported to have the habit of tobacco chewing and smoking. Periodontal health of the participants was found to be poor, especially among the older age groups. Furthermore, the prevalence of oral mucosal lesions was high which necessitates the adoption and conduction of adequate awareness programs about the deleterious effect of tobacco habit, regarding importance of oral hygiene, and the importance of regular visits to the dentist for maintenance of good oral health.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Shyagali TR, Rai N. Occupational dental health hazards: A review. Int J Contemp Dent Med Rev 2015. ID: 140115, 2015. doi: 10.15713/ins.ijdmr.41.
2. Shizukushi S, Hayashi N, Tamagawa H, Hanoioka T, Maruyama S, Takeshita T, et al. Lifestyle and periodontal health status of Japanese factory workers. Ann Periodontol 1998;3:303-11.
3. Sanadhyia S, Nagarajappa R, Sharda AJ, Asawa K, Tak M, Batra M, et al. The oral health status and the treatment needs of salt workers at Sambhar Lake, Jaipur, India. J Clin Diagn Res 2013;7:1782-6.
4. Nagarajappa R, Sanadhyia S, Sharda AJ, Asawa K, Tak M, Batra M, et al. Assessment of the periodontal status among Kota stone workers in Jhalawar, India. J Clin Diagn Res 2013;7:1498-503.
5. Hohlfeld M, Bernimoulin JP. Application of the community periodontal index of treatment needs (CPTIN) in a group of 45-54-year-old German factory workers. J Clin Periodontol 1993;20:551-6.
6. Kumar S, Dagli RJ, Chandrakant D, Prabu D, Suhas K. Periodontal status of green marble mine labourers in Kesarayaji, Rajasthan, India. Oral Health Prev Dent 2008;6:217-21.
7. Shaikh H, Shankar S, Vinay S. Assessment of periodontal status and treatment needs among beedi factory employees Harapanahalli town, Davangere district, Karnataka. J Indian Acad Dent Spec 2011;13:7.
8. Pilot T, Lu ZY, Lin QZ, Yen WP, Cao GR. Periodontal conditions in 35-44-year-old factory workers in Shanghai. Community Dent Oral Epidemiol 1989;17:216.
9. Dini EL, Guimarães LO. Periodontal conditions and treatment needs (CPTIN) in a worker population in Araraquara, SP, Brazil. Int Dent J 1994;44:309-11.
10. Hetland L, Midtn N, Kristoffersen T. Effect of oral hygiene instructions given by paraprofessional personnel. Community Dent Oral Epidemiol 1982;10:8-14.
11. Ansari ZA, Bano SN, Zulkifle M. Prevalence of tobacco use among
power loom workers – A cross-sectional study. Indian J Community Med 2010;35:34-9.
12. Parashar M, Dwivedi S, Singh M, Patavegar B, Bhardwaj M. Tobacco use behavior among construction site workers of Delhi, India. Int J Health Allied Sci 2017;6:210-4.
13. Aishwarya KM, Reddy MP, Kulkarni S, Doshi D, Reddy BS, Satyanarayana D, et al. Effect of frequency and duration of tobacco use on oral mucosal lesions – A cross-sectional study among tobacco users in Hyderabad, India. Asian Pac J Cancer Prev 2017;18:2233-8.
14. Reddy SS, Prashanth R, Yashodha Devi BK, Chugh N, Kaur A, Thomas N, et al. Prevalence of oral mucosal lesions among chewing tobacco users: A cross-sectional study. Indian J Dent Res 2015;26:537-41.
15. Mathew AL, Pai KM, Sholapurkar AA, Vengal M. The prevalence of oral mucosal lesions in patients visiting a dental school in Southern India. Indian J Dent Res 2008;19:99103.
16. Balasubramanian R. Prevalence of oral mucosal lesions among granite factory employees in Nanjangud taluk, Mysore. Global J Med Res 2014;14:787-9.
17. Vikneshan M, Ankola AV, Hebball M, Sharma R, Suganya M. Patterns of tobacco usage and oral mucosal lesions of industrial workers: A cross-sectional study. Austin J Public Health Epidemiol 2016;3:1029-135.
18. Phookan J, Saikia KP. A clinicopathological study of the pre-malignant conditions of oral cavity. Indian J Otolaryngol Head Neck Surg 1998;50:246-9.
19. Ahmad MS, Ali SA, Ali AS, Chaubey KK. Epidemiological and etiological study of oral submucous fibrosis among gutkha chewers of Patna, Bihar, India. J Indian Soc Pedod Prev Dent 2006;24:84-9.
20. Shulman JD, Beach MM, Rivera-Hidalgo F. The prevalence of oral mucosal lesions in U.S. adults: Data from the Third National Health and Nutrition Examination Survey, 1988-1994. J Am Dent Assoc 2004;135:1279-86.
21. Shenoy RP, Shetty MS, Shenai KP, Kotian MS. Evaluation of oral status and tobacco use in a rural population and testing a scale developed to rate oral status: A pilot study. J Res Pract Dent 2014;2014:8.
22. Kamble KA, Guddad SS, Naya AG, Suragimath A, Sanade AR. Prevalence of oral mucosal lesions in Western Maharashtra: A prospective study. J Indian Acad Oral Med Radiol 2017;29:282-7.
23. Ali M, Joseph B, Sundaram D. Prevalence of oral mucosal lesions in patients of the Kuwait university dental center. Saudi Dent J 2013;25:111-8.