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Original Article

Association of Smoking with Dental Caries and Periodontal Health Status Among Incarcerated Women in Karachi

Hina Shah, Imran Khan*, Sibghat Ullah Khan, Jai Kershan*, Sanaa Ahmed, Sumbul Ayaz

Department. of Dentistry, Sindh Institute of Oral Health Sciences, Jinnah Sindh Medical University, Karachi, Pakistan *Department of Medicine, United Medical & Dental College, Karachi Pakistan

ABSTRACT

Objective: To assess the association of smoking with dental caries and periodontal health status among incarcerated women in Karachi facility, Sindh, Pakistan.

Study Design: Cross-sectional study.

Place and Duration of study: Department of Community, Sindh Institute of Oral Health Sciences, Karachi Pakistan, from Dec 2021 to Feb 2022.

Methodology: All female inmates between the ages of 18-65 years, serving various jail terms, including those sentenced to life, prisoners condemned to death and awaiting trial, were included in the study. For each participant, dental caries and periodontal status examinations were performed. Dental caries was scored using the DMFT index, while periodontal status was scored using the CPI index. Smoking status (yes or no) and duration of smoking were observed.

Results: Out of 131 women, 76(58%), 42(32.1%), and 13(9.9%) had a DMFT score between 0-5, 6-10, and 11 or higher, respectively. 14(63.6%) and 2(9.1%) women smokers had moderate to severe periodontitis. The association between smoking and severe periodontitis was statistically significant (p=0.023). Employment status prior to incarceration was significantly associated with smoking (p=0.02).

Conclusion: We concluded that the rate of severe periodontitis was higher among incarcerated women who were smokers. Women in prison require regular oral health assessment and increased awareness about oral health management. Smoking was not a significant factor associated with dental caries or periodontal disease.

Keywords: CPI index, Dental caries, DMFT, Oral health, Periodontitis, Smoking, tobacco.

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INTRODUCTION

The World Health Organization's (WHO) data suggests that more than 7 million deaths are attributed to tobacco, which is responsible for the loss of billions of dollars each year worldwide.[1,2] Tobacco has more than 60 toxic chemicals, nicotine being one of them; these toxic chemicals can invade various systems of the human body,[3] playing a major role in cardiovascular diseases, cancers and other systemic diseases.[4] Additionally, tobacco usage is harmful in terms of the fact that it is responsible for oral diseases.[5]

Dental health prevention primarily focuses on the prevention of Dental Caries, as it is the foremost disease,[6] being preceded only by flu.[7] The dental caries problem is not just limited to a single age group, but it affects the young as much as the elderly population; thus, it is considered a public health problem.[8] Dental caries and infections severity range from mild buccal or gingivitis to severe multi-space diseases.[9] Untimely treatment of dental caries can cause gradual destruction of tooth hard tissue, which perforates into the pulp, leading to inflammatory issues, including pulpitis or periapical inflammation, which leads to tooth loss. Consumption of sugary drinks, some types of food, and microorganisms contribute to the developing of dental caries.[10]

The inconsistent findings and paucity of data do not suffice to establish the association between poor oral health status and smoking tobacco; therefore, rigid research on the subject is required to get validation. Thus, considering the dearth of literature involving prisoners, especially women prisoners, the current study explored the relationship between smoking and dental caries and the severity of periodontitis.

METHODOLOGY

The cross-sectional study was conducted from December 2021 to March 2022 at the Department of Community and Preventive Dentistry, Sindh Institute of Oral Health Sciences and Women's Prison Karachi. The study was started after permission from the Institutional Review Board of Jinnah Sindh Medical

Correspondence: Dr Hina Shah, Department of Dentistry, Sindh Institute of Oral Health Sciences, Karachi Pakistan

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University (Ltr no. JSMU/IRB/2021/579) and permission from the Prison Facility.

Sample size was calculated taking prevalence of dental caries as 47% among women in Pakistan.[9]

Inclusion Criteria: All female inmates serving various jail terms, including those sentenced to life, prisoners condemned to death and awaiting trial, were included in the study.

Exclusion Criteria: Women younger than 18 or older than 65 and those who refused to consent to participate were excluded.

Data collection was initiated using predesigned structured questionnaires and oral assessments. The demographic information, such as age, period of incarceration, literacy level, family size, marital status, occupation of husband, and smoking status, was obtained using a predefined proforma.

Oral examinations were conducted on each participant. A mouth mirror, explorer, and CPITN probe were used to examine dental caries and periodontal condition in direct sunlight while wearing suitable personal protective equipment (PPE). The DMFT index was used to score dental caries. All of the findings were extensively documented. To minimize the possibility of bias, the examination was completed by a dentist with over five years of expertise who was blinded to the purpose of the study.

Statistical Package for Social Sciences (SPSS) version 26.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value of ≤0.05 was considered statistically significant.

RESULTS

A total of 131 women prisoners participated in the study. The mean age of prisoners was 34.73±9.94 years. A total of 76(58%), 42(32.1%), and 13(9.9%) women had a DMFT score between 0-5, 6-10, and 11 or higher, respectively. Although 4(18.2%) of the women with a positive smoking status reported a DMFT score >11, there was no significant association found between dental caries and tobacco smoking (*p*=0.150) (Table-I).

Table-I: Association of Severity of Dental Caries with Smoking among Incarcerated Women (n=131)

Smoking status	DMFT score			*p*-value
	0-5	6-10	>11	
Yes	9(40.9%)	9(40.9%)	4(18.2%)	0.150
No	67(61.5%)	33(30.3%)	9(8.3%)	
Total	76(58.0%)	42(32.1%)	13(9.9%)	

Five out of nine women with severe periodontitis were not active smokers. However, 14(63.6%) and 2 (9.1%) women smokers had moderate to severe periodontitis. The association between smoking and severe periodontitis was statistically significant (*p*=0.023) (Table-II).

Table-II: Association of Severity of Periodontitis with Smoking among Incarcerated Women (n=131)

	Severity of Periodontitis				Total	*p*-value
	Healthy=<0.1 mm (n=37)	Mild=0.1-1.0 mm (n=34)	Moderate=1.1-2.0 mm (n=52)	Severe=2.1-3.0 mm (n=7)	131	
Smoking status						
Yes	1(4.5%)	5(22.7%)	14(63.6%)	2(9.1%)	22(100%)	0.023
No	36(33.0%)	29(26.6%)	38(52%)	5(5.5%)	109(100%)	
Total	37(28.2%)	34(26.0%)	52(39.7%)	8(6.1%)	131(100%)	

Certain socio-demographic factors were significantly associated with smoking status, as demonstrated in Table-III. Employment status prior to incarceration was significantly associated with smoking (*p*=0.02).

DISCUSSION

The results of this study provided a unique opportunity for analyzing the oral health status. Although almost 18% per cent of women with severe dental caries were active smokers, the association between tobacco smoking and dental caries in our study was not found to be significant. 16 out of 22 women with severe periodontitis reported indulging in tobacco smoking, and a significant association was found between severe periodontitis and tobacco smoking (*p*=0.023). No association between tobacco smoking and age, ethnicity and education status was found. However, employment before imprisonment showed a positive association with smoking, as almost one-fourth of women who smoked were employed before incarceration. Previous studies on this topic have supported our results.[11,12] Findings from a study conducted by Aziz highlighted that smoking and increased tobacco consumption correlate with caries development (net DT increment) in adults.[13] Other studies also supported our findings; their studies

Table-III: Association of Sociodemographic Factors with Smoking status (n=131)

Sociodemographic Factors	Smoking Status		*p*-value
	Yes (n=22)	No (n=109)	
Age group	n(%)		
<= 35 years	9(12.7)	62(87.3)	0.128
>35 years	13(21.7)	47(78.3%)	
Ethnicity			
Sindhi	5(20.8%)	19(79.2%)	0.054
Punjabi	3(8.3%)	33(91.7%)	
Baloch	6(37.5%)	10(62.5%)	
Pashtun	0(0)	11(100%)	
Other	8(18.2%)	36(81.8%)	
Education			
No formal education	14(17.5%)	66(82.5%)	0.840
Primary to Secondary	5(17.2%)	24(82.8%)	
Matric to Intermediate	3(16.7%)	15(83.3%)	
Bachelors or above	0(0%)	4(100%)	
Employment Status (Prior to incarceration)			
Employed	15(25.4%)	44(74.6%)	0.02*
Unemployed	7(9.7%)	65(90.3%)	
Relationship Status			
Married	7(13.2%)	46(86.8%)	0.238**
Divorced	8(32.0%)	17(68.0%)	
Unmarried	2(10.0%)	18(90.0%)	
Widowed	5(15.6%)	84.4(84.4%)	
Number of Children			
Not married	2(10%)	18(90%)	0.157**
No children	10(33.3%)	20(66.7%)	
1-3	7(12.5%)	49(66.7%)	
3 to 6	2(12.5%)	16(88.9%)	
>6	1(25%)	4(75%)	
Residence (Prior to incarceration)			
Urban	18(17.8%)	83(82.2%)	0.782*
Rural	4(13.3%)	26(86.7%)	
History of Diabetes Mellitus			
Yes	2(20%)	8(80%)	0.675*
No	20(16.5%)	101(83.5%)	
History of Hypertension			
Yes	5(23.8%)	16(76.2%)	0.349*
No	17(15.5%)	93(84.5%)	
History of Cardiovascular Disease			
Yes	2(20.0%)	8(80.0%)	0.675*
No	20(16.5%)	101(83.2%)	
History of Psychiatric Disease (Depression/anxiety, etc.)			
Yes	5(18.5%)	22(81.5%)	0.777*
No	17(16.3%)	87(83.7%)	
Category of BMI			
Underweight (<18kg/m^2)	6(22.2%)	21(77.8%)	0.565
Healthy weight (18.5-24.9kg/m^2)	8(12.3%)	57(87.7%)	
Overweight (25-29.9 kg/m^2)	6(19.4%)	25(80.6%)	
Obesity (30.0kg/m^2 and above)	2(25.0%)	6(75.0%)	
Source of Food			
Prison provided	21(18.8%)	91(81.3%)	0.195*
Both	1(5.3%)	18(94.7%)	
Frequency of Food intake			
Once daily	0(0%)	3(100%)	0.711**
Twice Daily	20(16.9%)	98(83.1%)	
>2 times a day	2(20.0 %)	8(80.0%)	

**Fisher's Exact Test was applied.*
***Freeman-Halton extension of fisher's exact test was applied.*

found no association between severe periodontitis and dental caries in participants who smoked.[14,15] However, a study conducted by Ueno *et al*. found that smokers have a significantly higher number of decaying, missing and filling teeth (DMF) when compared to nonsmokers (p=0.001).[16]

Two past studies showed that those who actively and passively smoke are at an increased risk of periodontitis, regardless of the type of tobacco used; this may be because nicotine causes peripheral vasoconstriction, which leads to reduced blood supply which is a reason why tobacco and nicotine have harmful effects on periodontal health.[17,18]

Our study found a substantial relationship between periodontal status with smoking status. Furthermore, smoking in a small area, such as in a prison setting, increases the risk of passive smoking amongst nonsmokers, making them vulnerable to the same health risks as smokers. Moreover, incarcerated women do not have access to proper healthcare facilities and equipment to tackle healthcare issues they may face, and often, their needs and health are neglected. Prison administrators and health staff should address the tobacco issue and take an active part in the education of prisoners about tobacco and the consequences of its use as well and take steps to prioritize healthcare for incarcerated women.

To date, only a limited number of studies have explored the oral health status of active smokers. Our study can be a reference for comparing the unfavourable effects of smoking on health and how smoking affects oral health. Studies in the future can focus on psychological stressors such as increased financial responsibilities, emotional problems, etc., which may increase the risk of smoking among individuals.

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CONCLUSION

The present study revealed an association between smoking and periodontal disease among women prisoners. The association between smoking and dental caries remained statistically insignificant. Tobacco smoking is extremely deleterious to health and must be dissuaded. Furthermore, vulnerable populations such as prisoners must undergo regular dental check-ups to ensure improved dental hygiene.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

HS & IK: Conception, study design, drafting the manuscript, approval of the final version to be published.

SUK & JK: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

SA & SA: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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