

Assessment of the prevalence of periodontal diseases in Beedi factory workers of Bilhaur town, Kanpur Nagar District, Uttar Pradesh, India: A cross-sectional study

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Abstract

Introduction: Oral health is a vital part of general health and is a valuable asset of every individual. Periodontal disease is generally considered to result from an imbalance between potentially pathogenic microbes and the nature and efficacy of local and systemic host responses. **Materials and Methods:** A cross-sectional study was conducted on 1500 beedi factory workers of Bilhaur town. A proforma comprising basic sociodemographic details and the Community Periodontal Index (CPI) of Treatment Needs Index was used. Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) Statistics version 21 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). Descriptive statistics were calculated. All values were considered statistically significant for a value of $P < 0.05$. **Results:** Among the age group of up to 20 years, 1 (0.5%) worker presented with CPI code 1 (bleeding) and 179 (99.5%) with code 2 (calculus). Among the 21–30 years age group, 574 (98.6%) had code 2, 5 (0.9%) had code 3 (shallow pockets), and 3 (0.5%) had code 4 (deep pockets). Among the 31–40 years age group, 266 (67.7%) had CPI code 2, 122 (31.1%) had code 3, and 5 (1.3%) had code 4. It was observed that as the age advances, the CPI scores also increase; the same results were also found in relation to code x with statistically significant findings. **Conclusion:** The study also found that as age increases, the prevalence of periodontal disease and the level of treatment need also increase, whereas, as the level of education increases, both the level of periodontal disease and treatment needs decrease.

Keywords: Oral health, Periodontal disease, Treatment needs

1. Introduction

Oral health is an essential component of overall health and is a crucial asset for every individual. Oral diseases are among the most common non-communicable diseases that affect diverse populations. They represent a major public health issue due to their high prevalence, socio-economic impact, costly treatment options, and limited awareness.^[1]

Periodontitis is one of the most widespread chronic diseases globally, as noted by the World Health Organization (WHO) in 1978. It is recognized as the primary cause of tooth loss in adults over the age of 35. According to WHO reports, the age at which tooth longevity is significantly affected by periodontal damage has shifted to around 50 years.^[1-4]

The WHO oral health unit initiated a group of experts to analyze and provide guidance on the epidemiology, causes, and prevention of periodontal disease.

As a result, a new method for assessing treatment needs, the community periodontal index of treatment needs (CPITN), was established during a joint meeting of the Foreign Direct Investment/WHO working group held in Rio de Janeiro in September 1982.^[2]

In developing countries like India, where traditional lifestyles continue to persist, the risk of disease and death is linked to poor nutrition, inadequate personal hygiene, and cultural practices. These personal risk factors play a significant role in the development of adult periodontal disease.^[5]

In India, tobacco use contributes to half of all cancers in men and a quarter of all cancers in women. Tobacco consumption is more prevalent among individuals from poorer, less educated, scheduled caste and scheduled tribe communities. The rate of tobacco use increases up to the age of 50, and then either stabilizes or decreases. The use of smoking and chewing tobacco differs significantly across various states and is strongly linked to an individual's sociocultural background.^[6]

Bidis, also known as beedies, are thin, hand-rolled, unfiltered cigarettes made from two main ingredients: tendu leaves used as the wrapper and tobacco flakes. Beedies are often referred to as the poor man's cigarette. The beedi industry plays a significant role in both rural and urban areas due to its capacity to offer employment to a large number of people.

In India, over 800 million beedies are sold annually, compared to 100 million cigarettes.

It is estimated that there are more than 300 major beedi manufacturers, along with thousands of small-scale contractors and producers involved in the bulk production. The industry employs roughly 4.4 million full-time workers and an additional 4 million in related jobs. Beedi workers represent 87% of the total tobacco industry labor force, with women constituting 76% of the beedi workforce.^[7]

On average, a woman rolls between 500 and 1000 beedies/day, using about 500 g of tobacco flakes. During the process of rolling beedies, workers may inhale tobacco dust and other harmful substances. Many of these workers live in small rooms where they carry out beedi rolling along with cooking, sleeping, and other daily activities. The health risks associated with tobacco exposure through smoking have been well-documented, and both active and passive exposure to tobacco smoke have a significant impact on women's health. Beedi rolling also poses serious health risks.^[8]

There are several locations in Kanpur district where beedi work is carried out, with Bilhaur town being one of them. In Bilhaur, generations of workers have been employed in beedi factories, making it a suitable area for an epidemiological study.

Therefore, the study aimed to assess the prevalence of periodontal diseases using CPITN in the beedi factory workers of Bilhaur town, Kanpur Nagar district, Uttar Pradesh.

2. Materials and Methods

The present study was conducted among beedi factory workers of Bilhaur town, Kanpur Nagar District, Kanpur. The information about beedi factory workers was collected with the help of the city Municipal Corporation and the labor office of Bilhaur.

2.1. Study population

There are more than 1500 beedi workers aged 19–60 years who roll and pack beedis. These workers cut the tobacco leaves in the morning and then roll these leaves with a pinch of tobacco and close the ends of the formed beedi. Then, they bundle the beedis and send them to the packing department. On average, they roll around 1000–2000 beedis/day.

2.2. Ethical approval for the study

The study protocol was reviewed by the institutional review board, and ethical clearance was obtained for the same.

2.3. Obtaining approval from authorities

The details of the study, along with a request letter from the Principal, Rama Dental College, Kanpur, were provided to the labor inspector, the labor office, Bilhaur. An official permission was obtained from the labor inspector, the labor office, Bilhaur, before the start of the study. Written informed consent was obtained, and an information sheet was given to the enrolled participants in their spoken language.

2.4. Training and calibration

Before the commencement of the study, the examiner was standardized and calibrated in the Department of Public Health Dentistry by Faculty members to ensure uniform interpretations, understanding, and application of the codes and criteria for the diseases to be observed and to ensure consistent examination.

2.5. Pilot study

A pilot study was conducted to determine the prevalence of periodontal diseases among 150 beedi workers in the collection point of the beedi factory. The pilot study was helpful in determining the feasibility of the study and getting acquainted with the study work.

2.6. Sampling design and sample size

Cluster random sampling was used. There were 140 factory/manufacturing units in Bilhaur town. Out of which, 32 working units with around 50 workers each were chosen as clusters in the study. Hence, the chosen sample size was 1500.

2.7. Inclusion criteria

Beedi workers who gave informed consent to participate in the study, participants who were available at the time of the study, and factory/manufacturing units that gave permission for the study.

2.8. Exclusion criteria

Participants with other systemic diseases.

2.9. Collection of data

A proforma containing general information, such as name, age, sex, and CPITN Index^[8] was used. The examination was conducted on the workers in the collection point of beedi factories on an ordinary chair in natural daylight using mouth mirrors and CPITN probes.

The examination areas were arranged in such a way that the workers were allowed to come one by one for examination and were not allowed to crowd around the examiner.

The forms were collected and arranged in serial number and stacked together in bundles of 250 or 500. The bundles were labeled with identification numbers and the date of recording to make them ready for data entry. Data entry was made on the same day or within 2–3 days, so that if any discrepancy was seen, it could be rectified easily.

2.10. Statistical analysis

Data were analyzed using IBM Statistical Package for the Social Sciences (SPSS) Statistics version 21 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) Descriptive statistics included calculation of means, standard deviation (SD), median, and percentages. Data distribution was assessed for normality using the Shapiro–Wilk test. Student's *t*-test (two-tailed, independent) has been used to find the significance of study parameters on a continuous scale between males and females. A single binomial proportion test has been used to find the significance of the community periodontal index (CPI) according to sociodemographic variables. All values were considered statistically significant for a value of $P < 0.05$.

3. Results

An epidemiological cross-sectional study was conducted on 1500 beedi factory workers in Bilhaur town, Kanpur Nagar district, to assess their periodontal status and treatment needs in the age group of 19–60 years.

Table 1 shows the association of sociodemographic variables and CPI. Among the age group of up to 20 years, 1 (0.5%) worker presented with CPI code 1 (bleeding) and 179 (99.5%) with code 2 (calculus). Among the 21–30 years age group, 574 (98.6%) had code 2, 5 (0.9%) had code 3 (shallow pockets), and 3 (0.5%) had code 4 (deep pockets). Among the 31–40 years age group, 266 (67.7%) had CPI code 2, 122 (31.1%) had code 3, and 5 (1.3%) had code 4. Among the 41–50 years age group 29 (16.3%) had CPI code 2, 132 (74.2%) had code 3 and 17 (9.6%) had code 4. among age group above 50 years 1 (0.6%) had CPI code 2, 71 (42.5%) had code 3 and 76 (45.5%) had code 4. Code x (excluded sextant) of CPI was seen only in the age group above 50 years. It has been observed that as the age advances, the CPI scores also increase; the same results have also been found in relation to code x with statistically significant findings.

Table 1: Distribution according to the association of sociodemographic variables and CPI

Basic variables	Number of subjects	CPI					
		0	1 (%)	2 (%)	3 (%)	4 (%)	X (%)
Age in years							
Up to 20	180	-	1 (0.5)*	179 (99.5)**	-	-	-
21–30	582	-	-	574 (98.6)**	5 (0.9)	3 (0.5)	-
31–40	393	-	-	266 (67.7)	122 (31.1)**	5 (1.3)	-
41–50	178	-	-	29 (16.3)	132 (74.2)**	17 (9.6)	-
>50	167	-	-	1 (0.6)	71 (42.5)	76 (45.5)**	19 (11.4)**
Gender							
Male	202	-	1 (0.5)*	120 (59.4)	53 (26.2)	23 (11.4)**	5 (2.5)
Female	1298	-	-	929 (71.6)	277 (21.3)	78 (6.1)	14 (1.1)
Religion							
Hindu	585	-	-	386 (65.9)	153 (26.2)	38 (6.5)	8 (1.4)
Muslim	915	-	1 (0.1)	663 (72.5)	177 (19.3)	63 (6.9)	11 (1.2)
Education levels							
1	1433	-	-	988 (68.9)	327 (22.8)	99 (6.9)	19 (1.3)
2	41	-	-	37 (9.0)	2 (4.9)	2 (4.8)	-
3	15	-	1 (6.7)**	13 (86.7)	1 (6.7)	-	-
4	7	-	-	7 (100.0) ⁺	-	-	-
5	4	-	-	4 (100.0) ⁺		-	-
Diet							
Vegetarian	12	-		3 (25.0)	2 (16.7)	6 (50.0)**	1 (8.3)*
Mixed	1488	-	1 (0.07)	1046 (70.2)	328 (22.1)	95 (6.4)	18 (1.2)
Total	1500	-	1 (0.07)	1049 (69.9)	330 (22.0)	101 (6.7)	19 (1.3)

⁺Suggestive of significance, *Moderately significance, **Highly significant. CPI: Community periodontal index

The CPI score among males was 1 (0.5%), had CPI code 1, 120 (59.4%) had code 2, 53 (26.2%) had code 3, 23 (11.4%) had code 4, and 5 (2.5%) had code x. Moreover, among the females, 929 (71.6%) had CPI code 2, 277 (21.3%) had code 3, 63 (6.9%) had code 4, and 11 (1.2%) had code x.

It shows that CPI code 2 (calculus) was seen more among females than males, whereas CPI code 1 (bleeding), 3 (shallow pockets), 4 (deep pockets), and x (excluded sextant) were seen more among males than females, with statistically significant findings for code 1 and code 4.

Among education level 1 (illiterate) 988 (68.9%) workers had CPI score code 2, 327 (22.8%) had code 3, 99 (6.9%) had code 4, and 19 (1.35) had code x. Among workers with an education level 2 (primary school), 37 (9.0%) workers had code 2, 2 (4.9%) had code 3, and 2 (4.8%) had code 4. Among workers with an education level 3 (middle school), 1 (6.7%) had code 1, 13 (86.7%) had code 2, and 1 (6.7%) had code 3. Among workers with an education level 4 (high school), 7 workers had code 2, and among workers with an education level 5 (intermediate/diploma), 4 workers had code 2. It shows that as the education level among the workers increased, the scores of CPI decreased.

Among vegetarian workers, 3 (25%) had CPI code 2, 2 (16.7%) had code 3, 6 (50%) had code 4, and 1(8.3%) had code x. Among workers with mixed diet, 1(0.07%) had CPI code 1, 1046 (70.2%) had code 2, 328 (22.1%) had code 3, 95 (6.4%) had code 4, and 18 (1.2%) had code x. Although the number of vegetarian workers was very low compared to workers with a mixed diet, the statistical significant finding was observed for code 4 and code x, where the vegetarian workers had more CPI scores than workers with a mixed diet.

Table 2 shows the distribution of the number of sextants in CPI according to gender. It shows that for CPI code 2 (calculus), the number of sextants affected was more in females than in males, but for CPI code 1 (bleeding), code 3 (shallow pockets), code 4 (deep pockets), and code x (excluded sextant), the number of sextants affected was more in males than in females.

Table 2: Distribution of the number of sextants in the Community Periodontal Index according to gender

Sextants-CPI	Male		Female		Total		P-value
	Mean	SD	Mean	SD	Mean	SD	
CPIO-Healthy	-	-	-	-	-	-	-
CPI1-Bleeding observed, directly or using a mouth mirror, after probing	0.03	0.43	0.04	0.27	0.04	0.29	0.864
CPI2 Calculus was detected during the probing, but all of the black band on the probing was visible	4.12	2.54	4.87	2.05	4.77	2.13	<0.001**
CPI 3-Pocket 4–5 mm	1.19	2.01	0.78	1.66	0.84	1.72	0.002**
CPI 4-Pocket 6 mm or more	0.56	1.56	0.28	1.14	0.32	1.21	0.002**
CPI-X -Excluded sextant	0.08	0.47	0.03	0.24	0.04	0.28	0.008**
Not recorded	-	-	-	-	-	-	-

**Highly significant. CPI: Community periodontal index, SD: Standard deviation

Table 3 shows the distribution of treatment needs according to age. It shows that for the age groups of up to 20 years, 21–30 years, 31–40 years and 41–50 years majority of the workers (99.4%, 99.5%, 98.7% and 90.4% respectively) requires TN 2 but for the age group of above 50 years the majority (55.7%) of workers require TN 3 followed by (44.3%) workers requiring TN 2.

Table 4 shows the distribution of treatment need according to gender. Among males, the mean and SD were (0.03 and 0.43, 5.32 and 1.77, and 0.56 and 1.56 for TN 1, TN 2, and TN 3, respectively), and among females, the mean and SD were (0.02 and 0.21, 5.67 and 1.25, and 0.28 and 1.14 for TN 1, TN 2, and TN 3, respectively). It shows that among males less number of sextants require TN 2 and a larger number of sextants require TN 3 as compared to females.

4. Discussion

The beedi factory workers represent a special population group who are exposed to a tobacco environment and dust. The main raw material used for beedi rolling involves tobacco, which is provided in powder form, to which the workers are constantly exposed.

The present study was conducted to assess the periodontal status and treatment needs of the beedi factory workers.

Literature about the periodontal health of the beedi factory workers was not available, as no study has been published in this regard, and the present study has been compared with the studies done on the general population.

In the present study, the prevalence of periodontal disease increased as the age advanced, which is similar to the studies conducted by Miyazaki *et al.*,^[9] Van Palenstein Helderman *et al.*^[10] and Krstrup and Erik Petersen^[11]

In this current study, not a single sextant presented a healthy state, and other studies were conducted by Van Palenstein Helderman *et al.*,^[10] and Anil *et al.*^[12] (11%) had similar findings.

The mean number of sextants with bleeding as the highest score was (0.04–0.29) in this study, showing that fewer sextants were affected by score 1, which is bleeding as the highest score, similar to Miyazaki *et al.*^[9] in his study also showed a smaller number of sextants (0.5–0.1) affected by score 1. Whereas the studies conducted by Pilot *et al.*,^[13] Van Palenstein Helderman *et al.*^[10] and Anil *et al.*^[12] showed the highest number of sextants affected by score 1, that is, (with the mean of 5.3, 5.2, 5.03, and 5.0, respectively).

The mean number of sextants with code 2, calculus as the highest score, was seen to be a mean of 4.77 and SD of 2.13, which indicates that the majority of the sextants per person are affected by the score code 2. There were similar findings that stated a large number of sextants affected by the score of code 2 were reported by the studies conducted by Garcia and Cutress^[8] (4.4), Songpaisan and Davis^[14] (4.6), Pilot *et al.*^[13] (4.87), Gamonal *et al.*^[15] (4.20–1.36).

Treatments needs for the population in the present study showed that, not a single worker (0%) presented with TN 0 (there is no need of treatment), only 0.1% of the population requires TN 1 (need for improving personal oral hygiene), the majority of the population that is 92.1% requires TN 2 (needs professional cleaning of the teeth that is scaling and removal of plaque

Table 3: Distribution of treatment needs according to age

Age in years	Total number	Treatment needs							
		TN0		TN1		TN2		TN3	
		No.	%	No.	%	No.	%	No.	%
Up to 20	180	-	-	1	0.6	179	99.4	-	-
21–30	582	-	-	-	-	579	99.5	3	0.5
31–40	393	-	-	-	-	388	98.7	5	1.3
41–50	178	-	-	-	-	161	90.4	17	9.6
>50	167	-	-	-	-	74	44.3	93	55.7
Total	1500	-	-	1	0.1	1381	92.1	118	7.9

Table 4: Distribution of treatment needs per sextants according to gender

Gender	Total number	Treatment needs-sextants							
		TN0		TN1		TN2		TN3	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Male	202	-	-	0.03	0.43	5.32	1.77	0.56	1.56
Female	1298	-	-	0.02	0.21	5.67	1.25	0.28	1.14
Total	1500	-	-	0.03	0.25	5.62	1.34	0.32	1.21

SD: Standard deviation

retentive factors with oral hygiene instructions). Moreover, 7.9% of the total population requires TN 3 (needs complex treatment involving deep scaling, root planning, and more complex surgical procedures).

In the present study, we found that it is the male gender that requires more complex treatment (TN 3) than females, that is, 13.9% for males and 6.9% for females. Similar results, that is, males requiring more complex treatment (TN 3) than females, were shown by studies conducted by Miyazuki *et al.*^[9] showed 11.5% males and 3.7% females require TN 3, Bourgeois *et al.*^[16] had shown 1.9% males and 1.6% females need TN 3, and Gamonal *et al.*^[15] in which 54.2% males need TN 3 and 36.6% females need TN 3, among their study population.

5. Conclusion

The study presented a high prevalence of periodontal disease among the beedi factory workers; it was found that females are the major group (86.5%) working for this business. The majority (78.9%) of subjects are in the range of 19–40 years and 95.5% of the total population are illiterates, 69.9% of the workers presented with CPI code 2 (calculus), 22% with code 3 (shallow pockets) and 1.3% with code 4 (deep pockets) as the prevalence of calculus was more it can be explained that the study groups had more number of younger and middle aged population. The study also found that as age increases, the prevalence of periodontal disease and the level of treatment need also increase, whereas as the level of education increases, both the level of periodontal disease and treatment needs decrease. It was also observed that male workers had a higher prevalence of deep pockets (code 4) and required complex treatment (TN 3) than females.

As for the treatment, only 0.1% of the study population required TN 1 (oral hygiene instructions), whereas the bulk (92.1%) requires TN 2 (indicates professional cleaning of the teeth/scaling and removal of plaque retentive factors and oral hygiene instructions), and 7.9% requires complex treatment involving deep scaling, root planning, and more complex procedures.

Since these factory workers form a well-confined, easily accessible group, efforts should be extended to carry out programs to meet the treatment needs of this population, thus enhancing their periodontal health, which in turn improves their oral and general health.

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