Prevalence And Potential Risk Factors Of Tooth Wear Among Undergraduate Science Students Of Jabalpur City, Madhya Pradesh, India

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ABSTRACT

Tooth wear is an evolving dental public health problem. The alarming rate of tooth wear has been observed in children and young adults. The present study aimed to assess the prevalence and to identify potential risk factors of tooth wear among undergraduate science students of Jabalpur city, Madhya Pradesh state, India. An analytical cross-sectional study was conducted among 400 Bachelor of Science students of Jabalpur city. The data were collected using a questionnaire and clinical examination. The clinical examination for tooth wear was carried out according to Smith and Knight's Tooth Wear Index. Descriptive statistics, Pearson's chi-square test and logistic regression were applied for data analysis. The Prevalence of tooth wear was 40.50%. Higher odds of tooth wear were observed among males, hard bristle toothbrush users, tooth brushing with the horizontal method, students with parafunctional habits, tobacco chewers, the habit of eating citrus fruits every day, drinking carbonated beverages every day and anxious students compared to their counterparts. In conclusion, the prevalence of tooth wear is high among undergraduate science students of Jabalpur city, Madhya Pradesh, India. The male students are at more risk. The incisors are most prone to tooth wear.

INTRODUCTION

Tooth wear may be defined as the irreversible loss of hard tooth structure, not being considered caries process, resorption, or trauma (Schlueter *et al.*, 2020). Attrition, abrasion, and erosion are the three main forms of tooth wear (Ahuja & Ahuja, 2017; Bhambal, Saxena, Saxena, & Shanthi, 2011). In addition, abfraction is another manner that may potentiate wear by abrasion or erosion (Hanif, Rashid, & Nasim, 2015).

Tooth wear is a relatively new evolving dental public health problem (Ahuja & Ahuja, 2017; Hanif *et al.*, 2015). It has not yet gained sufficient awareness among the public. Even most dental professionals overlook the early stages of tooth erosion and consider tooth surface loss as 'normal' or physiological and thus does not require any intervention (Ab Halim, Esa, & Chew, 2018). The

prevalence of tooth wear is increasing, and the younger generation is at higher risks. The alarming rate of tooth wear is now been observed in children and young adults (Hanif *et al.*, 2015). Physiological wear triggering vertical loss of enamel in an individual is approximately 0.02 - 0.04 mm per year, but it is considered excessive when it causes aesthetic concerns and discomfort to the patient (Hanif *et al.*, 2015). Severe tooth wear causes recurrent symptoms such as hypersensitivity and deemed 'pathological' tooth surface loss and becomes a challenge to restore for a dentist (Ahuja & Ahuja, 2017; Hanif *et al.*, 2015).

Intraoral distribution of tooth wear shows that maxillary permanent incisors are the more frequently affected teeth, followed by mandibular first molars. Tooth wear tends to be bilateral and symmetrical in both upper and lower arches (Al-Khalifa, 2020).

Several studies have explored oral health behaviour, bruxism, parafunctional activity, diet, foreign objects, environment, occupation, medicaments and gastrointestinal problems among the risk factors that contribute to tooth wear (Ab Halim *et al.*, 2018; Ahuja & Ahuja, 2017; Al-Khalifa, 2020; Liu, Zhang, Chen, & Yao, 2014).

Measurement of tooth wear is difficult because some amount of tooth wear is a physiological process. Many different tooth wear indices have been developed for clinical evaluation and epidemiological studies. Smith and Knight introduced the Tooth Wear Index (TWI) in 1984 (Ahuja & Ahuja, 2017), attempted to provide solutions to some of the problems associated with measuring tooth wear at individual and community levels. The TWI and modified versions have been used in several studies across the globe, which suggests its widespread acceptance (de Carvalho Sales-Peres *et al.*, 2008).

The lack of studies on the prevalence of tooth wear among young adults in India is a concern. Thus, it is important to assess the distribution of tooth wear and associated factors, as this will guide dental professionals to apply preventive measures. This study aimed to assess the prevalence and to identify potential risk factors of tooth wear among undergraduate science students of Jabalpur city, Madhya Pradesh state, India.

MATERIALS AND METHODS

Study design:
This was an analytical cross-sectional study, conducted to assess the prevalence and to identify potential risk factors of tooth wear among undergraduate science students of Jabalpur city, Madhya Pradesh state, India.

Study Population:
The study population was comprised of Bachelor of Science (BSc) in Zoology students, studying in various colleges of Jabalpur city in the year 2016.

Inclusion Criteria:

1. Bachelor of Science (BSc) in Zoology students, studying in various colleges of Jabalpur city.

2. Willingness to give consent of participation and adherence to the study protocol.

Exclusion Criteria:

1. Students who cannot respond to the questionnaires or cooperate with clinical examination.

2. Students clinical abnormalities or an unusual medical history.

3. Students with fixed orthodontic appliances.

Pilot study:

To assess validity and feasibility, a pilot study was conducted among 20 BSc (Zoology) students.

Sample size and method:

Based on 50% expected tooth wear prevalence, confidence interval of 95% and 5% absolute precision sample size calculated was 384 study subjects. Hence, it was decided to collect data from 400 students. The quota sampling method was used in the present study.

Data collection tool:

The data collecting tool was a blending of a questionnaire and clinical examination.

Questionnaire: A pilot tested, self-administered questionnaire in the English language was used in the study. The questionnaire included items on sociodemographic information, oral hygiene practices, parafunctional habits, tobacco chewing, dietary habits, and assessment of anxiety.

Clinical Examination: Two trained, and calibrated examiners carried out ADA type III examination according to Smith and Knight's Tooth Wear Index. The clinical observations were recorded in a proforma.

Informed consent and ethical clearance:

Participation in the study was voluntary. The written informed consent was obtained from all the students participating in the present study. Ethical clearance for the study was obtained from the institutional ethical committee (ethics number HDCH/16/05).

Statistical methods:

Data collected were entered in Microsoft Excel 2013 for Windows. Descriptive statistics, Pearson's chi-square test and logistic regression were applied for data analysis using version 21.0 of the Statistical Package for Social Sciences (IBM Corporation, Armonk, New York, USA). P values <0.05 were considered statistically significant.

RESULTS

Table 1 shows sociodemographic details of study subjects. The mean $\pm$ SD of the age of study subjects was 20.17 ± 2.18 years. There were 59.00% (n = 236) males and 41.00% (n = 164) females. According to the year of study maximum number of subjects (35.25%, n = 141) were studying in the second year.

The Prevalence of tooth wear was 40.50% (n = 162) among the study subjects. The incisal/occlusal surface was most affected (45.60%), followed by buccal (24.79%) and lingual/palatal surfaces (3.01%). The incisors were the most affected teeth (35.02%), followed by canines (27.93%), molars (16.59%), and premolars (10.71%).

The prevalence of tooth wear among males was 51.27% and among females was 25.00% (graph 1). The Chi-quare test showed that the prevalence of tooth wear among males was significantly higher than in females ($\chi^2 = 27.713$, df = 1, p<0.001).

All the study subjects in the present study were using toothbrush and toothpaste for tooth cleaning.

Table 1: Sociodemographic details of study subjects.

Sociodemographic characteristics	Value (n = 400)
Age (years, mean ± SD)	20.17 ± 2.18
Gender	
Male {n (%)}	236 (59.00)
Female {n (%)}	164 (41.00)
Year of study	
First year {n (%)}	135 (33.75)
Second year {n (%)}	141 (35.25)
Final year {n (%)}	124 (31.00)

Graph 1: Gender wise prevalence of tooth wear.
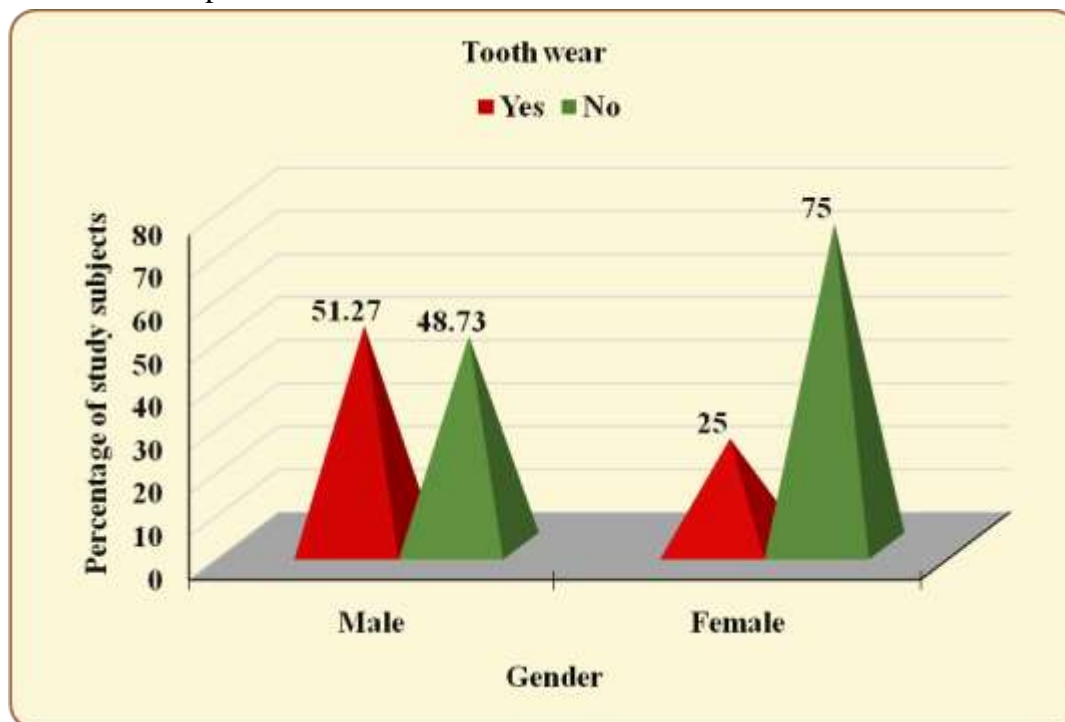
Prevalence of tooth wear was significantly higher (p<0.05) among the hard bristle toothbrush users (86.38%), tooth brushing with horizontal method (55.13%), students with parafunctional habits (61.74%), tobacco chewers (50.66%), habit of eating citrus fruits every day (41.52%), drinking carbonated beverages every day (51.78%) and anxious students (58.63%) compared to their counterparts.

No significant association (p>0.05) of tooth wear was observed with the year of study, duration of teeth cleaning, frequency of tooth brushing, the habit of tobacco smoking, alcohol consumption, and frequency of pickle consumption per day.

Table 2: Association between tooth wear and explanatory variables (adjusted odds ratio).

Variable	Reference category	Comparison group	Odds ratio	95% CI	P value
Gender	Female	Male	1.932	0.947-5.675	0.011 (<0.05), Sig.
Type of toothbrush	Soft bristle toothbrush	Medium bristle toothbrush	1.094	0.323-2.655	0.781 (>0.05), Not sig.
	Soft bristle toothbrush	Hard bristle toothbrush	17.434	2.872-454.183	0.001 (<0.01), Highly sig.
Method of tooth brushing	Vertical	Horizontal	11.114	2.782-33.967	0.009 (<0.01), Highly sig.
	Vertical	Circular	2.273	0.751-8.499	0.971 (>0.05), Not sig.
Parafunctional habits	Absent	Present	6.193	3.544-12.418	0.004 (<0.01), Highly sig.
Tobacco chewing	No	Yes	14.327	5.902-40.626	0.000 (<0.001), Very high sig.
Eating citrus fruits every day	No	Yes	9.663	4.360-41.988	0.000 (<0.001), Very high sig.
Drinking carbonated beverages every day	No	Yes	7.986	2.491-35.207	0.000 (<0.001), Very high sig.
Anxiety	No	Yes	6.159	3.325-11.166	0.004 (<0.01), Highly sig.

Factors that showed significant association with tooth wear were further processed for multiple logistic regression analysis. Table 2 shows an association between tooth wear and explanatory variables (adjusted odds ratio). Multiple logistic regression analysis revealed that males were having 1.932 times higher odds (95% CI = 0.947-5.675) for tooth wear than females (p<0.05). Hard bristle toothbrush users were having 17.434 times higher odds (95% CI = 2.872-454.183) for tooth wear than soft bristle toothbrush users (p<0.01). Study subjects who were cleaning teeth by the horizontal method were 11.114 times more susceptible (95% CI = 2.782-33.967) to tooth wear than those who were cleaning teeth by the vertical method (p<0.01). Presence of parafunctional and tobacco chewing habits caused 6.193 times (95% CI = 3.544-12.418, p<0.01) and 14.327 times (95% CI = 5.902-40.626, p<0.001) higher risks respectively, for tooth wear. The everyday habit of eating citrus fruits and drinking carbonated beverages put study subjects at 9.663 times (95% CI =

4.360-41.988, p<0.001) and 7.986 times (95% CI = 2.491-35.207, p<0.001) higher risks respectively, for tooth wear. Anxious students were at 6.159 times more risk (95% CI = 3.325-11.166) for tooth wear than their counterparts (p<0.01).

DISCUSSION

The present study conducted to assess the prevalence and to identify potential risk factors of tooth wear among undergraduate science students, was a pioneer study for the geographical area of Jabalpur city, Madhya Pradesh, India. In the current study, tooth wear was evaluated using Smith and Knight's Tooth Wear Index. The index has been widely employed for assessing tooth wear in several studies earlier due to its easy comparability and coverage of whole dentition (Ahuja & Ahuja, 2017).

The overall prevalence of tooth wear in the present study was 40.50%, which was lower than the study conducted by Al-Khalifa (2020) among adults of Saudi Arabia (77.00%).

Results of the current study show that among all the surfaces examined, the incisal/occlusal surface was most affected, and the incisors were the most affected teeth, followed by canines, molars, and premolars. The results were consistent with several other studies (Ab Halim *et al.*, 2018; Ahuja & Ahuja, 2017; Liu *et al.*, 2014; Sun *et al.*, 2017). The incisal and occlusal surfaces of teeth are the functional surfaces of our dentition (Liu *et al.*, 2014). The higher degree of wear in the incisors and canines may be attributed to the thinner enamel and their active role in both masticatory and excursive jaw movements during function and parafunction (Ahuja & Ahuja, 2017; Liu *et al.*, 2014; Sun *et al.*, 2017).

The observation of the present study showed that the prevalence of tooth wear was higher among males than females. The results are in line with several previous studies (Ab Halim *et al.*, 2018; Al-Khalifa, 2020; Gillborg, Åkerman, & Ekberg, 2020; Schierz, Dommel, Hirsch, & Reissmann, 2014). The probable explanations for this observation could be because males have higher masticatory forces, more stress, consume more tobacco and eat a coarse diet compared to females (Koç, Doğan, & Bek, 2011). Also, males tend to avoid, or delay visit to a dental professional, until the condition becomes more severe (Armfield, 2012).

In the current study, results showed that hard bristle toothbrush, horizontal brushing method, tobacco chewing, everyday eating citrus fruits and drinking carbonated beverages were associated with higher odds of tooth wear. In a study, Brandini *et al.* (2011) have reported that toothbrush bristle design, abrasive dentifrice, and brushing technique, frequency and time are associated with tooth wear. The abrasive silica particles of tobacco when mixed with saliva and chewed form an abrasive paste that over the period causes tooth wear. Also, with an increase in the frequency and duration of tobacco chewing, the number of pathologically worn surfaces increases (Ahuja & Ahuja, 2017).

In this study, parafunctional habits and anxiety showed significantly higher odds of tooth wear. The high biting and masticatory forces due to parafunctional habits are responsible for the increased wear seen in incisal/occlusal surfaces of teeth (Solanki, Gupta, Prasad, & Chinmaya, 2013). These

observations are in line with several earlier studies (Cunha-Cruz, Pashova, Packard, Zhou, & Hilton, 2010; Deshpande, 2015; Liu *et al.*, 2014). In anxiety, as one's stress adaptive capacity, clenching of teeth is a frequently observed feature, which may play a vital role in tooth wear (Cunha-Cruz *et al.*, 2010).

CONCLUSION

Based on the findings of the current study, it can be concluded that the prevalence of tooth wear is high among undergraduate science students of Jabalpur city, Madhya Pradesh, India. The male students are at more risk. The incisors are most prone to tooth wear. The use of hard bristle toothbrushes, horizontal method of brushing, parafunctional habits, chewing tobacco, anxiety, consumption of citrus fruits and carbonated beverages are the potential risk factors for tooth wear. The dental professionals shall conduct programs to increase awareness about tooth wear and plan preventive programs based on analysis of risk factors.

LIMITATIONS AND FUTURE STUDIES

In the present study, the responses of participants were recorded by the questionnaire. Hence, an element of social desirability bias could not be eliminated in term of oral hygiene practices, tobacco habit and dietary practices. In the present study, assessment of tooth wear was via the clinical examination without radiographic method, hence the complete extent of tooth destruction could not be evaluated. The study was conducted in a single geographical area that is Jabalpur city of Madhya Pradesh state, India. The temporal association of risk factors with tooth wear cannot be established with a cross-sectional study. Multicentric longitudinal studies are recommended to establish a causal relationship.

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