

Prevalence and severity of occlusal tooth wear in a young Saudi population

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An epidemiologic investigation of the prevalence and severity of occlusal wear was carried out in a young Saudi population. Occlusal wear was evaluated on a tooth-by-tooth basis on study casts made for 206 dental students, using an ordinal scale. The reliability of the scale was assessed by percentage inter- and intra-observer concordance. The mean occlusal wear was high for the population studied. The sample presented the highest wear scores in the incisor region, maxillary canines, and mandibular molars. Comparison with other studies of similarly aged Western populations showed a more extensive pattern of wear in the present sample, pointing to the possible role of environmental influences. □ *Abrasion; attrition; epidemiology; wear facets*

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The factors most frequently considered to be contributory to occlusal tooth wear are abrasion, erosion, and attrition (1). Abrasive and erosive loss of tooth substance is dependent on dietary composition (2); heavy attritional loss, on the other hand, may be attributed to parafunctional activity, notably bruxism (3, 4).

Notwithstanding the near-universality of occlusal tooth wear, several studies have shown that large differences in its severity occur (5–8). Compared with modern urbanized societies, primitive peoples show extensive occlusal wear (9). Furthermore, it has been suggested that the severity of tooth wear decreases with increasing urbanization (10–12).

The occurrence and pattern of wear in contemporary primitive populations have been studied. The dentitions of Australian aborigines and Eskimos become 'worn in' at an early age, with relative flattening of the occlusal surface by the early twenties (5, 8, 13). Furthermore, considerable similarity exists between such groups and skeletal material from earlier periods (9, 12, 14–17). Whereas it is likely that the patterns and degrees of such tooth wear may be related to cultural and dietary factors of the popu-

lations studied (6), the influence of ambient air pollution—that is, fine particulate material—may be an aggravating factor. Nevertheless, it has been observed that even in dry, sandy environments, where extensive dentin exposure commonly occurs, a reduced tendency for tooth destruction could be correlated with an increase in cultural development (11).

The Kingdom of Saudi Arabia is the largest of several countries located in the Arabian Peninsula, occupying approximately 80% of its total land mass. In 1986 the population was 11.5 million, which represents a very large increase over the 1962 estimate of 3.2 million (18). From a largely nomadic existence, the population has participated in unparalleled development programs, which have taken place in the past two decades. With this there has been a massive relocation from rural to urban areas and, indeed, a concomitant shift towards urban lifestyles. Consequently, the present generation of young adults has more than likely spent the greater part of or their entire lives in the oil boom period, which started in the late 1960s. The country comprises largely desert terrain and experiences extremely hot climatic conditions for most of the year. Humidity occurs

Table 1. Male/female distributions within the sample

| | Male | Female | Total |
|---------------------------|------|--------|-------|
| Unmatched group, <i>n</i> | 94 | 65 | 159 |
| Matched group, <i>n</i> | 27 | 20 | 47 |
| Total, <i>n</i> | 121 | 85 | 206 |

in extremes, with coastal areas being very humid and inland very dry.

In reviewing the relevant literature, we found a paucity of information on the occurrence of tooth wear in a contemporary Arab population. It was therefore the purpose of this study to investigate the prevalence and severity of occlusal tooth wear in a young adult Saudi population.

Materials and methods

As part of the requirements of their pre-clinical training in fixed prosthodontics at King Saud University, students have to submit for evaluation a maxillary and/or mandibular study cast. The casts, poured in vacuum-mixed diestone (Die-Keen, Columbus Dental, St. Louis, Mo., USA) were to be constructed from an alginate impression (Jeltrate, L.D. Caulk Co., Milford, Del., USA) obtained in perforated metal stock trays (Stok Trays, Coe Laboratories Inc., Chicago, Ill., USA) from a colleague's maxillary and mandibular arch. The standard of the casts is graded in accordance with the usual criteria for suitability in a diagnostic mounting on a semi-adjustable articulator.

Between 1985 and 1989 the number of casts thus collected totaled 286, representing one of two arches from 227 individuals. After duplicate casts and those with impression

and/or pouring-related errors had been excluded, the remaining number was 253, comprising 129 maxillary and 124 mandibular casts, which constituted the study sample. A few teeth were excluded from assessments because they had crown and bridge treatment or large restorations. Third molars were similarly excluded. Within the total sample there were 47 matched sets of maxillary and mandibular casts (the subgroup), while 159 were unmatched, representing in total 206 individuals.

The male/female distributions are shown in Table 1. The mean age of the subjects was 22.1 years (range, 19–25 years) for the men and 21.2 years (range, 19–23 years) for the women; the overall sample mean was 21.7 (range, 19–25) years. The mean number of teeth per arch was 13.7 (range, 11–14).

Two examiners (A. Johansson and K. Fareed) recorded occlusal wear on a tooth-by-tooth basis, using a modified ordinal scale (Table 2), which assigned a score to each degree of wear (19). All assessments were performed in near-standardized lighting conditions, and intra- and inter-examiner concordances were tested, first, by each examiner performing two successive blind assessments on each of 228 teeth on 17 casts on a randomly selected and ordered basis and, secondly, by each examiner independently scoring each of 325 teeth on 25 randomly selected casts after a period of mutual calibration. Concordances were calculated on the basis of percentage agreement.

From the raw tooth-by-tooth occlusal wear data, medians, ranges, and standard deviations were calculated. Similarly, mean data were obtained for each tooth group—that is, incisors, canines, premolars, and molars for each arch. Differences in individual teeth

Table 2. Ordinal scale used for grading severity of occlusal wear

| | |
|---|--|
| 0 | No visible wear facets in the enamel. Occlusal/incisal morphology intact. |
| 1 | Marked wear facets in the enamel. Occlusal/incisal morphology altered. |
| 2 | Wear into the dentin. Dentin exposed occlusally/incisally or another tooth surface. Occlusal/incisal morphology changed in shape, with height reduction of the tooth. |
| 3 | Extensive wear into the dentin. Large dentin area (>2mm ²) exposed occlusally/incisally or another tooth surface. Occlusal/incisal morphology totally lost locally or generally. Substantial loss of crown height. |

Table 3. Medians, standard deviations (SD), and ranges of occlusal wear scores for different tooth groups

| | Maxilla | | | | Mandible | | | |
|--------|---------|-----------|---------|----------|----------|-----------|---------|----------|
| | Molars | Premolars | Canines | Incisors | Molars | Premolars | Canines | Incisors |
| Median | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 2 |
| SD | 0.52 | 0.42 | 0.55 | 0.44 | 0.52 | 0.37 | 0.50 | 0.41 |
| Range | 1-3 | 1-3 | 1-3 | 1-3 | 1-3 | 0-3 | 1-2 | 1-3 |

between men and women were tested with the Mann-Whitney U-test (20).

On the basis of a full or nearly full (excluding third molars) complement of teeth in the sample, it was considered reasonable to assign a mean occlusal wear index to each of the casts. This was obtained by dividing the sum of the scores for each arch by the number of teeth present.

Results

Inter- and intra-examiner concordances were calculated as 91% and 89% (for both examiners), respectively.

From the pooled data (Table 3) it was generally found that in both arches anterior

teeth showed greater wear than did posterior teeth. An exception to this trend was the mandibular molar group, which showed a median score similar to that of anterior teeth. Both incisor groups, the maxillary canine group, and the mandibular molar group showed median scores of 2, which corresponds to 'wear into dentin'. All other tooth groups had a median score of 1, corresponding to 'marked wear facets in the enamel' (Figs. 1-3). Score 0 was found in only 9 (0.26%) of 3459 teeth examined, and these were confined to the mandibular premolars. When maxillary and mandibular mean wear indices were compared, no difference was apparent (Fig. 4, Table 4).

Statistical comparison of individual teeth between men and women showed certain

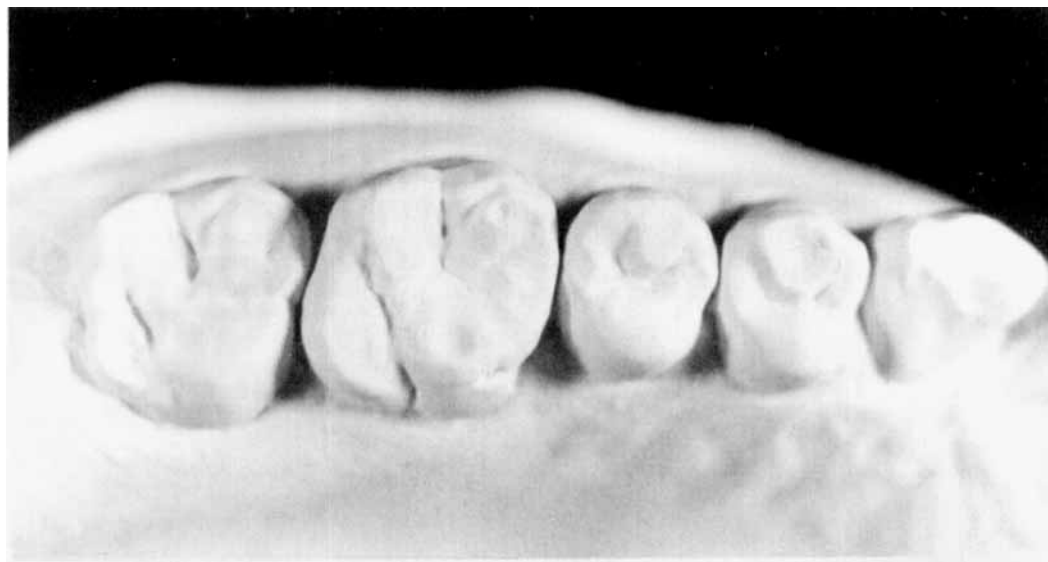


Fig. 1. Occlusal view illustrating grade-1 wear on the second premolar and grade-2 wear on the first premolar and first molar (note definite pits or depressions indicative of exposed dentin).

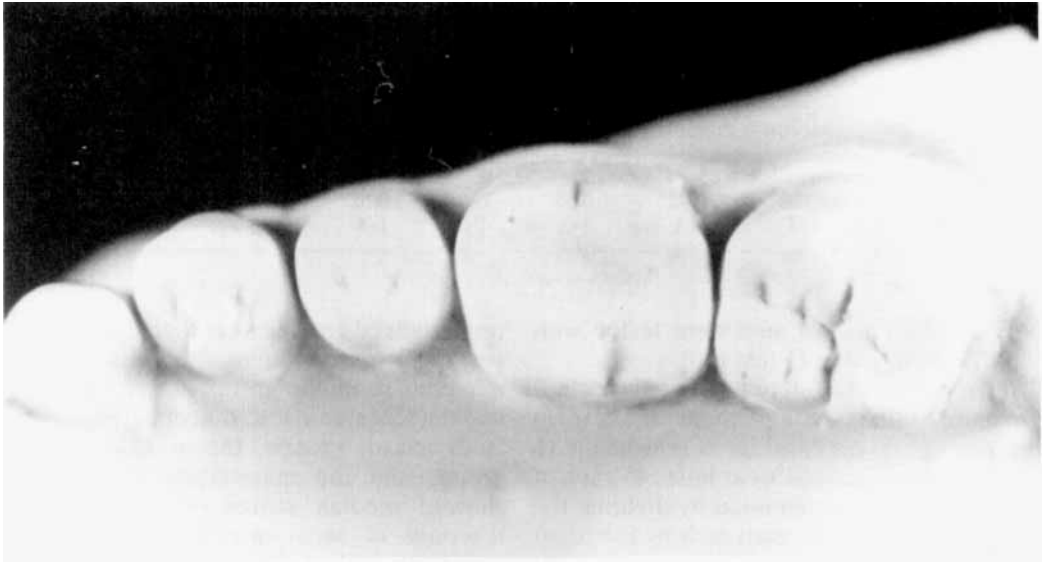


Fig. 2. Flattened posterior occlusal surfaces with total loss of morphology on first molar, illustrating grade-3 wear.

differences. Men showed significantly greater scores in all second molars ($P < 0.05$) except that in the lower right quadrant, whereas women had greater wear in the mandibular right central incisor ($P < 0.01$). No

significant differences were found in the other teeth. Table 5 shows the similarity in mean occlusal wear index for the matched subgroup and the mixed total sample. In view of the nature of the study sample, it was



Fig. 3. Buccal view illustrating grade-3 wear on central incisors (note substantial loss of clinical crown height).



Fig. 4. Maxillary cast of a 21-year-old male with a mean occlusal wear index of 1.93.

Table 4. Means, standard deviations (SD), and ranges of occlusal wear indices of the sample

| | Maxilla (n = 129) | Mandible (n = 124) | Total (n = 253) |
|-------|----------------------|-----------------------|--------------------|
| Means | 1.48 | 1.47 | 1.48 |
| SD | 0.27 | 0.21 | 0.24 |
| Range | 1.07-2.64 | 1.00-2.43 | 1.00-2.64 |

considered important to verify this positive relationship, to validate the sample composition.

Discussion

Inasmuch as the casts comprising the sample in this study were fabricated as a supervised student exercise, quality was ensured and was generally uniform. Substandard casts were excluded, further improving the reliability of the occlusal examination.

When the sample composition is considered, the disproportionate number of maxillary and mandibular casts is evident. In this respect, if, in a given population, occlusal wear affects opposing arches of a dentition to similar extents, mean data derived from one or other arch may

adequately reflect that population's overall state of wear. In the present study the mean occlusal wear index for the matched subgroup concurred almost exactly with that for the total mixed sample (Table 5), which, we believe, supports the above contention. It is also clear that the potential for identifying indicator teeth from an occlusal wear index exists. In a recent report (21) an abrasion index based on four selected teeth was suggested.

The ordinal scale for grading the wear in the present study was adapted from one previously described (19). Whereas many of the available scales are applicable largely to extensive wear (4-10, 22), the one used in the present study is considered applicable over a wide range of degrees of wear. Not only is the quantity of exposed dentin accounted for, but the resultant changes in

Table 5. Means, standard deviations (SD), and ranges of occlusal wear indices for the matched subgroup (n = 47) and the total group (n = 206)

| | Subgroup | Total group |
|-------|-----------|-------------|
| Mean | 1.46 | 1.48 |
| SD | 0.18 | 0.24 |
| Range | 1.14-2.17 | 1.00-2.64 |

morphology are also ranked. The good concordances in both inter- and intra-examiner analyses indicate the reliability of the scale used.

The high recorded wear in the present study is in sharp contrast to the findings in a similarly aged and evaluated Western sample (23), in which a milder degree and prevalence of wear was found. Other studies of young Western populations (24, 25) have similarly reported a mild degree of occlusal wear.

However, several studies of tooth wear in primitive societies (4–10) have reported that extensive wear is the norm and that it progresses rapidly. Indeed, Molnar et al. (26) have alluded to the influence of harsh environmental conditions in their observations of severe wear in contemporary Australian aborigines.

In this respect, the present population, while contemporary and to a large extent urbanized, contends with environmental conditions that may be similarly conducive to occlusal wear. Preliminary investigations into the demographic profiles of the study sample further indicate that most of the subjects spent their entire lives in the dry and hot conditions of Riyadh and surrounding areas. It may therefore be suggested that, notwithstanding the urban locality, the presence of fine ambient particulate material in the air constituted an important etiologic factor in the occurrence of wear. The role of the environmental factors referred to and other possible etiologic factors in the occurrence of wear require further investigation.

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