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Assessment Of Oral Health Status And Tobacco Usage Among Female Beedi Workers Residing In A Beedi Colony In Bangalore, India. A Cross-Sectional Study.

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Abstract:
Background*: Tobacco use remains a leading preventable cause of morbidity and mortality worldwide. In India, non-cigarette products such as beedis and smokeless tobacco account for the majority of use, creating unique public health challenges. Female beedi workers represent a particularly vulnerable group, experiencing both high personal tobacco consumption and chronic occupational exposure to tobacco dust. Despite this dual risk, their oral health status has received limited focused research. This study sought to quantify the burden of oral disease and identify determinants of poor oral health in this population.*
Materials and Methods*: A cross-sectional study was carried out among 600 female beedi workers in Bangalore, selected through total enumeration sampling. Data were gathered using structured interviews on socio-demographic factors, deleterious habits, and oral hygiene practices, followed by comprehensive oral examinations conducted with the WHO Oral Health Assessment Form (2013).*
Results *The majority of participants were middle-aged women with limited education. Tobacco use was widespread (83.3%), and oral hygiene practices were suboptimal, with 90.5% brushing only once daily. Clinical findings revealed an alarming burden: over 80% had active caries, 67.7% showed gingival bleeding, 52.8% had periodontal pockets, and 72.5% presented with dental erosion. Oral mucosal lesions, including leukoplakia (2.2%), were also detected. A striking 87.6% of participants required dental treatment, underscoring a profound unmet need.*
Conclusion: *Female beedi workers carry a disproportionately high burden of preventable oral diseases, reflecting the combined impact of tobacco exposure, inadequate oral hygiene, and socio-economic disadvantage. The presence of potentially malignant lesions alongside widespread caries and periodontal disease highlights the urgent need for targeted, multi-level public health interventions. Addressing both behavioral risks and systemic determinants is essential to reduce this entrenched oral health inequity.*
Key Word: *Beedi workers, Oral health, Tobacco exposure, Periodontal disease, Occupational health.*

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I. Introduction

Tobacco use is a leading preventable cause of disease and death worldwide, contributing to cancers, cardiovascular and respiratory illnesses, and imposing heavy economic costs. In recognition of its broad impact, tobacco control is embedded in the United Nations Sustainable Development Goal 3 (Good Health and Well-Being).

India, the world's second-largest producer and consumer of tobacco, faces a unique challenge due to the dominance of non-cigarette forms. Beedis and smokeless tobacco account for 81% of national consumption, with beedis outselling cigarettes 8:1 and nearly 200 million people using smokeless products. These forms deliver higher levels of carcinogens and toxins than conventional cigarettes, increasing risks for systemic and oral health.

Female beedi workers represent a particularly vulnerable group. The industry employs over 4.4 million workers, most of them women, in home-based, low-wage settings. These women are often poor, illiterate, and dependent on beedi rolling for survival. Their socio-economic disadvantage, coupled with occupational exposure to tobacco dust and high personal use, creates a cycle of health inequity, where limited income and inadequate welfare access restrict healthcare utilization.[2]

Despite their dual risks, research specifically addressing the oral health status of female beedi workers is scarce. The context of a "beedi colony" provides an opportunity to study the combined effects of occupational and behavioral exposures.[7]

This study was therefore undertaken to quantify the burden of oral disease and tobacco usage patterns among female beedi workers in Bangalore, and to generate evidence that can inform targeted interventions, awareness programs, and policy measures aimed at improving their oral and overall health.

II. Material And Methods

This Cross-sectional study was carried out on female beedi worker of Beedi worker colony Bangalore. A total 600 female subjects of aged ≥ 18, years were for in this study.

Study Design: A community-based cross-sectional study.

Study Location: Beedi Workers' Colony, Kengeri, Bangalore, Karnataka, India.

Study Duration: Four months.

Sample size: 600 female beedi workers

Sample size calculation: A total enumeration sampling technique was employed, whereby every eligible female beedi worker residing in the designated colony was included. This approach ensured comprehensive coverage of the study population.

Subjects & selection method: All female beedi workers aged 18–60 years, currently residing in the colony, were invited to participate.

Inclusion criteria:
- Female beedi workers aged 18–60 years.
- Residents of the selected beedi colony.
- Willing to provide informed consent.

Exclusion criteria:
- Women not engaged in beedi rolling.
- Those with systemic conditions preventing oral examination.
- Individuals unwilling to participate.

Procedure methodology:

Ethical clearance was obtained prior to study initiation. Informed consent was collected from all participants. Data collection involved:

1. Structured Questionnaire: Administered via personal interviews to record socio-demographic details, deleterious habits, oral hygiene practices, dietary habits, and dental care utilization.
2. Clinical Examination: Conducted by a trained and calibrated examiner using the WHO Oral Health Assessment Form (2013). Standard diagnostic armamentarium (mouth mirror, probe, CPI probe, cotton rolls, gloves, masks, and adequate light source) was used. Parameters assessed included dentition status, periodontal health, enamel fluorosis, dental erosion, oral mucosal lesions, and treatment needs.

Statistical analysis

Collected data were entered and analyzed using statistical software (SPSS). Descriptive statistics were used to summarize demographic and clinical characteristics. Associations between risk factors and oral health outcomes were evaluated using Chi-square tests, with $p < 0.05$ considered statistically significant.

III. Result

The study included 600 female beedi workers. The age distribution was skewed toward middle age: the largest group (33.3%, $n = 200$) was 41–50 years, followed by 31–40 years (30.8%, $n = 185$), 51–60 years (24.0%, $n = 144$), and 21–30 years (11.8%, $n = 71$). In sum, 64.1% of participants were between 31 and 50 years, indicating a predominantly middle-aged cohort. Most participants had low formal education: among the 296 with

available data, 50.7% ($n = 165$) had only primary schooling, 27.5% ($n = 85$) completed high school, 14.2% ($n = 40$) had higher secondary education, and just 6.7% ($n = 6$) held a university degree. Regarding marital status (N=600), 83.8% ($n = 503$) were married and 16.2% ($n = 97$) unmarried. The vast majority (82.7%, $n = 496$) were Muslim (with smaller Hindu and Christian minorities), and most worked a standard 6–8 hours per day (67.2%, $n = 403$).

Table 1: Distribution Of study population according to age group

Characteristic	Category	Count (n)	Percentage (%)
Age Group	21-30 years	71	11.8
	31-40 years	185	30.8
	41-50 years	200	33.3
	51-60 years	144	24.0

A very high proportion of participants reported deleterious habits: 83.3% ($n = 500$) of women used tobacco or related substances, while only 16.7% ($n = 100$) reported no such habits. These habits typically include smoking, smokeless tobacco, betel chewing, or alcohol. The prevalence is notable, as such habits are major risk factors for oral disease. This high rate of habitual tobacco use is likely a principal driver of the poor oral health observed in this group.

Table 2: Distribution Of study population according to deleterious habit

Characteristic	Category	Count (n)	Percentage (%)
Deleterious Habit	Yes	500	83.3
	No	100	16.7

Oral Hygiene Behaviors

The predominant cleaning method was the toothbrush (66.3%, $n = 398$), but many still used traditional methods (Figure 3). About 24.0% ($n = 144$) cleaned with chewing sticks and 9.7% ($n = 58$) with their fingers. Thus one-third of women relied on less effective traditional tools, which likely contributed to inadequate plaque removal. The choice of cleaning aids had clinical implications: inadequate use of modern tools is directly linked to the high levels of gingival inflammation and periodontal disease seen in these workers.

Table 3: Distribution Of study population according to type to tooth cleaning

Characteristic	Category	Count (n)	Percentage (%)
Type of Cleaning	Toothbrush	398	66.3
	Finger	58	9.7
	Chewing stick	144	24

The method of brushing was largely suboptimal: 71.3% ($n = 428$) used a horizontal (back-and-forth) technique, while only 17.7% ($n = 106$) used vertical brushing and 11.0% ($n = 66$) used a combination. Over 90% (90.5%, $n = 543$) reported brushing their teeth only once a day, and only 6.7% ($n = 40$) did so twice daily. Very few (2.8%, $n = 17$) brushed more than twice a day. The timing of brushing was usually before meals (96.7%, $n = 580$) rather than after. In summary, almost all participants performed only a single daily cleaning, mostly before meals, using predominantly horizontal strokes. Such infrequent and mechanically inefficient brushing practices explain much of the accumulated plaque, gingivitis, and caries in the group.

Table 4: Distribution Of study population according to method of tooth cleaning

Characteristic	Category	Count (n)	Percentage (%)
Method of Cleaning	Vertical	106	17.7
	Horizontal	428	71.3
	Both	66	11

The materials used for cleaning were also mixed: 62.7% ($n = 376$) used toothpaste, but 33.3% ($n = 200$) used traditional toothpowder (often abrasive) and 4.0% ($n = 24$) other materials. Moreover, 94.7% ($n = 568$) reported using no supplementary aids (no mouthrinse, floss, etc.), with only 5.3% ($n = 32$) using a mouthrinse. These findings indicate that oral hygiene practices were basic and limited, emphasizing the need for improved education on effective tools and techniques.

Clinical Oral Health Status

Clinical examinations revealed a **very high burden of dental disease**. Dentition status (Figure 5) showed that 59.3% ($n = 356$) had active untreated caries and 21.5% ($n = 129$) had filled teeth with recurrent caries. Only 5.0% ($n = 30$) had all sound teeth. Missing teeth (edentulous due to extraction) were present in 9.3% ($n = 56$), and small percentages had restorations without disease (2.0%, $n = 12$) or prosthetic replacements (2.5%, $n = 15$); unerupted teeth were rare (0.3%, $n = 2$). Overall, 80.8% of women had evidence of dental caries (active or recurrent), indicating an overwhelmingly high prevalence of decay and a very low level of intact dentition. This points to chronic unmet dental needs and reflects the long-term effects of poor oral hygiene and low dental care utilization.

Table 5: Distribution Of study population according to dentition status

Characteristic	Category	Count (n)	Percentage (%)
Dentition Status	Caries	356	59.30%
	Filled w/ caries	129	21.50%
	Missing	56	9.30%
	Sound	30	5.00%
	Prosthesis	15	2.50%
	Filled, no caries	12	2.00%
	Unerupted	2	0.30%

Periodontal findings were similarly poor. Gingival bleeding on probing, a sign of inflammation, was observed in 67.7% ($n = 406$) of the women, and 52.8% ($n = 317$) had periodontal pockets (indicative of periodontitis). Only 32.3% and 47.2% were free of bleeding and pockets, respectively. These values are exceedingly high; more than two-thirds exhibited gingivitis and over half had developed periodontitis. The clustered bar chart below (Figure 6) illustrates that far more participants were "present" for bleeding and pockets than "absent." Poor plaque control and infrequent professional cleaning—already noted in the hygiene data—likely explain these outcomes.

Table 6: Distribution Of study population according to periodontal status

Characteristic	Category	Count (n)	Percentage (%)
Periodontal Status	Gingival bleeding - Present	406	67.70%
	Gingival bleeding - Absent	196	32.70%
	Pocket - Present	317	52.80%
	Pocket - Absent	283	47.20%

Other oral conditions were also common. Nearly one-third (28.2%) had abnormal extraoral findings: 16.0% ($n = 96$) had enlarged lymph nodes and 12.2% ($n = 73$) had facial swellings, possibly reflecting chronic dental infections. On intraoral exam, 8.5% had some mucosal lesion. For example, 2.2% ($n = 13$) had leukoplakia and 2.0% ($n = 12$) had chronic ulcerations. Though 91.5% ($n = 549$) had normal oral mucosa, the identified lesions are significant because leukoplakia is potentially precancerous. The concurrence of such lesions with prevalent tobacco habits raises concern for oral pre-cancerous changes.

Treatment Needs

Dental treatment needs were extensive (Figure 7). Only 5.0% ($n = 30$) of women required **no treatment**. The remaining 95% needed care: 45.7% ($n = 274$) required **preventive or basic care** (prophylaxis, fluoride, oral hygiene instruction), 25.7% ($n = 154$) needed **prompt (non-urgent) treatment** (e.g. simple restorations or extractions), and 16.2% ($n = 97$) required **immediate treatment** (urgent or emergency care). A further 7.5% ($n = 45$) were flagged for comprehensive evaluation. In aggregate, 87.6% of participants (preventive + prompt + immediate) had clear, defined dental intervention needs.

Table 7: Distribution Of study population according to intervention urgency

Characteristic	Category	Count (n)	Percentage (%)
Intervention Urgency	Preventive treatment needed	274	45.70%
	Prompt treatment needed	154	25.70%
	Immediate treatment needed	97	16.20%
	Referred for comprehensive evaluation	45	7.50%
	No treatment	30	5.00%

The combined data underscore that these beedi workers face a **critical oral health burden**. Poor oral hygiene behaviors and widespread tobacco use have coincided with very high caries and periodontal disease rates, resulting in nearly universal treatment needs. This suggests an urgent need for preventive programs and expanded dental care services for this population.

IV. Discussion

This study among female beedi workers in Bangalore revealed a disproportionately high burden of oral diseases, with over 80% affected by active or recurrent dental caries, more than half exhibiting periodontal pockets, and nearly 70% showing gingival bleeding. These findings are consistent with other regional studies on beedi workers, which similarly report poor oral and general health outcomes due to occupational tobacco exposure and inadequate oral hygiene practices.

Padma Bhat et al. (2018, Karnataka) observed oral mucosal lesions in 26.9% of beedi workers, while in our study, 8.5% had identifiable mucosal conditions, including leukoplakia and ulcerations. Though the

prevalence was lower here, the presence of potentially malignant lesions highlights the same underlying risk factors: widespread tobacco use and chronic exposure to unburnt tobacco dust.[3]

Anupama Singh et al. (2021, Bihar) documented high levels of periodontal disease among beedi workers, with over 67% classified under CPI-2 and nearly 10% under CPI-4. Our findings mirror this pattern, with 67.7% showing gingival bleeding and 52.8% periodontal pockets, suggesting a consistent periodontal disease burden across states.[13]

Similar to the observations of Madhusudhan et al. (2014, Karnataka)[1] and Ria Ann Thomas et al. (2015, Mangalore)[15], our study found that oral hygiene practices were largely suboptimal, with most participants brushing only once daily, relying on horizontal brushing techniques, and using abrasive toothpowders or chewing sticks. These parallels emphasize that poor oral health literacy and limited access to professional care are common challenges across beedi worker populations.

In terms of treatment needs, our study found that nearly 90% required preventive, prompt, or immediate intervention. This aligns with findings from national reviews (Tyagi et al., 2023), which concluded that beedi workers and their families face widespread health hazards and substantial unmet healthcare needs[5].

Overall, when compared with other studies, our findings reinforce the evidence that female beedi workers face overlapping vulnerabilities: low socioeconomic status, occupational tobacco exposure, and poor oral hygiene. These factors collectively perpetuate a cycle of advanced oral disease and untreated needs. Interventions must therefore combine preventive oral health programs with structural reforms to address occupational and socioeconomic determinants.

V. Conclusion

The present study demonstrates that female beedi workers in Bangalore experience a markedly high burden of oral disease, closely linked to widespread tobacco use, occupational exposure to tobacco dust, and inadequate oral hygiene practices. Dental caries, periodontal disease, and dental erosion were highly prevalent, and the majority of participants required preventive or immediate treatment. The low utilization of professional dental services and reliance on ineffective oral hygiene methods further compounded these problems.

These findings highlight the urgent need for comprehensive oral health promotion, including community-based education on effective hygiene practices, regular preventive care, and early detection of precancerous lesions. At the same time, structural interventions—such as improved occupational safety, alternative livelihood opportunities, and inclusion of beedi workers in welfare and social security schemes—are essential to address the broader determinants of health. Strengthening both preventive strategies and systemic support can substantially reduce the oral disease burden and improve the overall well-being of this vulnerable population.

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