A national survey of tooth wear on facial and oral surfaces and risk factors in young Nigerian adults

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ABSTRACT

Objective: The objective of this study is to assess the prevalence of tooth wear and to identify risk factors in a sample of young Nigerian adults. **Materials and Methods:** Participants were individuals aged 18–35 years, attending dental clinics located in eight centers representing the six geopolitical zones of the country. Calibrated examiners measured tooth wear using basic erosive wear examination (BEWE) index. Individuals were characterized by the highest BEWE score recorded for any facial/oral tooth surface. Previously validated questionnaire was used to gather information on demographics and risk factors. **Results:** A total of 1349 participants were examined. The prevalence of tooth wear was 60.2%. Bivariate analysis showed significant differences in the prevalence of tooth wear with age, educational level, and occupation ($P \leq 0.05$). There were significant differences in tooth wear among the participants from the different states. Tooth wear was found to increase with smoking. Tooth wear was associated with brushing frequency, use of chewing stick, and other local cleaning agents. Multiple regression analysis showed that age, brushing frequency, brushing after breakfast added statistically significantly to the prediction of tooth wear ($P < 0.05$). **Conclusion:** Tooth wear was common in the population. The frequency of tooth brushing, use of chewing sticks and other local tooth cleaning agents may be contributory.

Key words: Facial/oral tooth surface wear, prevalence, risk factors

INTRODUCTION

Tooth wear is common in contemporary humans, and it occurs sooner or later in life.[1] It is a physiologic process which becomes pathologic if the "teeth become so worn that they do not function effectively or seriously mar the appearance."[2] The condition arise because of different physical and chemical impacts acting on the tooth surfaces to change the anatomy. Described clinical subtypes include abrasion, attrition, erosion, and abfraction.[3,4] Clinical diagnosis

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is often challenging because most cases result from a combination of etiologic factors, one of which may predominate.[3] Hence, detailed dietary, oral hygiene, occupation, medical, and dental history are necessary to identify etiology or risk factors which is cardinal in the prevention and successful management of the worn dentition. Report of studies[5-7] support that tooth wear is common in both young and adults. Other studies[8-10] also identified risk factors in the population studied. Available data[11,12] on prevalence and risk factors for tooth wear in Nigeria is limited to selected population groups hence the need for this national survey in our multiethnic and cultural population.

This study determined the prevalence of tooth wear on facial/oral (palatal/lingual) tooth surfaces and identified possible risks factors from young adults (18–35 years). Changes in the anatomy of the teeth because of tooth surface loss was measured using the basic erosive wear examination (BEWE)[13] which is a validated index for both practice-based assessment and epidemiological studies.[9]

MATERIALS AND METHODS

A cross-sectional clinic-based survey of young adults was conducted in seven states and the Federal Capital Territory (Abuja) of Nigeria. The states represented the six geopolitical zones of Nigeria. Ethical approval was given by Health Research Ethics Committees. This study was part of a larger study which was fashioned after a similar study called European Study in NonCarious Cervical Lesions (Escarcel). Escarcel[14] is a Pan European study designed to estimate the levels of sensitivity, periodontal disease, and tooth wear in young adults. Permission to use the Escarcel study protocol was granted by members of the European study group. The Nigerian study group comprised of 13 dentists including a National coordinator, drawn from public and private hospitals.

Participants were recruited from patients attending designated dental centers in each of the seven states during the study period of 6 months. Two centers located in rural/small-middle sized town and metropolitan city in each of the states were used. They were consenting patients who were in good general health, within the age range of 18 and 35 years, were able to read and understand English. They also had a minimum of six eligible teeth with no restorations. Exclusion criteria were the inability to communicate in English Language, presence of orthodontic appliance

or cervical restorations in any of the six eligible teeth. Participants were also excluded if they were currently taking analgesic, received local anesthesia in the last 24 h, and those who are on anticoagulants or have bleeding disorder or required prophylactic antibiotics for dental treatment. Employees of the study sites were also excluded from the study.

Each participant completed a questionnaire which was based on those used in the previous study identifying risk factors for tooth wear and dentine hypersensitivity[9,15] but was modified to include some local factors (local tooth cleaning agents including salt, grounded charcoal, and broken plates) that are peculiar to our environment. The questionnaire included data on lifestyle, dietary, and oral health behavior.

Clinical examination of participants was performed by the investigators. Investigators were trained and calibrated by members of the European Escarcel study group at a training session in Lagos, Nigeria. A second training session was conducted after 2 weeks whereby the investigators' ability to assess teeth using the clinical protocol was evaluated. Intra-and inter-examined reliability was calculated according to the World Health Organization recommendation giving a kappa agreement of 85.5%.

Teeth were dried using compressed air and examined without magnification under normal dental surgery conditions with good lighting. The cervical, facial, and oral (palatal/lingual) tooth surfaces were scored on all teeth (second molar to second molar) using the BEWE[13] on a 0–3 ordinal scale (0 = no wear, 1 = early surface loss, 2 = surface loss <50%, 3 = surface loss >50%). Missing teeth, restored surfaces (>50% of the surface), traumatized or carious teeth and third molars were not scored.

Data were analyzed using IBM-Statistical Package for Service Solution (SPSS Inc., Chicago, IL, USA) Version 21.0). Bivariate analyses evaluated the proportion of participants who had facial/oral surface wear of BEWE score 2 or 3 for at least one tooth to a range of demographics, dietary, lifestyle, and oral care variables. Multiple regression analysis was conducted to predict tooth wear from the various factors.

RESULTS

A total of 1349 adults participated in the study. Six out of ten participants had a certain severity level of tooth

surface wear (60.2%). Highest tooth wear BEWE score 0 was seen in 537 patients (39.8%), 1 for 279 (20.7%), 2 for 397 (29.4%), and 3 for 136 (10.1%).

Bivariate analysis of demographic factors and tooth wear (BEWE Scores 2or 3) showed an increase in tooth wear with age. There were significant differences in tooth wear recorded as the BEWE scores 2 or 3 among the participants from the different states (P = 0.000) with significant levels of tooth wear observed in the Northern groups (Kano, Borno) and the Federal Capital, Abuja. Significant differences were also shown in the prevalence of tooth wear (BEWE Scores 2 or 3) with educational levels and occupation, especially among those that claimed they are house persons Table 1.

The most associated oral hygiene factors for tooth wear (BEWE score 2 or 3) was found in participants who brushed their teeth most frequently and those who use chewing stick and other local means to clean their teeth [Table 2]. The prevalence of tooth wear (BEWE scores 2 or 3) was not significantly associated with lifestyle factors, including snoring, use of sleeping medications/antidepressant, and chewing gum. However, occurrences of tooth wear (BEWE scores of 2 or 3) were found to increase with smoking [Table 3]. Despite high prevalence of tooth wear (BEWE score 2 or 3) related to most of the acidic dietary factors, there was no significant association with these factors [Table 4].

Multiple logistic regression analysis of the subjects' demographic factors, oral hygiene factors, dietary

Table 1: Relationship between tooth wear and demographics

	n	Erosive tooth wear		OR	95% confidence limits		χ^2	P
		BEWE (2-3)	Percentage		Lower	Upper		
Total patients	1349	533	39.5					
Age (years)	1303							
18-25	466	154	33.0	0.66	0.52	0.83	26.86	0.000*
26-35	837	347	41.5	1.24	0.99	1.56		
Gender	1329							
Male	592	218	36.8	0.82	0.66	1.02	3.39	0.071
Female	737	308	41.8	1.24	0.99	1.54		
Centre	1349							
Osun	200	45	22.5	0.39	0.28	0.56	89.53	0.000*
Oyo	200	54	27.0	0.52	0.37	0.72		
Edo	100	39	39.0	0.98	0.64	1.48		
Enugu	100	35	35.0	0.81	0.53	1.24		
Kano	200	96	48.0	1.50	1.11	2.03		
Lagos	250	90	36.0	0.83	0.63	1.11		
FCT	200	114	57.0	2.31	1.70	3.13		
Borno	99	60	60.6	2.52	1.66	3.84		
Area of residence	1147							
Rural	395	158	40.0	1.03	0.81	1.31	0.423	0.807
Small/mid-size towns	100	38	38.0	0.93	0.61	1.42		
Metropolitan zone	652	248	38.0	0.89	0.71	1.10		
Education	828							
To age 15+	265	130	49.1	1.63	1.24	2.13	15.96	0.001*
To age 16-19	106	46	43.4	1.19	0.80	1.78		
To age 20+	185	73	39.5	1.00	0.73	1.37		
Still studying	272	88	32.4	0.68	0.51	0.90		
Occupation	1238							
Self employed	201	70	34.8	0.79	0.58	1.08	16.44	0.012*
Managers	28	8	28.6	0.61	0.27	1.39		
Other white collars	335	144	43.0	1.21	0.94	1.56		
Manual workers	61	23	37.7	0.92	0.54	1.57		
House person	101	53	52.5	1.77	1.18	2.65		
Unemployed	97	36	37.1	0.90	0.59	1.37		
Student	415	143	34.5	0.73	0.58	0.93		

*Statistically significant. OR=1; factor does not have effect on tooth wear, OR>1; factor associated with high odds for tooth wear, OR <1; factor associated with lower odds for tooth wear. BEWE: Basic erosive wear examination, OR: Odds ratio

Table 2: Relationship between tooth wear and oral hygiene factors

	n	Erosive tooth wear		OR	95% confidence limits		χ^2	*P*
		BEWE (2-3)	Percentage		Lower	Upper		
Total patients	1349	533	39.5					
Brushing frequency	1265							
Once per day	1009	373	37.0	0.66	0.52	0.85	11.21	0.003*
Twice per day	247	116	47.0	1.45	1.10	1.92		
Thrice per day	9	6	66.9	3.09	0.77	12.39		
Toothbrush used	1265							
None	21	6	28.6	0.61	0.23	1.58	2.16	0.702
Manual toothbrush	1193	467	39.1	0.88	0.63	1.23		
Electric toothbrush	26	10	38.5	0.96	0.43	2.12		
Chewing stick	18	8	44.4	1.23	0.48	3.13		
Others	7	4	57.1	2.05	0.46	9.19		
Brush movement	1329							
Various motion	403	162	40.2	1.04	0.82	1.32	11.56	0.020*
Horizontal	334	153	45.8	1.41	1.10	1.81		
Vertical	517	178	34.4	0.71	0.56	0.89		
Circular	53	23	43.4	1.18	0.68	2.05		
Don't know/not sure	22	9	40.9	1.06	0.45	2.50		
Brush after breakfast	1349							
Often	437	148	33.9	0.70	0.55	0.89	10.34	0.035*
Occasionally	215	87	40.5	1.05	0.78	1.41		
Rarely	240	101	42.1	1.39	0.86	1.51		
Never	303	125	41.3	1.10	0.85	1.42		
Don't know	154	72	46.8	1.40	1.00	1.96		
Brush before breakfast	1349							
Often	1004	403	40.1	1.11	0.86	1.43	4.44	0.34
Occasionally	195	71	36.4	0.86	0.63	1.18		
Rarely	72	33	45.8	1.32	0.82	2.12		
Never	70	22	31.4	0.69	0.41	1.16		
Don't know	8	4	50.0	1.54	0.38	6.16		
Brush after lunch	1349							
Often	40	15	37.5	0.92	0.48	1.75	1.72	0.788
Occasionally	72	27	37.5	0.91	0.56	1.49		
Rarely	533	205	38.5	0.93	0.74	1.16		
Never	687	281	40.9	1.13	0.91	1.40		
Don't know	17	5	29.4	0.63	0.22	1.81		
Brush after dinner								
Often	385	164	42.6	1.20	0.94	1.52	6.23	0.183
Occasionally	306	111	36.3	0.84	0.64	1.09		
Rarely	299	128	42.8	1.19	0.92	1.54		
Never	330	121	36.7	0.85	0.66	1.10		
Don't know	29	9	31.0	0.68	0.31	1.51		

*Statistical significant. BEWE: Basic erosive wear examination, OR: Odds ratio

factors, and other lifestyle factors showed that only the oral hygiene practices predict tooth wear. These oral hygiene factors; brushing frequency, brushing movement, brush after breakfast, brush before breakfast, brush after lunch and brush after dinner, significantly predict toothwear. F (6, 1241) = 3.500, $P = 0.002$ ($P < 0.005$), $R^2 = 0.017$. Specifically, brushing frequency, and brushing after breakfast as shown in Table 5, added significantly to the prediction ($P < 0.05$).

DISCUSSION

Assessment of the prevalence of tooth wear of young adults was necessary following reports[16,17] that dentine hypersensitivity, a likely sequelae of tooth wear maybe common in this age group. In addition, a recent data (yet unpublished) indicated that Nigerian dentists reported that about 20% of their patients presenting with dentine hypersensitivity falls within this age group.

Table 3: Relationship between tooth wear and lifestyle factors

	n	Erosive tooth wear		OR	95% confidence limits		χ^2	P
		BEWE (2-3)	Percentage		Lower	Upper		
Total patients	1349	533	39.5					
Snoring								
Often	88	32	36.4	0.87	0.55	1.36	7.91	0.095
Occasionally	155	63	40.6	1.06	0.75	1.48		
Rarely	306	141	46.1	1.42	1.10	1.84		
Never	587	219	37.3	0.85	0.68	1.06		
Don't know	213	78	36.6	0.87	0.64	1.17		
Sleeping medication/antidepressant								
Often	23	8	34.8	0.81	0.34	1.93	0.80	0.938
Occasionally	64	27	42.2	1.12	0.68	1.87		
Rarely	235	93	39.6	1.00	0.75	1.33		
Never	991	389	39.3	0.96	0.75	1.23		
Don't know	36	16	44.4	1.23	0.63	2.40		
Smoking								
Often	50	19	38.0	0.94	0.52	1.68	14.44	0.006*
Occasionally	90	47	52.2	1.74	1.13	2.67		
Rarely	162	75	46.3	1.37	0.99	1.91		
Never	1030	382	37.1	0.61	0.58	0.63		
Don't know	17	10	58.8	2.21	0.84	5.84		
Chew gum								
Often	191	67	35.1	0.80	0.58	1.10	8.37	0.083
Occasionally	580	241	41.6	1.16	0.93	1.45		
Rarely	333	131	39.3	0.99	0.77	1.28		
Never	216	77	35.6	0.82	0.61	1.11		
Don't know	29	17	58.6	2.21	1.05	4.66		

*Statistically significant. OR=1; factor does not have effect on tooth wear, OR >1; factor associated with high odds for tooth wear, OR <1; factor associated with lower odds for tooth wear. BEWE: Basic erosive wear examination, OR: Odds ratio

Results of this study indicated that facial/oral tooth surface wear when characterized as either mild or severe change in tooth surface anatomy was very common and seen in 60% of the participants. Although the prevalence is higher to that obtained among European population,[9] the general prevalence trend was similar. The reasons for the high prevalence among the Nigerian population maybe because of difference in exposure to etiologic factors such as local cleaning agents (salt, chewing sticks, grounded charcoal/broken ceramic plates) which maybe more abrasive than toothpaste. Further support for this view from the result of this study was that the most associated oral hygiene factors for tooth wear were brushing frequency and the use of local cleaning agents. The use of local agents such as chewing sticks and locally prepared toothpaste had been previously reported among Nigerians.[18] These agents are not as smooth as toothpaste and maybe more abrasive on the tooth surface.

The prevalence of tooth wear was found to increase with age of the participants. It can be inferred that as they get older the degree of tooth wear may further worsen with possibility of pulpal exposure. In view of this, it is important that efforts must be made to increase awareness concerning this condition and its associated risk factors. Increasing level of education was protective against having tooth wear. This may suggest that those with higher levels of education are aware of this condition and can implement preventive measures.

Findings in this study further confirmed Gillam *et al*.[19] report that horizontal tooth brushing motion was found to cause more tooth wear than vertical brushing technique. This should reinforce the dentists' advice to patients not to use horizontal or scrubbing motion while the rolling, circular motion with the brush bristles at 45° should be encouraged. Another risk factor for tooth wear is the timing of tooth brushing in relation to breakfast. While controversies persist in this regard concerning brushing before or after breakfast, the findings of this study showed that brushing after breakfast has effect on degree of tooth wear. The finding that smoking was strongly associated with tooth wear among the participants may be due to more

Table 4: Relationship between tooth wear and dietary factors

	n	Erosive tooth wear		OR	95% confidence limits		χ²	P
		BEWE (2-3)	Percentage		Lower	Upper		
Total patients	1349	533	39.5					
Fresh fruits								
Often	390	156	40.0	1.03	0.81	1.31	3.31	0.511
Occasionally	754	301	39.9	1.04	0.83	1.30		
Rarely	154	56	36.4	0.86	0.61	1.22		
Never	24	6	26.1	0.54	0.21	1.37		
Don't know	27	13	48.1	1.43	0.67	3.07		
Fruit/vegetable juice								
Often	340	138	40.6	1.06	0.83	1.36	4.71	0.319
Occasionally	711	278	39.1	0.96	0.78	1.20		
Rarely	234	90	38.5	0.95	0.71	1.27		
Never	44	14	32.6	0.73	0.38	1.40		
Don't know	20	12	60.0	2.33	0.95	5.73		
Isotonic/energy drinks								
Often	81	38	46.9	1.38	0.88	2.17	8.77	0.067
Occasionally	342	135	39.6	1.00	0.78	1.29		
Rarely	384	151	39.3	0.99	0.78	1.26		
Never	502	185	36.9	0.84	0.67	1.05		
Don't know	40	23	57.5	2.12	1.12	4.01		
Soft drinks								
Often	361	139	38.5	0.94	0.74	1.21	6.22	0.183
Occasionally	679	276	40.6	1.10	0.89	1.37		
Rarely	222	80	36.0	0.84	0.62	1.13		
Never	67	25	37.3	0.91	0.55	1.51		
Don't know	20	12	63.2	2.66	1.04	6.81		
Dairy products								
Often	167	69	41.3	1.09	0.78	1.52	1.46	0.834
Occasionally	570	220	38.6	0.94	0.75	1.17		
Rarely	446	172	38.6	0.94	0.75	1.19		
Never	126	54	42.9	1.17	0.80	1.69		
Don't know	40	17	43.6	1.19	0.63	2.26		
Acidic foods								
Often	346	142	41.0	1.09	0.85	1.40	2.82	0.588
Occasionally	591	226	38.2	0.91	0.73	1.13		
Rarely	280	116	41.4	1.11	0.85	1.45		
Never	109	38	34.9	0.81	0.54	1.21		
Don't know	23	11	47.8	1.41	0.62	3.22		

OR=1; factor does not have effect on tooth wear, OR >1; factor associated with high odds for tooth wear, OR <1; factor associated with lower odds for tooth wear. BEWE: Basic erosive wear examination, OR: Odds ratio

aggressive tooth brushing effort by the individuals to remove tobacco extrinsic stains on teeth surfaces. In addition, important in this action is probably the use of hard bristled tooth brush along with abrasive cleaning agents (e.g., grounded charcoal, broken plate) use of which was common among the participants. Tooth surface wear was more prevalent among the Northern participants. While specific reasons could not be ascribed to these findings, further investigation may be needed to ascertain probable risk factors.

Results of this study negate the reports[20,21] that have identified acidic food items (Soft drinks, fruits) as being associated with tooth wear from erosive effects. However, frequent consumption of energy drinks among the participants indicated a high odd for tooth wear (odds ratio OR = 1.3). This finding can be substantiated by the previous report that popular sports and energy drinks in the Nigerian market are acidic with mean titratable acidity ranges from 4.1 to 13.8 ml and pHs well below the critical pH (5.5) of enamel demineralization.[22] The finding of this study collaborated the protective actions of dairy products on the teeth which was also supported by Aidi *et al.*[23]

Variables	n	Erosive tooth wear		B	SE	β	t	P
		BEWE (2-3)	Percentage					
Brushing frequency								
Once per day	1009	373	37.0	0.109	0.034	0.095	3.198	0.001*
Twice per day	247	116	47.0					
Thrice per day	9	6	66.9					
Brush movement								
Various motion	403	162	40.2	−0.016	0.014	−0.032	−1.109	0.268
Horizontal	334	153	45.8					
Vertical	517	178	34.4					
Circular	53	23	43.4					
Not sure	22	9	40.9					
Brush after breakfast								
Often	437	148	33.9	0.026	0.011	0.074	2.420	0.016*
Rarely	215	87	40.5					
Never	240	101	42.1					
Don't know	303	125	41.3					
Brush before breakfast								
Often	1004	403	40.1	−0.006	0.017	−0.010	−0.343	0.732
Occasionally	195	71	36.4					
Rarely	72	33	45.8					
Never	70	22	31.4					
Don't know	8	4	50.0					
Brush after lunch								
Often	40	15	37.5	0.020	0.020	0.030	0.996	0.320
Occasionally	72	27	37.5					
Rarely	533	205	38.5					
Never	687	281	40.9					
Don't know	17	5	29.4					
Brush after dinner								
Often	385	164	42.6	−0.012	0.013	−0.029	−0.923	0.356
Occasionally	306	111	36.3					
Rarely	299	128	42.8					
Never	330	121	36.7					
Don't know	29	9	31.0					

*Statistically significant. BEWE: Basic erosive wear examination, SE: Standard error

CONCLUSION

This national study discovered that facial/oral tooth surface wear is very common among young Nigerian adults. Possible risk factors with high association are oral hygiene measures, especially frequency, horizontal tooth brushing motion, and the use of local tooth cleaning agents such as chewing sticks. Smoking and consumption of energy drinks were also contributory. It is important that the dental profession and relevant stakeholders take actions to increase public awareness for this dental condition.

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