

Signs and symptoms of temporomandibular disorders in Nigerian adult patients with and without occlusal tooth wear.

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Objectives: The purpose of this study was to investigate the prevalence of signs and symptoms of temporomandibular disorders in Nigerian patients with and without occlusal tooth wear, and to relate the signs and symptoms with the severity of occlusal tooth wear. **Methods:** One hundred and fifty patients with occlusal tooth wear, and 100 control subjects participated in this study (mean age 40.8 ± 12.2 years, range 18-65 years). Exclusion criteria included patients and subjects with more than one missing opposing pair of premolars or molars, restorations covering the entire incisal edge, canine cusps and occlusal surfaces of premolars and molars. The severity of occlusal wear was assessed using the tooth wear index (TWI) designed by Smith and Knight (1984). Chi-square test was used to compare the differences in signs and symptoms of TMD. $P < 0.05$ was defined as significant. **Results:** Although more females reported pain than males the difference was not statistically significant ($p = 0.05$). Except for impaired range of movement, tooth wear patients and controls differ significantly with respect to the variables; pain report, pain on palpation, TMJ sound and deviation on opening ($p < 0.001$). Patients with mean occlusal TWI score of ≥ 3 differ significantly from those with TWI score ≤ 2 with respect to pain on palpation and TMJ sound ($p < 0.001$). **Conclusions:** Posterior occlusal wear (mean TWI scores of 3 or 4) was significantly associated with pain on palpation and TMJ sound. Hence there may be a clinically relevant risk of TMD among Nigerian patients with occlusal tooth wear.

Key words: Occlusal tooth wear; signs, symptoms, temporomandibular joint disorders

Introduction

Prolonged tooth retention by the aging population increases the likelihood of tooth wear. Occlusal tooth wear may result from: (1) Erosion, loss of tooth surface by chemical processes not involving bacterial action, (2) Attrition, loss of tooth surface caused by tooth-to-tooth contact during mastication or para-function. A differential diagnosis is however not always possible, since there may be a combination of these processes (Smith and Knight, 1984). Dental erosion has been documented as the most important cause of tooth wear among the people of the western world (Young, 1998), while attrition is more important in Black Africans due to the more fibrous nature of our diet (Oginni and Olusile, 2002).

The average wear rate on occlusal contact areas has been estimated to be $29 \mu\text{m}$ per year for molars and $15 \mu\text{m}$ per year for premolars (Lambrechts *et al.*, 1989). When the normal rate of wear becomes accelerated by endogenous or exogenous factors, pathological wear occurs. Loss of vertical dimensions of occlusion (VDO) caused by physiologic tooth wear is usually compensated for by continuous tooth eruption and alveolar bone growth. Loss of VDO occurs in situations where tooth wear exceeds compensatory mechanisms. This may lead to some form of strain and stress on the temporomandibular joint.

Tooth wear is one of the most frequently reported signs of bruxism (a para-functional activity). Also, it is thought to be a proxy measure for functional or masticatory activity. Several studies have reported a relationship between

tooth wear and temporomandibular disorder (TMD) symptoms (De Laat *et al.*, 1986), other investigators have not been able to support these findings (Seligman *et al.*, 1988). John *et al.*, (2002) found no association between incisal wear (anterior wear) and TMDs. A review of 18 epidemiologic studies published found prevalence rates ranging from 16% to 59% for reported symptoms and 33% to 86% for clinical signs (Carlsson and LeResche, 1995). Also a meta-analysis of 51 prevalence studies registered even more extreme variations of prevalences: 6% to 93% based on subjects' reports and 0% to 93% according to clinical assessments (De Kanter *et al.*, 1993). More recent epidemiologic studies have generally found significantly more frequent and more severe TMD signs and symptoms in women than in men (Carlsson, 1999). Signs and symptoms of TMD have also been reported to be present in young people, even in a small number of children (Bonjardim *et al.*, 2003).

The most common symptom of TMDs is the pain that usually appear as the result of mandibular activity (speaking and chewing), and is usually located in the masticatory muscles, in the preauricular area and the temporomandibular joint. Other common symptoms are restriction of jaw movement, asymmetry in jaw movement and noises from the joint. TMD is generally determined by the presence of one or more symptoms. If at least one of a certain set of symptoms is observed, TMD is usually regarded as being in evidence (Van der Weele and Dibbets, 1987).

Nigeria is the most populous country in Africa with a population of 130 million and a population growth rate of 2.37%. The total adult literacy rate is 51%. Very little has been reported about the prevalence of TMD in sub-saharan Africa; Mazengo and Kirveskari (1991) reported prevalence of clinical signs of TMD of 40%. In Nigeria, Otuyemi *et al.* (2000) reported 58.1%, revealing some evidence to show that signs and symptoms of TMD occur amongst Nigerians. The purpose of this study therefore was to determine the prevalence of signs and symptoms of temporomandibular disorders in adult Nigerian patients with and without occlusal tooth wear, and to relate the signs and symptoms with the severity of occlusal tooth wear.

Subjects and methods

The study population consisted of 150 patients (Female = 87, Male = 63) with occlusal tooth wear and a control group of 100 subjects (Female = 58, Male = 42) presenting at the oral diagnostic unit of the Dental Hospital, Obafemi Awolowo University Ile-Ife. Their ages ranged from 16-65 years, with a mean age of 40.8 ± 12.2 years. Those that had occlusal tooth wear on examination were referred to as patients and those without occlusal wear were referred to as subjects. Both groups presented for routine dental problems; toothache, caries, periodontal infections and other oral diseases for which they were seeking help. Informed consent from all patients and subjects who participated in the investigation was obtained after the nature of the procedure had been fully explained. The severity of the tooth wear was assessed by one of the authors (OAO) using the tooth wear index (TWI) designed by Smith and Knight (1984). The control group had no occlusal tooth wear. Exclusion criteria for patients and controls were as follows: Restorations that cover the entire incisal edge, canine cusps, and occlusal surfaces of premolars and molars. Recent occlusal restorations, such as amalgam or composite fillings. More than one missing opposing pair of premolars or molars.

Both patients and the control group were interviewed regarding pain and sounds within the temporomandibular joint, pain in the jaw muscles/muscle stiffness. Clinical examinations consisted of palpation of the temporomandibular joint for pain and registration of clicking or crepitation of the joints. Similarly the muscles of mastication (temporalis, masseter.) were palpated for tenderness. Measurements of maximum mouth opening and the occlusal vertical dimension (OVD) were carried out to the nearest millimeter with a ruler (restricted mobility of the mandible was defined as <40mm jaw opening, and <7mm lateral excursions, and protrusion). Deviations of the mandible were also noted. Patients' report of pain and pain on palpation was assessed by 'using a verbal rating scale: none, mild, moderate, and extreme. The interview and clinical examinations were conducted by one of the authors (ACA) who was blind to the exact tooth wear index scores, the use of one examiner is to ensure continuity of interpretation of the answers provided.

The data were subjected to descriptive and statistical analyses using SPSS for windows statistical software package version 11.0. Chi-square test was used to compare the differences in signs and symptoms of TMD in the study groups; $p < 0.05$ was defined as statistically significant.

Results

The age and gender composition of the two groups are listed in Table 1. Although more females reported pain than males and also more TMD signs were recorded in females than in males (except for impaired range of movement), their differences were not statistically significant ($p > 0.05$), (Table 2). Except for impaired range of movement, tooth wear patients and controls differ significantly with respect to the variables; pain report, pain on palpation, TMJ sound and deviation on opening ($p < 0.001$), (Table 3).

Table 1. Age and gender distribution of tooth wear patients and control subjects.

Gender	Age (years)	Tooth wear patients		Control subjects		Total	
		No	%	No	%	No	%
Female	<25	13	15.0	8	13.8	21	14.4
	25-40	47	54.0	34	58.6	81	55.9
	>40	27	31.0	16	27.6	43	29.7
	Total	87	100.0	58	100.0	145	100.0
Male	<25	7	11.1	4	9.5	11	10.5
	25-40	35	55.6	25	59.5	60	57.1
	>40	21	33.3	13	31.0	34	32.4
	Total	63	100.0	42	100.0	105	100.0
Combined	<25	20	13.3	12	12.0	32	12.8
	25-40	82	54.7	59	59.0	141	56.4
	>40	48	32.0	29	29.0	77	30.8
	Total	150	100.0	100	100.0	250	100.0

Table 2. Gender distribution of TMD symptoms and signs.

	Tooth wear patients				<i>p</i> value	Control subjects				<i>p</i> value
	Male (63)		Female (87)			Male (42)		Female (58)		
	No	%	No	%		No	%	No	%	
Pain report	37	24.7	64	42.7	p=0.05	11	11.0	19	19.0	p=0.47
Pain on palpation	33	22.0	46	30.7	p=0.95	7	7.0	10	10.0	p=0.93
Impaired range of movement	10	6.7	8	5.3	p=0.21	4	4.0	5	5.0	p=0.83
TMJ sound	34	22.7	38	25.3	p=0.21	6	6.0	6	6.0	p=0.54
Deviation on opening	17	11.3	20	13.3	p=0.89	1	1.0	1	1.0	*

*An expected cell value is less than 5.

Table 3. Prevalence of symptoms and signs of TMD

	Tooth wear patients		Control subjects		<i>p</i> value
	No	%	No	%	
Pain report	101	67.3	30	30.0	p<0.001
Pain on palpation	79	52.7	17	17.0	p<0.001
TMJ sound	72	48.0	12	12.0	p<0.001
Impaired range of movement	18	12.0	9	9.0	p>0.05
Deviation on opening	37	24.6	2	2.0	p<0.001

The prevalence of patients' report of pain and pain on palpation is shown in Figs. 1 and 2. Pain was a common symptom in both groups. There was a greater prevalence of mild (20.7%), moderate (39.3%), and extreme (7.3%) pain levels in patients with occlusal tooth wear than in control subjects (mild 14%, moderate 15%, and extreme 2%) as recorded by the clinician ratings based on patients' report of pain. Most of the control subjects (83%) had no pain on palpation, whereas 52.7% of patients with occlusal tooth wear had pain on palpation (Fig. 2).

Attrition scores differ between age groups with higher scores in the older age groups. Males had higher attrition scores than females. Patients with a mean occlusal TWI score of 3 or 4 (Loss of enamel exposing dentine for more than one-third of the occlusal surface or complete loss of enamel and exposure of secondary dentine) presented with more symptoms and signs of TMD than in patients with a mean occlusal TWI score of 2 or less (Loss of enamel exposing dentine for less than one-third of the occlusal surface or loss of enamel surface characteristics). Patients with mean occlusal TWI score of ≥ 3 differ significantly from those with TWI score ≤ 2 with respect to pain on palpation and TMJ sound ($p<0.001$), (Table 4).

Discussion

Temporomandibular disorders is a collective term embracing a number of clinical problems that involve the muscles of mastication, the temporomandibular joint and associated structures or both (Okeson, 1996). This group of disorders has been identified as the chief cause of pain, which is not of dental origin, in the orofacial

area. These disorders impair the quality of life of those suffering from them due to the extent of pain and the chronic nature of its symptoms.

An important observation is the comparability of both groups in terms of demographic characteristics such as age and gender. The majority of the tooth wear patients fall into the 25-40 year age group. Tooth wear increases cumulatively with age and also TMD is most prevalent in persons between 25 and 40 years of age (McNeill, 1997). Therefore, the patients and subjects in the present study were considered representative group of adult suitable for the study of possible associations between early signs of TMD. The lack of no significant gender differences in reported symptoms and clinical signs of TMD in this study tend to agree with other investigations (Otuyemi *et al.*, 2000), although De Kanter *et al.*, (1993) found a higher incidence of TMD in females

The results of this investigation showed that there were statistically significant differences between the reported symptoms and signs of TMD in occlusal tooth wear patients and control subjects, except for impaired range of movement. While the high prevalence of pain in this study is contrary to the findings of Otuyemi *et al.*, (2000) in which less than one-tenth of the subjects showed clinically detectable pain, it is consistent with those of Lundeen *et al.*, (1988) where pain was reported as the most common symptom. However, the prevalence of patients' report of pain and pain on palpation was greater in occlusal tooth wear patients. It may be that the loss of vertical dimension resulting from occlusal wear is exerting some degree of strain and stress on the masticatory muscles and the temporomandibular joint,

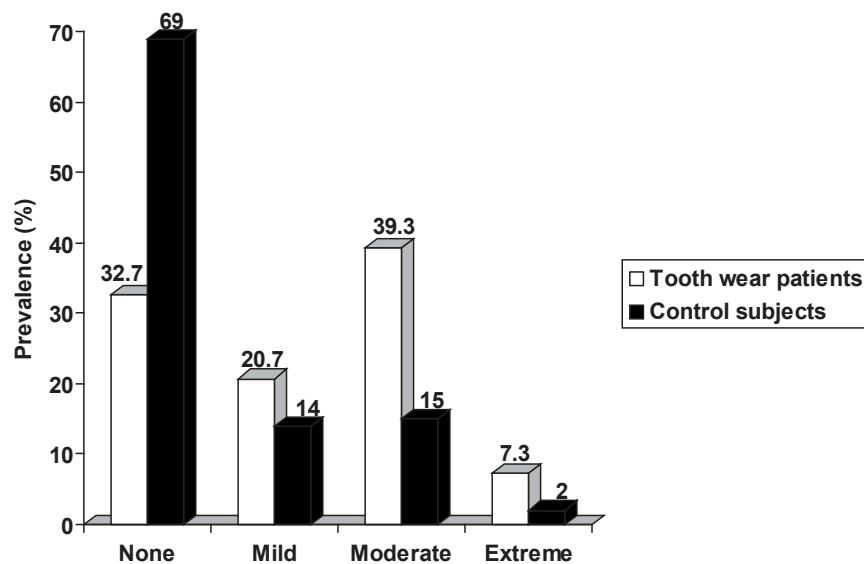


Figure 1. Prevalence of report of pain in patients with occlusal tooth wear and control subjects.

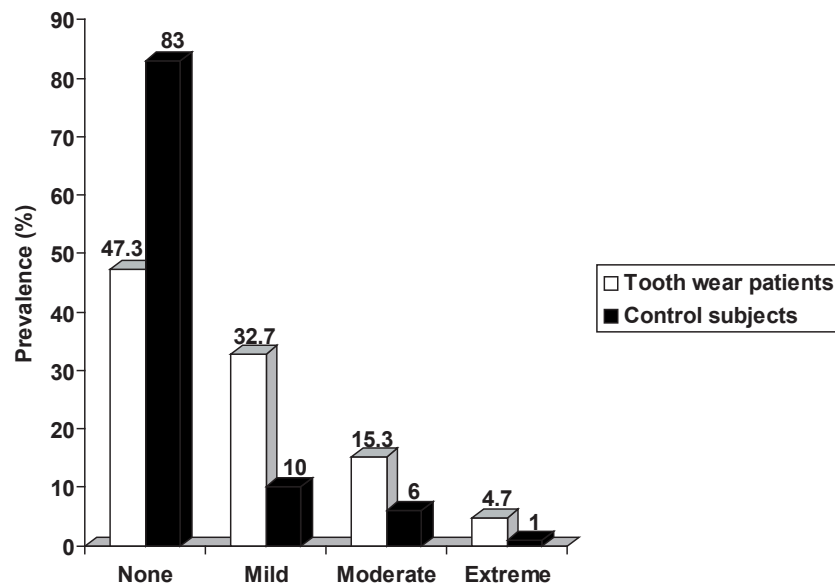


Figure 2. Prevalence of pain on palpation in patients with occlusal wear and control subjects.

Table 4. Mean tooth wear index score of posterior teeth Vs TMD symptoms and signs.

Mean TWI score	Pain report		Pain on palpation		Impaired range of movement		TMJ sound		Deviation on opening	
	No	%	No	%	No	%	No	%	No	%
≤2 (n=60)	43	28.7	22	14.7	4	2.6	15	10.0	12	8.0
≥3 (n=90)	58	38.7	57	38.0	14	9.3	57	38.0	25	16.6

Pain on palpation: $\chi^2 = 10.77$, $df = 1$, $p < 0.001$

TMJ sound: $\chi^2 = 21.19$, $df = 1$, $p < 0.001$

resulting in pain in the muscles and joint. In patients with occlusal tooth wear, the modal pain rating category (39.3%) was moderate pain while in control subjects, the modal pain rating category (69%) was none. Also 83% of control subjects had none or mild pain. This difference in overall pain report is highly significant. Contrary to expectation, the majority sought no treatment. It may be that the pain is not severe enough for them to seek treat-

ment or they might have gradually adapted to it. There was some background level of pain on palpation in the control subjects which is consistent with other reports (Solberg *et al.*, 1979).

The aetiologic importance of occlusal factors in the development of TMD is still a topic of great controversy (Magnusson *et al.*, 2005). Several correlations were found between occlusal factors and both signs and symptoms

of TMD. However, these correlations were weak and inconsistent in most cases. While the contribution of occlusion was not zero, most of the variations among groups with TMD were not explained by occlusal parameters. Thus occlusion cannot be considered the unique or dominant factor in defining TMD populations (Pullinger *et al.*, 1993). It has also been stated that the lack of an association between occlusal interferences and signs of TMD is due to the omnipresence of such interferences and that inadequate and invalid study designs may have led to false-negative results (Kirveskari *et al.*, 1989). Of the different morphological malocclusions, the presence of crossbite and deep bite seem to be risk factors/contributing factors for TMD. Prolonged presence of crossbite predisposes to temporomandibular joint pain (Egermark *et al.*, 2003). Also Magnuson *et al.*, (2005) in their study found that the presence of deep bite at baseline was one of the risk factors found for the development of clinical signs of TMD 20 years later.

In this study, attrition scores differed between age groups, with higher scores in the older age group. These run contrary to the findings of Seligman, *et al.*, (1988) who reported that attrition scores did not differ significantly between age groups and that notable attrition, when present, often occurs early. While other studies (John *et al.*, 2002) reported that incisal wear was not significantly associated with TMD, the present study recorded more symptoms and clinical signs of TMD in patients with mean tooth wear index score of 3 or 4 for the posterior teeth. Also patients with TWI score ≥ 3 and those with TWI score ≤ 2 differ significantly with respect to pain on palpation and TMJ sound. This may signify an association between posterior tooth wear and TMD. The more severe the tooth wear becomes, the more the resulting stress and strain on the masticatory muscles and the temporomandibular joint during chewing.

Conclusions

There is some background level of signs and symptoms of TMD in the control subjects, which may indicate some degree of TMD among adult Nigerians. Posterior occlusal wear (mean TWI scores of 3 or 4) was significantly associated with pain on palpation and TMJ sound. Hence there may be a clinically relevant risk of TMD among Nigerian patients with occlusal tooth wear.

References

- Bonjardim, L.R., Gaviao, M.B., Carmagnani, F.G., Pereira, L.J., Castelo, P.M. (2003): Signs and symptoms of temporomandibular joint dysfunctions in children with primary dentition. *Journal of Clinical Pediatric Dentistry* **28**, 53-8.
- Carlsson, G.E. (1999): Epidemiology and Treatment Need for Temporomandibular Disorders. *Journal of Orofacial Pain* **13**, 232-7.
- Carlsson, G.E., LeResche, L. (1995): Epidemiology of temporomandibular disorders. In: Sessle BJ, Bryant PS, Dionne RA (eds). *Temporomandibular Disorders and Related Pain Conditions*. Seattle: IASP Press.
- De-Kanter, R.J., Truin, G.J., Burgerdijk, R.C., Van-'t-Hof, M.A., Battistuzzi, P.G., Kalsbeek, H., Kayser, A.F. (1993): Prevalence in the Dutch adult population and meta-analysis of signs and symptoms of Temporomandibular disorder. *Journal of Dental Research* **72**, 1509-18.
- De Latt, A., Van Steenberghe, D., Lesaffre, I. (1986): Occlusal relationships and temporomandibular dysfunction. Part II: correlations between occlusal and articular parameters and symptoms of TMJ dysfunction by means of stepwise logistic regression. *Journal of Prosthetic Dentistry* **55**, 116-21.
- Egermark, I., Magnusson, T., Carlsson, G.E. (2003): A 20-year follow-up of signs and symptoms of temporomandibular disorders and malocclusions in subjects with and without orthodontic treatment in childhood. *Angle Orthodontics* **73**, 109-15.
- John, M.I., Frank, H., Lobbezoo, F., Drangsholt, M., Dette, K. (2002): No association between incisal tooth wear and Temporomandibular disorders. *Journal of Prosthetic Dentistry* **87**, 197-203.
- Kirveskari, P., Alanen, P., Jamsa, T. (1989): Association between craniomandibular disorders and occlusal interferences. *Journal of Prosthetic Dentistry* **62**, 66-9.
- Lambrechts, P., Braem, M., Vuylsteke-Wanters, M., Vanherle, G. (1989): Quantitative in-vivo wear of human enamel. *Journal of Dental research* **68**, 1752-4.
- Lundeen, Y.F., Levitt, S.R., McKinney, M.W. (1988): Evaluation of Temporomandibular joint disorders by clinician ratings. *Journal of Prosthetic Dentistry* **59**, 202-11.
- Magnusson, T., Egermark, I., Carlsson, G.E. (2005): A prospective investigation over two decades on signs and symptoms of temporomandibular disorders and associated variables. A final summary. *Acta Odontologica Scandinavica* **63**, 99-109.
- Mazengo, M.C., Kirveskari, P. (1991): Prevalence of Cranio-mandibular disorders in adults of Hela District, Dar-es-salaam, Tanzania. *Journal of Oral Rehabilitation* **18**, 568-572.
- McNeill, C. (1997): Management of Temporomandibular disorders: concept and controversies. *Journal of Prosthetic Dentistry* **77**, 510-22.
- Oginni, A.O., Olusile, A.O. (2002): The prevalence, aetiology and clinical appearance of tooth wear: the Nigerian experience. *International Dental Journal* **52**, 268-72.
- Okeson, J.P. (1996): Orofacial pain: guidelines for assessment, diagnosis and management. Carol Stream: Quintessence.
- Otuyemi, O.D., Owotade, F.J., Ugboko, V.I., Ndukwe, K.C., Olusile O.A. (2000): Prevalence of signs and symptoms of Temporomandibular Disorders in young Nigerian adults. *Journal of Orthodontics* **27**, 61-5.
- Pullinger, A.G., Seligman, D.A., Gornbein, J.A. (1993): A multiple logistic regression analysis of the risk and relative odds of temporomandibular disorders as a function of common occlusal features. *Journal of Dental Research* **72**, 968-79.
- Seligman, D.A., Pullinger, A.G., Solberg, W.K. (1988): The prevalence of dental attrition and its association with factors of age, gender, occlusion and TMJ symptomatology. *Journal of Dental Research* **67**, 1323-33.
- Smith, B.G., Knight, J.K. (1984): A comparison of patterns of tooth wear with aetiological factors. *British Dental Journal* **157**, 16-19.
- Solberg, W.K., Woo, M.W., Houston, J.B. (1979): Prevalence of mandibular dysfunction in young adults. *Journal of American Dental Association* **98**, 25-34.
- Van der Weele, L.Th., Dibbets, J.M.H. (1987): Helkimo's index: a scale or just a set of symptoms. *Journal of Oral Rehabilitation* **14**, 229-37.
- Young, W.G. (1998): Anthropology, tooth wear, and occlusion in the aborigine. *Journal of Dental Research* **77**, 1860-63.