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**BURDEN OF ORAL DISEASE AND ORAL HEALTH-RELATED QUALITY
OF LIFE AMONG FEMALE SEX WORKERS IN BELAGAVI DISTRICT, INDIA**

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ABSTRACT

BACKGROUND. Oral health is crucial for overall well-being, yet certain marginalized populations often face significant barriers to accessing adequate oral healthcare. This study aims to assess oral health status, oral health-related quality of life, oral hygiene practices, and tobacco use among sex workers in the Belagavi district of Karnataka.

OBJECTIVE. To assess oral health status, oral hygiene practices, tobacco use, and OHRQoL among female sex workers in Belagavi district, India.

MATERIAL AND METHODS. A cross-sectional survey was conducted among female sex workers from May to July 2023 in compliance with STROBE guidelines. Data were collected through clinical examinations using the WHO Oral Health Assessment Form (2013), the Oral Health Impact Profile (OHIP-14), and a tobacco use assessment questionnaire. The total sample size of 525 was achieved. Statistical analysis was performed using descriptive statistics, the Kruskal-Wallis test, and Spearman's correlation.

RESULTS. The study revealed a high prevalence of untreated dental caries (75.1%), missing teeth (38.9%), and a low rate of fillings (2.1%). Significant correlations were found between oral hygiene practices and dental caries. The prevalence of tobacco use among sex workers was low. The results showed a positive perception towards oral health-related quality of life.

CONCLUSIONS. This study revealed a considerable burden of untreated oral diseases among female sex workers in Belagavi district, despite a relatively minimal perceived impact on oral health-related quality of life.

Keywords: *oral hygiene, oral health-related quality of life, oral health, sex workers*

INTRODUCTION

Oral diseases are a major global public health concern due to their high prevalence and substantial impact on individuals, communities, and health care system. More than 3.5 billion people worldwide are affected by chronic and progressive oral conditions (1).

Oral diseases, which are mostly preventable, cause "pain, discomfort, deformity, and even death", impacting people at all stages of life. Oral disorders, including dental caries, periodontal disease, tooth loss, oral cavity cancer, oral diseases connected to HIV/AIDS, and orodental trauma, are significant global public health issues. According to the findings of the study conducted by Nursyamsi et al. in 2023, the average Decayed Missing Filled Teeth (DMF-T) index among commercial sex worker in Makassar City was found to be 7.76, which falls under the "high caries" group based on the WHO assessment indicators (2).

The significance of oral health extends to a wide range of demographics, as it is a crucial element of overall well-being (3). This is particularly true for those with lower socioeconomic status because oral illnesses are more likely to be more common among them. This association holds for all stages of life, from early childhood to old age (4). Another group that requires special attention is the sex workers, who also confront specific health problems as a result of their marginalization (5). Global studies paint a concerning picture, highlighting the high prevalence of oral diseases among sex workers (6).

Among many other challenges, the daily lives of women employed in the sex industry include social, psychological, physical, and financial obstacles. Many are forced into the field due to economic necessity or the inability to make a living in any other way (7). Furthermore, due to the societal shame attached to their line of work, they experience mental distress and ultimately succumb to various addictions (8). According to an estimates given by Witte et al. in the study conducted among sex workers in Mongolia, 57% of males and 11% of women between the ages of 15 and 49 smoke. This increases the risk of diseases and mortality, with women in sex industries being particularly vulnerable (9).

According to a 2018 study by Muralidharan et al., a number of risk factors, including nutrition, poor oral hygiene maintenance, and drug addiction, have a negative impact on oral health (6).

A study conducted by Ankola et al. in the year 2020 concluded that sex workers in the Belagavi district have a significant burden of oral health problems, including dental caries and periodontal disease (10).

The detrimental effects of tobacco use on oral health are well-established, and sex workers are disproportionately affected by this risk factor. According to a study conducted on female sex workers in the city of Botucatu, Brazil, when it comes to smoking, sex workers smoke more than the overall population, with estimates ranging from 50% to 80% among female sex workers (11). This increased tobacco use significantly elevates their risk of developing oral cancer, periodontal disease, and other oral health problems. Furthermore, the challenging living and working conditions faced by sex workers often lead to poor oral hygiene practices. Limited availability of dental treatment, financial constraints, and the stigma associated with their profession can contribute to inadequate brushing, flossing, and other essential oral hygiene routines. These factors collectively create a perfect storm for compromised oral health among sex workers, highlighting the urgent need for targeted interventions and awareness programs.

Despite all the above, the focus of prevention programs among sex workers has traditionally been on STIs (sexually transmitted illnesses) and HIV, with little mention made of oral health (4,7,9). In addition they often face barriers to accessing healthcare, including oral health services, leading to unmet dental needs and poor oral health outcomes.

Although previous studies conducted in the Belagavi district (10) have documented clinical oral health findings among female sex workers, there remains limited evidence examining how oral health conditions influence daily functioning, psychological well-being, and overall quality of life among this socially and economically vulnerable population. Therefore, the present study aimed to assess oral health status, oral hygiene practices, tobacco use, and oral health-related quality of life among female sex workers in Belagavi district, India.

MATERIALS AND METHODS

Study design and study setting. This study followed STROBE guidelines and employed an observational, cross-sectional study design. To assess oral health status, oral health-related quality of life (OHRQoL), oral hygiene practices, and use of tobacco among sex workers in Belagavi district, Karnataka.

The study was conducted from May to July 2023. The purpose of the study was explained to the participants, and their informed consent was acquired.

Inclusion criteria.

- Female sex workers aged 18 years and above
- Residents of the selected taluks of Belagavi district
- Currently living in areas of the selected taluks

- Identification was based entirely on voluntary self-declaration by the participants
- Regarding gender identity, the study strictly included female sex workers
- Willing to provide written informed consent for participation in the study.

Exclusion criteria.

- Participants who were medically compromised or unable to undergo oral examination
- Participants not willing to provide informed consent.

Sampling technique. Participants were recruited using non-probability convenience sampling during comprehensive health screening camps conducted in three selected taluks of Belagavi district. The camps were organized in collaboration with local Community-Based Organizations (CBOs), and oral health assessment was included as a component of the overall health screening.

Pilot study. To find any design faults, such as word ambiguity, trouble comprehending the questions, and other questionnaire-related concerns, pilot research with 10 female sex workers was conducted.

Questionnaire development. English questionnaires were used to assess oral hygiene practices and tobacco practices to determine oral habits. A face-to-face interview was conducted to record the findings. Cronbach's α was used to evaluate the questionnaire's reliability, which was 0.85. Face validity (84%) and content validity ratio (0.78) were used to evaluate the questionnaire's validity. A viable questionnaire was created by further refining the questionnaire based on the pre-test feedback, specifically targeting the study objectives.

Sample size. The formula for precision calculation, $n = Z^2 p.q/d^2$, where, $Z = 1.96$, $p = 0.62$, $q = 1 - p = 0.38$, $d = 7\%$ (0.07) ($1.96^2 \cdot 0.62 \cdot 0.38 / 0.0049 = 184.7 \sim 185$). Thus, a minimum target of 185 participants was established as the baseline requirement for statistical significance. Because convenience sampling can inherently be vulnerable to selection bias, the institutional health camps aggressively maximized recruitment efforts to capture as large a cross-section of the resident population as possible. This resulted in a final sample of 525 participants. The prevalence was taken from a survey by Nouaman et al. in 2018 (12).

Questionnaire details. WHO Oral Health Proforma 2013 was used to record the dentition and periodontal status of the population (13). It provides a standardized framework for epidemiological surveillance of dentition and periodontal status. Dentition status is evaluated by recording specific clinical conditions (such as sound, decayed, filled, or missing) for each tooth space. Cumulative dental caries experience in permanent teeth is quantified using the Decayed, Missing, and Filled Teeth (DMFT) index. The Oral Health Impact Profile is a pre-

validated questionnaire used to assess the (OHRQoL) among adults (14). It consists of 14 closed-ended questions on a five-point Likert scale designed to assess oral health quality in seven different domains. namely, “functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap”. There are two questions in each domain. The five-point Likert scale was used for rating patients’ responses. The answers were coded with the numbers 0 (never), 1 (hardly ever), 2 (occasionally), 3 (fairly often), and 4 (very often/every day).

For each participant, an overall cumulative OHIP-14 score was calculated by taking the direct summation of all 14 individual item scores. This was also verified to be valid for the Indian context.

To quantitatively evaluate the oral hygiene practices of the study participants, a composite practice score was calculated based on six primary survey items related to cleaning methods and frequencies. Table 4 provides the specifics. A similar questionnaire consisting of various forms of tobacco and the frequency of their use was administered to record tobacco use among this population.

Examination. Data was collected in the form of a clinical examination for the WHO oral health proforma 2013. Disposable instruments were used to conduct a Type III examination to assess the dentition status and periodontal status of the participants. The clinical examination was done by 5 different examiners. Utmost care was taken for the maintenance of asepsis to avoid cross-contamination during clinical examination. All precautions were taken to maintain asepsis and prevent cross-contamination during the clinical examination. Data collection for OHIP-14, oral hygiene practices, and tobacco habits was done in the form of an interview by the principal investigator. All the participants present on the day of the examination and who were willing to give consent were included in the study.

Training and calibration. Training and calibration of examiners were done in the Department of Public Health Dentistry to record the WHO oral proforma 2013. The inter-examiner and intra-examiner reliability was evaluated utilizing Kappa statistics and was found to be 0.86 and 0.87, respectively, for the WHO Oral Health Proforma 2013.

Statistical analysis. Collected data were entered in MS Excel and analyzed using IBM-SPSS® Statistics Version 21 (USA: IBM Corp.). For the frequency distribution and population percentage, descriptive statistics were used. For each test, the cutoff value for statistical significance was established at $p < 0.05$. The data was found to follow a non-normal distribution when put under the test, viz. Shapiro-Wilk. Hence, to check the difference between the three groups, the Kruskal-Wallis test was used. The relationship between the overall score

for oral hygiene practices and the total score for the DMFT (Decayed, Missing, and Filled Treatment) index was examined using Spearman correlation.

Ethical clearance and informed consent. The institutional review board accorded ethical approval for this study (Ref. No: 98).

RESULTS

A total of 525 responses were obtained from the sex workers, all of whom were females with a mean age of 38.2 years. A total of 525 responses were obtained from the sex workers, all of whom were female sex worker with a mean age of 38.2 years. The geographic distribution of the 525 participants across the surveyed areas of Belagavi district was as follows: Taluka-1 with 224 participants, followed by Taluka-2 with 141 participants, and Taluka-3 with 160 participants.

Oral Health-Related Quality of Life (OHIP-14). The distribution of responses for OHIP scores among sex workers is represented in Table 1. The mean OHIP score was found to be 17.58. The majority of participants reported minimal impact of oral health problems on their quality of life across all seven domains assessed by OHIP-14. Specifically, 75.4% of participants reported never having trouble pronouncing words due to oral problems, while 74.0% never experienced worsening of taste. Regarding physical pain, 66.2% never experienced painful aching in the mouth, though 17.6% reported this problem very often. For functional limitations, 67.6% never found it uncomfortable to eat foods due to dental problems.

In the psychological discomfort domain, 67.6% never felt self-conscious because of their teeth or mouth, while 23.7% reported feeling tense hardly ever. Regarding physical disability, 69.8% never had an unsatisfactory diet due to oral problems, and 89.1% never had to interrupt meals. For psychological disability, 92.4% never found it difficult to relax, and 92.6% never felt irritable with others due to oral health issues. In terms of social disability, 92.7% never felt embarrassed, and 90.8% never had difficulty doing their usual jobs. Finally, in the handicap domain, 94.8% never felt that life was less satisfying, and 94.8% never felt unable to function due to oral problems.

Dental caries and DMFT status. The distribution of DMFT and OHIP scores across different age groups is presented in Table 2. The DMFT score showed significant variation across age groups: participants aged less than 25 years had a mean DMFT of 2.45 ± 2.3 , those aged 25-45 years had 3.65 ± 3.1 , and participants over 45 years had 6.53 ± 6.3 . The difference in DMFT scores among the three age groups was found to be statistically significant using the Kruskal-Wallis test ($p < 0.001$). The overall mean DMFT 4.35.

The study population was distributed across three distinct age brackets: the younger age group of <25 years (n = 51; 10%), the middle age group of 25-45 years (n = 324; 62%), and the older age group of >45 years (n = 150; 29%).

The DMFT score showed a clear increasing trend with age, with the highest mean DMFT observed in participants aged >45 years (6.53 ± 6.3), compared to younger age groups.

Similarly, the OHIP score was also found to differ across all three age groups with statistical significance ($p=0.032$). The mean OHIP scores were 17.61 ± 9.1 for the <25 age group, 17.23 ± 6.9 for the 25-45 age group, and 18.35 ± 7.2 for the >45 age group.

OHIP scores showed statistically significant variation across age groups ($p=0.032$), suggesting differences in perceived oral health impact with age.

Oral hygiene practices. The distribution of responses for oral hygiene practices among sex workers is represented in Table 3. Regarding the method of teeth cleaning, the vast majority (93.9%) used a toothbrush, while 4.2% used their finger and 1.9% used a datum – it is a traditional, organic toothbrush made from the fresh twig or root of a tree usually the Neem tree. In terms of frequency, 75.4% cleaned their teeth once daily, 24.4% twice daily, and only 0.2% cleaned after every meal. The timing of cleaning showed that 90.3% cleaned in the morning only, 7.2% in both morning and night, and 2.5% at night only.

For cleaning agents, 417 (79.4%) used toothpaste, 90 (17.1%) used tooth powder, and 18 (3.4%) used other agents. Regarding the type of toothpaste or powder, 364 (69.3%) used fluoridated products, 159 (30.3%) used non-fluoridated products, and 2 (0.4%) used herbal products. The toothbrush replacement frequency showed good practices, with 442 (84.2%) replacing their toothbrush every 1-3 months and 83 (15.8%) every 4-6 months.

Periodontal status. The prevalence of periodontal conditions among the study participants is shown in Figure 1. Bleeding on probing was observed in 52.2% of participants, indicating widespread gingival inflammation. Periodontal pockets measuring 4-5mm were found in 20.9% of participants, while deeper pockets exceeding 6mm were present in 6.1% of participants, suggesting varying degrees of periodontal disease severity.

Correlation analysis. The relationship between the DMFT score, OHIP score, and oral hygiene practice score was examined using Spearman correlation (Table 4). A weak negative correlation was found between oral hygiene practices and DMFT score ($r = -0.106$, $p = 0.015$), which was statistically significant. This indicates that participants with better oral hygiene practices tended to have lower caries experience. The correlation between oral hygiene practices and OHIP score was also negative ($r = -0.217$) but not statistically significant ($p = 0.12$).

Tobacco use patterns. Various forms of tobacco use among sex workers are presented in Figure 2. Cigarette smoking was reported by 0.1% of participants, and bidi smoking was also reported by 0.1%. Pan (quid) use was observed in 0.2% of participants. The most common forms of tobacco use were smokeless tobacco products: chewing tobacco (Ghutaka) was used by 4.1% of participants, and Mishri was used by 4.2% of participants.

DISCUSSION

This study sheds light on the oral health of Indian sex workers, a community that is marginalized and frequently has particular challenges in obtaining treatment.

The results demonstrate that oral health conditions are prevalent among sex workers which are consistent with research done in a variety of geographical contexts. A qualitative search by Schneider et al. encompassing 22 studies worldwide reported consistently higher DMFT scores and poorer oral health self-perceptions in this population compared to the general public. While some individuals reported practicing good dental hygiene, the study discovered that adverse practices like drinking alcohol and smoking, which are associated with impaired oral health, were more widespread. Some women reported good oral health despite clinical examinations revealing issues. This finding suggests that clinically assessed oral disease burden and self-perceived oral health may not always correspond. Despite having relatively high DMFT scores, many participants reported good OHRQoL (15). Similarly, research from Kenya conducted by Hoodhoy et al. documented limited access to preventive and restorative care due to financial constraints, scheduling difficulties, and fear of discrimination within healthcare settings (16). These findings resonate with the experiences of other marginalized groups, such as older adults. Both sex workers and older adults often face social isolation and challenges in accessing essential resources (17,18).

A cross-sectional study in Pune, South India, reported a concerning prevalence of dental caries 5.05 (± 4.81) and a lack of regular dental visits among sex workers (6). Moreover, a study in Belagavi district, South India, found a mean DMFT score of 3.15 and a significant prevalence of periodontal problems (37%) among sex workers, further emphasizing the burden of neglected oral health needs (10). These findings are comparable to those of the present study, which reported a mean DMFT score of 4.35. However, a significantly higher DMFT score was observed among women aged over 45 years, and periodontal problems were more prevalent. This difference may be attributed to the older age profile of participants in the present study, as dental caries experience and periodontal destruction tend to accumulate over time, resulting in higher DMFT scores and greater periodontal morbidity.

The majority of participants (75.4%) brushed once daily, whereas only 24.4% reported brushing twice daily. This proportion is considerably lower than the 43% reported by Ankola et al. (2010) in a Belagavi population, indicating less favorable oral hygiene practices among sex workers and highlighting the need for targeted oral health promotion interventions in this group.

This study also investigated the OHRQoL (OHIP-14), suggesting that oral health problems have a minimal impact on most participants' overall quality of life. Notably, over 74% of respondents reported "never" or "hardly ever" experiencing issues in most OHIP-14 domains, including taste, pronunciation, and self-consciousness. The highest prevalence of problems was reported for interrupting meals (1.5%) and difficulty doing daily activities (1.0%). This aligns with existing literature on the impact of oral health on functional limitations among various other population groups (3).

One of the important domains assessed in OHIP-14 is Psychological Discomfort. A moderate prevalence was observed for feeling tense (23.7%) and irritable (3.1%) due to oral health issues. While this prevalence is lower than the prevalence of functional limitations, these findings suggest that oral health concerns can contribute to psychological distress among sex workers. Painful teeth were a concern for 17.6% of participants. This is a significant finding, considering pain can significantly impact OHRQoL and overall QoL. This aligns with the study's earlier findings regarding the prevalence of DMFT. Few participants reported problems in the most severe OHIP-14 domain, which is disability due to oral health problems. This aligns with the overall minimal impact on QoL observed in this study.

The prevalence of tobacco reported in this study is significantly lower than in the other studies present in the literature. Given that the method of evaluating the tobacco was interview-based and that there is a strong stigma attached to tobacco use among women, this could be the result of reporting bias on the part of the participants. These studies collectively highlight the complex interplay of factors contributing to oral health disparities among sex workers (19,20).

Jain et al. reported a substantial burden of oral disease among marginalized populations, including female sex workers, with more than 70% of assessed teeth exhibiting carious lesions and several participants presenting with periodontal and oral mucosal conditions (21). Compared to the current study on female sex workers, high rates of untreated dental caries and missing teeth indicate significant unmet oral health needs, alongside a low rate of filled teeth, suggesting a substantial oral health burden. Both studies also mention various forms of tobacco use among sex workers, highlighting the need for comprehensive oral health promotion strategies addressing substance abuse (21).

These findings have important implications for policymakers, non-governmental organizations, and public health professionals involved in the welfare of female sex workers. The substantial burden of untreated oral diseases identified in this study highlights the need to integrate oral health services into existing outreach programs for female sex workers, which currently focus primarily on STI and HIV prevention.

Additionally, the assessment of oral health-related quality of life provides insight into how oral conditions affect daily functioning and well-being, thereby emphasizing the importance of patient-centered approaches in planning interventions. The findings may assist in designing targeted, evidence-based oral health promotion strategies aimed at improving both oral health outcomes and overall quality of life among female sex workers.

Strengths of this study include the relatively large sample size and focus on a marginalized population often neglected in oral health research. However, limitations include the inherent subjectivity of self-reported data and the cross-sectional design, which precludes establishing causal relationships. Due to the use of a non-probability sampling and the hidden nature of the study population, may have introduced selection bias, thereby limiting the generalizability of the findings. Future research efforts should explore these limitations by getting deeper insights into the lived experiences and perspectives of sex workers regarding their oral health needs, barriers to care, and facilitators to behavior change.

CONCLUSION

This study revealed a considerable burden of untreated oral diseases among female sex workers in Belagavi district, despite relatively minimal perceived impact on oral health-related quality of life. The findings highlight the need for targeted oral health promotion, preventive care, tobacco cessation support, and integration of oral healthcare services into existing outreach programs for this vulnerable population.

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Table. 1 Distribution of responses for OHIP score among sex workers

List of Questions on OHIP-14 Questionnaire	Response n (%)				
	Never	Hardly Ever	Occasionally	Fairly Often	Very Often
Have you had trouble pronouncing any words because of problems with your teeth or mouth?	395(75.4)	6(1.1)	106(20.2)	1(0.2)	1(0.2)
Have you felt that your sense of taste has worsened because of problems with your teeth or mouth	388(74)	9(1.7)	108(20.6)	4(0.8)	0
Have you had painful aching in your mouth	347(66.2)	11(2.1)	29(5.5)	30(5.7)	92(17.6)
Have you found it uncomfortable to eat any foods because of problems with your teeth or mouth	354(67.6)	9(1.7)	121(23.1)	23(4.4)	1(0.2)
Have you been self-conscious because of your teeth or mouth	354(67.6)	116(22.1)	22(4.2)	15(2.9)	1(0.2)
Have you felt tense because of problems with your teeth or mouth	363(69.3)	124(23.7)	16(3.1)	4(0.8)	1(0.2)
Has your diet been unsatisfactory because of problems with your teeth of mouth	366(69.8)	127(24.2)	10(1.9)	4(0.8)	1(0.2)
Have you had to interrupt meals because of problems with your teeth or mouth	467(89.1)	25(4.8)	7(1.3)	8(1.5)	1(0.2)
Have you found it difficult to relax because of problems with your teeth or mouth	484(92.4)	13(2.5)	8(1.5)	2(0.4)	1(0.2)
Have you been a bit embarrassed because of problems with your teeth or mouth	486(92.7)	14(2.7)	5(1)	1(0.2)	1(0.2)
Have you been a bit irritable with other people because of problems with your teeth or mouth	485(92.6)	16(3.1)	3(0.6)	3(0.6)	1(0.2)
Have you had difficulty doing your usual jobs because of problems with your teeth or mouth	476(90.8)	25(4.8)	5(1)	1(0.2)	1(0.2)
Have you felt that life in general was less satisfying because of problems with your teeth or mouth	497(94.8)	9(1.7)	1(0.2)	0	1(0.2)
Have you been unable to function because of problems with your teeth or mouth	497(94.8)	10(1.9)	0	0	1(0.2)

Table 2. Distribution of DMFT (Decayed, Missing, and Filled Teeth) and Oral Health Impact

	Age group			F value	p-value
	<25	25-45	>45		
DMF	2.45±2.3	3.65±3.1	6.53±6.3	38.63 [§]	<0.001*
OHI	17.61±9.1	17.23±6.9	18.35±7.2	6.86 [§]	0.032*

Profile (OHIP) scores among the study population

$p < 0.05$ *statistically significant, [§]statistical test used Kruskal Wallis

Table 3. Distribution of responses for oral hygiene practices among sex workers

Questions	Options	Response n (%)
How do you clean your teeth	Brush	493(93.9)
	Finger	22(4.2)
	Datun	10(1.9)
How often do you clean your teeth	Once	396(75.4)
	Twice	128(24.4)
	After every meal	1(0.2)
When do you clean your teeth	Morning only	474(90.3)
	Night only	13(2.5)
	Morning and night	38(7.2)
What agent do you use to clean your teeth	Toothpaste	417(79.4)
	Tooth powder	90(17.1)
	Other	18(3.4)
Name of your toothpaste/powder	Fluoridated	364(69.3)
	Non fluoridated	159(30.3)
	Herbal	2(0.4)
How often do you change your toothbrush?	1-3 months	442(84.2)
	4-6 months	83(15.8)

all the values are presented in the form of frequency and percentage

Table 4. Correlation between DMF Score, OHIP score, and oral hygiene practice

		r	p-value
Practice	DMFT	-.106*	0.015**
	OHIP	-.217*	0.12

**statistical test used Spearman correlation, ** statistically significant*

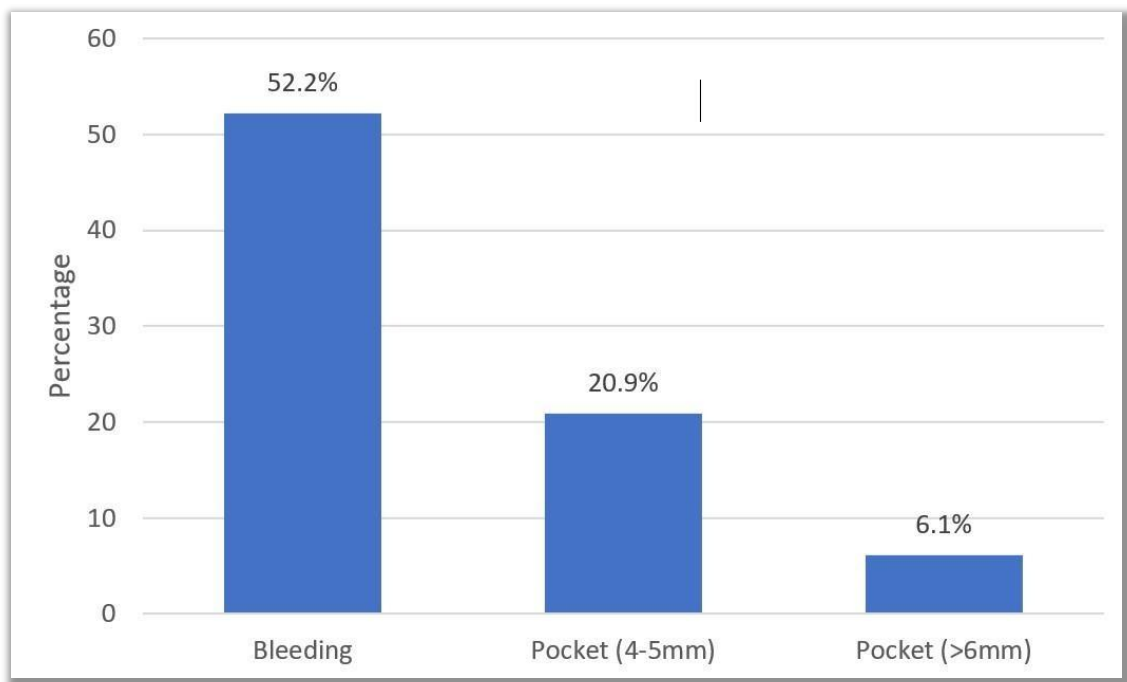


Figure 1. Prevalence of periodontal conditions among the study participants

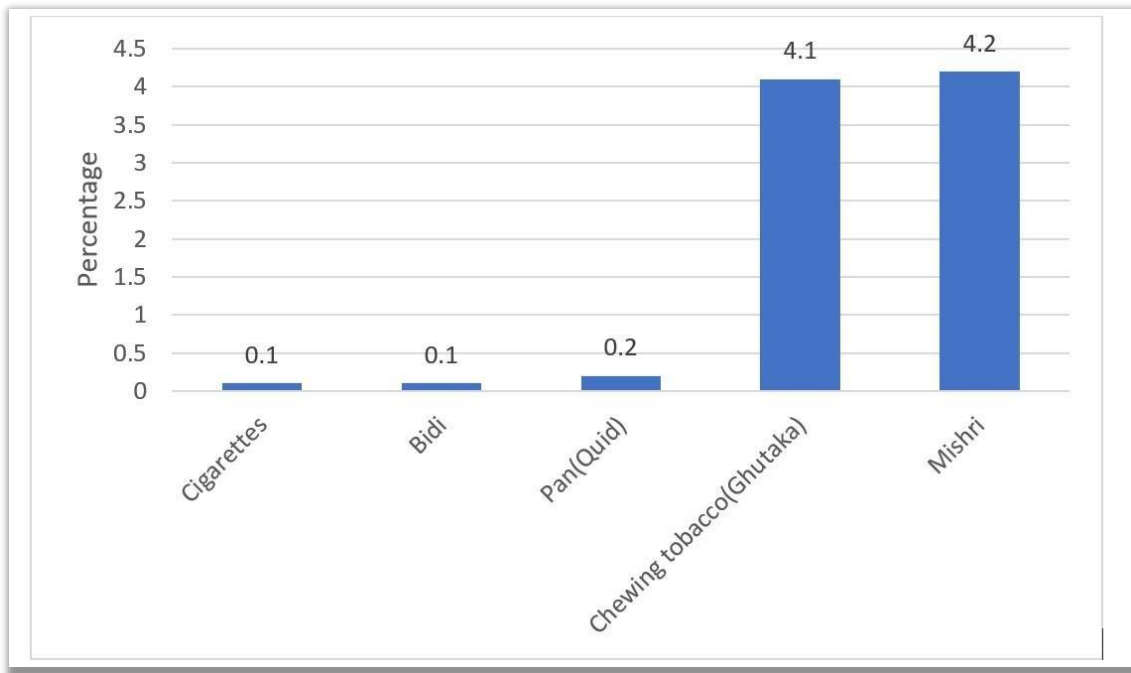


Figure 2. Various forms of tobacco use among sex workers