Periodontal disease in adolescents: epidemiologic findings in Navajo Indians

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Wolfe MD, Carlos JP: Periodontal disease in adolescents: epidemiologic findings in Navajo Indians. Community Dent Oral Epidemiol 1987; 15: 33–40.

Abstract – A cross-sectional epidemiologic survey was conducted of 618 Navajo Indians, aged 14–19, resident in a boarding school in New Mexico. Periodontal status was assessed by clinical measurements of attachment level and gingival bleeding, and evidence of alveolar bone loss from standardized bitewing radiographs. Attachment level and gingival bleeding were measured at 24 posterior interproximal sites (six sites in each quadrant): the mesio-buccal aspect of the second molar; the disto-buccal and mesio-buccal aspects of the first molar and second premolar; and the disto-buccal aspect of the first premolar. Alveolar bone level was measured from radiographs at the corresponding approximal surfaces of the same teeth. Attachment loss was considered present when the distance from the CEJ to the base of the pocket was >1 mm; bone loss was considered present when the radiographic distance from the CEJ to the alveolar crest was >2 mm, and gingival bleeding was considered present if bleeding occurred immediately after gentle probing. Attachment loss was evident at one or more sites in 88.7% of the population, 45.9% of the subjects had attachment loss at eight or more sites, and 101 subjects (16.3%) had one or more sites with at least 4.0 mm of attachment loss. Bone loss was present at one or more sites in 89.2% of the population, 28.6% had eight or more affected sites, and 4.7% (29 subjects) had one or more sites with at least 2.0 mm of bone loss. Gingival bleeding was evident at one or more sites in 70.6% of the population, and 19.7% had eight or more affected sites. None of the conditions were strongly associated with sex, but the prevalence of bone loss increased with age. The prevalence and severity of incipient periodontitis seemed much higher in these subjects than previously reported in other adolescent groups when similar diagnostic criteria and methods of measurement were used.

Key words: adolescence; epidemiology, oral; Indians, North American; Navajo; periodontal diseases

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Accepted for publication 22 September 1986

Although many investigators have described aspects of the periodontal status of adolescents from different countries, the detailed epidemiologic characteristics of periodontal diseases in this age group remain unclear.

Since RUSSELL proposed the Periodontal Index (PI) in 1956 (1), several investigators who used this index have reported that gingivitis was widespread among 12–19-yr-olds, but incipient destructive disease (mean PI scores in the range of 0.7–1.9) was found only in developing countries (2). However, it is generally agreed that the PI underestimates the prevalence and severity of periodontitis (3), and it is therefore likely that incipient destructive disease was more widespread than diagnosed in these early studies.

More recently, researchers have considered interproximal alveolar bone loss, as diagnosed from bitewing radiographs, a criterion for evidence of destructive periodontitis in adolescents. DAVIES *et al.* (4) examined 14–15-yr-old English schoolchildren and reported the prevalence of bone loss as 44.0%. BLANKENSTEIN *et al.* (5), on the other hand, examined 1645 English and Danish 13–15-yr-olds and reported that the prevalence of bone loss was 0.06%. There is little doubt that such disparate findings are partially attributable to differences in the criteria used to diagnose bone loss.

Data on destructive periodontal disease in adolescents from the United States are sparse. In 1955, MARSHALL-DAY *et al.* (6) found periodontal pockets of 3 mm or deeper in 43% of 13–15-yr-old children, and in 32% of 16–18-yr-olds. In the same groups, alveolar bone loss was found in 4% and 5%, respectively. In 1969, SUOMI (7) examined 100 white boys aged 15–19, and reported that 38% showed signs of alveolar bone loss on radiographs. In 1981, MANN *et al.* (8) found attachment loss of 1 mm or more in 47.3% of 16–19-yr-olds, and stated that the severity of attachment loss was greatest in those with "high bone loss". The methods and criteria used to diagnose bone loss in the latter two studies were not described.

Thus, the lack of uniformity in the definition of periodontal disease, in the methods of measurement and the criteria used to diagnose pathology, and in the

Table 1. Age and sex distribution of subjects

Age in yr	Boys		Girls		Both	
	n	(%)	*n*	(%)	*n*	(%)
14	14	(25.9)	40	(74.1)	54	(8.7)
15	66	(51.6)	62	(48.4)	128	(20.7)
16	71	(56.3)	55	(43.7)	126	(20.4)
17	74	(50.0)	74	(50.0)	148	(23.9)
18	63	(59.4)	43	(40.6)	106	(17.2)
19	36	(64.3)	20	(35.7)	56	(9.1)
Total	324	(52.4)	294	(47.6)	618	(100.0)
Mean age	16.6. yr		16.3 yr		16.5 yr	

reporting of clinical and radiographic findings prevent meaningful comparisons among studies, and provide little basis for conclusions about the epidemiology of the disease in adolescents.

The purpose of this investigation was to document the prevalence and distribution of early signs of periodontitis in an adolescent population residing in the United States, applying diagnostic methods which appear to be currently used by several researchers.

Methods

The study population consisted of 618 Native American children, 324 (52.4%) boys and 294 (47.6%) girls, 14–19-yr of age (Table 1). This volunteer group was 80% of the children enrolled in grades 9–12 at the US Bureau of Indian Affairs boarding school at Fort Wingate, New Mexico.

Most children were Navajo or of mixed Navajo parentage. During holidays and summer vacations they return to their families residing in a rural low socioeconomic environment on the adjacent 64 750 m^2 Navajo reservation.

The subjects were examined in a clinical facility at the school in November 1984 and January 1985. Portable dental chairs and fiberoptic examining lights (Rolux) were used.

Periodontitis was diagnosed by probing attachment loss and radiographic evidence of interproximal alveolar bone loss. The presence of gingivitis, as evidenced by gingival bleeding upon gentle probing, was also assessed.

Attachment level and gingival bleeding were measured at the following 24 posterior interproximal sites (six sites in each quadrant): second molar, mesio-buccal; first molar, disto-buccal and mesio-buccal; second premolar, disto-buccal and mesio-buccal; and the first premolar, disto-buccal.

The free gingiva adjacent to these sites was examined for evidence of bleeding using a modification of the Gingival Index (9). The field was dried with gauze, and a periodontal probe (NIDR probe, #2–12) was inserted beneath the edge of the gingival margin at the buccal aspect of the second molar and gently swept anteriorly along the gingival crevice to the buccal aspect of the first premolar. Each site was immediately scored "1" if bleeding occurred, or "0" otherwise.

Attachment level was measured according to the technique described by RAMFJORD (3), using the same NIDR probe which is color-banded at 2 mm increments. Paired measurements were made at each site. The first measurement was made from the gingival margin to the base of the sulcus, and the second from the gingival margin to the cemento-enamel junction (CEJ), and each was rounded down to the nearest whole millimeter. The attachment level was computed by subtracting the CEJ-to-gingival margin distance from the gingival margin-to-sulcus depth distance. Calculus was removed if it obstructed the CEJ; if the CEJ could not be located, its position was estimated using adjacent anatomical landmarks. When measurements could not be made due to, for example, a missing tooth or a severely malposed tooth, the site was excluded. A site was considered to have *attachment loss* if the attachment level was more than 1 mm from the CEJ.

Bitewing radiographs (one right and one left) were taken using a Siemens Heliodent 70, Portaray unit operating at 70 kV, 7 mA. Kodak Extaspeed film size 2, was positioned horizontally in a film positioning device (Eggen) and exposed for 0.25 seconds. Films were processed the same day as exposed using a Philips 410 automatic processor. All subjects wore a protective thyroid collar and lead apron.

Radiographs were read by one investigator using a Realist Vantage 5 Aperture Card Reader set at 10× magnification. Measurements of alveolar bone level were made at the mesial and distal aspects of the teeth corresponding to the 24 sites that had been probed. *Bone loss* was considered present at a site if the distance from the most opaque edge of the CEJ to the most opaque edge of the alveolar crest adjacent to the tooth exceeded 2 mm. Measurements were made with calipers and rounded down to the nearest half millimeter. If neither reference point was visible, the site was excluded. Out of 14,832 possible sites, 4.1% were excluded.

Sixty-five randomly selected pairs of radiographs were reexamined by the same investigator 2 months later and the kappa statistic was computed to estimate the reliability of the measurements (10). Replicate attachment level measurements were made blindly at each site in five subjects, 3 wk after the initial examination. The standard deviation of the difference between paired measurements as well as their reproducibility within 1 mm were computed.

From replicate estimates of attachment level at 117 sites in five subjects, the standard deviations of the intra-examiner differences for the whole mouth, and for right and left sides of the mouth were 0.63 mm, 0.60 mm, and 0.66 mm, respectively. 93.2% of the repeat measurements were within 1 mm. Repeat diagnoses for the presence of bone loss at 1275 sites in 65 randomly selected pairs of bitewing radiographs gave an agreement of 80% (kappa = 0.59).

The morphology of the interproximal bone from twelve posterior areas (three areas in each quadrant) was also recorded: between the first and second molar, between the second premolar and the first molar, and between the first and second premolar. The morphologic classifications used were similar to those described by KARN *et al.* (11).

Results

Prevalence of disease

The prevalence of attachment loss, bone loss, and gingival bleeding was calculated

Table 2. Prevalence (percent) of attachment loss, bone loss, and gingival bleeding by age and sex

Age in yr	Attachment loss			Bone loss			Gingival bleeding		
	B	G	Both	B	G	Both	B	G	Both
14	92.8	92.5	92.6	78.6	77.5	77.8	78.6	90.0	87.0
15	92.4	88.7	90.6	84.8	83.9	84.4	75.8	77.4	76.6
16	90.1	90.9	90.5	90.1	94.5	92.1	70.4	69.1	69.8
17	81.1	83.8	82.4	93.2	89.2	91.2	62.2	63.5	62.8
18	92.1	83.7	88.7	95.2	86.0	91.5	76.2	62.8	70.8
19	91.7	95.0	92.9	100.0	85.0	94.6	69.4	50.0	62.5
Total	89.2	88.1	88.7	91.4	86.7	89.2	71.0	70.1	70.6

Table 3. Mean percent of sites (extent) with attachment loss, bone loss, and gingival bleeding by age and sex

Age in yr	Attachment loss			Bone loss			Gingival bleeding		
	B	G	Both	B	G	Both	B	G	Both
14	45	31	34	15	14	14	20	18	19
15	36	30	33	20	19	20	18	17	17
16	30	29	30	23	17	21	14	13	13
17	27	24	26	23	18	20	13	9	11
18	30	28	29	32	21	27	13	14	13
19	26	27	27	32	18	27	13	9	11
Total	31	28	29	25	18	22	14	13	14

as the percent of subjects having one or more diseased sites. The overall prevalence of each condition was high; 88.7% of the subjects had attachment loss, 89.2% had bone loss, and 70.6% had gingival bleeding (Table 2). The association of the prevalence of each condition with age was inconsistent and generally weak; the prevalence of bone loss increased slightly with age, attachment loss showed little change, and the prevalence of gingival bleeding tended to decrease. Boys appeared to have a somewhat higher prevalence of bone loss but there were no differences between boys and girls in attachment loss or gingival bleeding.

Based on evidence of attachment loss and bone loss in the posterior regions only, four subjects (0.7%) had severe lesions on the mesial or distal surfaces of the first molars, consistent with a diagnosis of localized juvenile periodontitis. These subjects were included in the overall analyses.

Distribution of disease within the mouth

The distribution of each condition within the mouth was summarized in two ways; the percent of diagnosable sites that were diseased (disease extent) and the site-specific prevalence of the condition. The age- and sex-specific disease extent is the mean of the within-subject values.

The mean extent of attachment loss, bone loss, and gingival bleeding follow age- and sex-related patterns similar to disease prevalence. For the entire group, the mean within-subject disease extent was 29% for attachment loss, 22% for bone loss, and 14% for gingival bleeding

Table 4. Distribution of subjects with disease by number of diseased sites

No. of diseased sites	Attachment loss			Bone loss			Gingival bleeding		
	No. of subjects	Percent	Cumulative percent	No. of subjects	Percent	Cumulative percent	No. of subjects	Percent	Cumulative percent
1	43	7.9	100.3*	79	14.3	100.1*	91	20.9	100.1*
2	54	9.9	92.4	75	13.6	85.8	70	16.1	79.2
3	57	10.4	82.5	69	12.5	72.2	61	14.0	63.1
4	36	6.6	72.1	55	10.0	59.7	50	11.5	49.1
5	41	7.5	65.5	42	7.6	49.7	34	7.8	37.6
6	35	6.4	58.0	46	8.4	42.1	25	5.7	29.8
7	31	5.7	51.6	28	5.1	33.7	19	4.4	24.1
8	39	7.1	45.9	26	4.7	28.6	25	5.7	19.7
9	22	4.0	38.8	27	4.9	23.9	13	3.0	14.0
10	19	3.5	34.8	26	4.7	19.0	9	2.1	11.0
11	16	2.9	31.3	19	3.5	14.3	9	2.1	8.9
12	19	3.5	28.4	19	3.5	10.8	11	2.5	6.8
13	30	5.5	24.9	10	1.8	7.3	9	2.1	4.3
14	17	3.1	19.4	6	1.1	5.5	5	1.2	2.2
15	18	3.3	16.3	10	1.8	4.4	1	0.2	1.0
16	18	3.3	13.0	–	–	2.6	–	–	0.8
17	12	2.2	9.7	5	0.9	2.6	1	0.2	0.8
18	10	1.8	7.5	5	0.9	1.7	1	0.2	0.6
19	10	1.8	5.7	2	0.4	0.8	1	0.2	0.4
20	6	1.1	3.9	–	–	0.4	–	–	0.2
21	9	1.6	2.8	–	–	0.4	1	0.2	0.2
22	3	0.6	1.2	1	0.2	0.4	–	–	–
23	2	0.4	0.6	1	0.2	0.2	–	–	–
24	1	0.2	0.2	–	–	–	–	–	–
Total subjects (with disease)	548			551			436		
Total subjects examined	618			618			618		

* Exceeds 100.0% due to rounding.

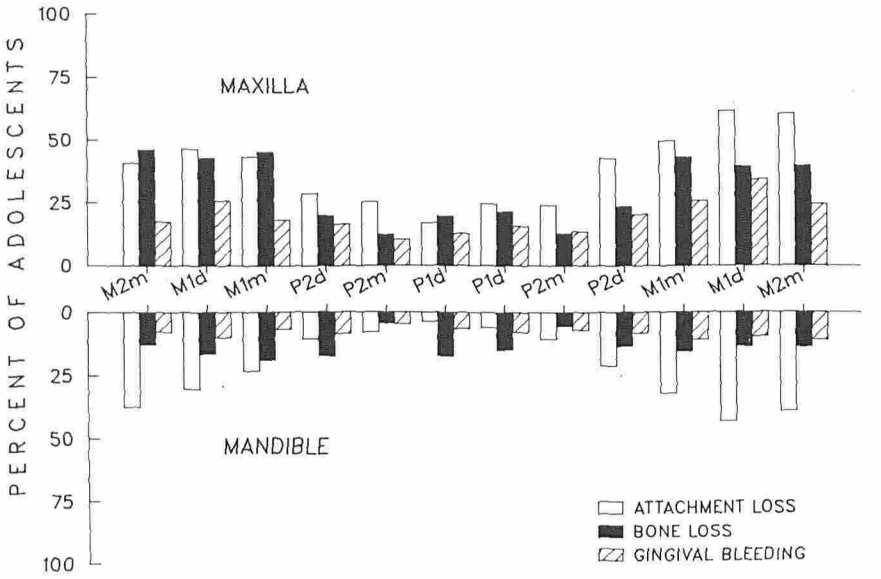

Fig. 1. Site-specific prevalence (percent) of attachment loss, bone loss, and gingival bleeding by arch.

Table 5A. Mean severity (millimeters) of attachment loss and bone loss by age and sex for all subjects

Age in yr	Attachment loss B	G	Both	Bone loss B	G	Both
14	2.12	2.05	2.07	0.21	0.29	0.27
15	2.04	2.00	2.02	0.29	0.30	0.29
16	2.00	1.97	1.99	0.33	0.32	0.32
17	1.85	1.91	1.88	0.35	0.34	0.34
18	2.03	1.85	1.96	0.39	0.34	0.37
19	2.05	2.01	2.04	0.56	0.30	0.47
Total	1.99	1.96	1.97	0.36	0.32	0.34

Table 5B. Mean severity (millimeters) of attachment loss and bone loss by age and sex for subjects with disease

Age in yr	Attachment loss B	G	Both	Bone loss B	G	Both
14	2.28	2.22	2.23	0.27	0.37	0.35
15	2.21	2.25	2.23	0.34	0.36	0.35
16	2.22	2.16	2.20	0.36	0.34	0.35
17	2.25	2.28	2.27	0.37	0.38	0.37
18	2.20	2.21	2.21	0.41	0.40	0.40
19	2.24	2.11	2.19	0.56	0.35	0.49
Total	2.23	2.22	2.22	0.39	0.37	0.38

(Table 3). The mean extent of disease increased with age only in the case of bone loss. In general, boys exhibited a slightly greater extent of each condition, but only for bone loss were the differences substantial.

Generalized attachment loss or bone loss was frequently observed. Almost half (45.9%) of the subjects with some attachment loss, and 28.6% of the subjects with some bone loss, had 8 or more affected sites (Table 4). Generalized within-subject gingival bleeding was less common; 19.7% of the subjects with some gingival bleeding had 8 or more sites affected.

The prevalence of attachment loss, bone loss, and gingival bleeding was greater at each site in the maxilla than the mandible (Fig. 1). A consistent difference between boys and girls was seen only in the case of bone loss; boys had a slightly higher site-specific prevalence than girls at almost every site (Fig. 2).

Severity of attachment loss and bone loss

The severity of attachment loss for each subject is the mean of the clinical attachment level measurements at diseased sites only. The severity of bone loss for each subject is the mean of the radiographic bone level measurements *in excess of* 2 mm at diseased sites only. Age- and sex-specific severity is the mean of the within-subject values.

The mean severity of attachment loss was 1.97 mm for the entire group of subjects, and 2.22 mm among subjects with some disease. The severity of attachment loss showed little association with age or sex. For bone loss, the mean severity was 0.34 mm (0.38 mm among subjects with disease). Bone loss increased consistently with age in boys, but showed little variation in girls. These data are shown in Tables 5A and 5B.

Marked attachment loss or bone loss was seen in several subjects. In the overall population, 16.3% (101 subjects) had one or more sites with at least 4.0 mm of attachment loss, and 4.7% (29 subjects) had one or more sites with at least 2.0 mm of bone loss (Table 6).

The mean severity of attachment loss was greater at all sites in the maxilla than in the mandible (Fig. 3). For bone loss, this difference was evident only in the molar areas, and disappeared when subjects without disease were excluded from the computation (Fig. 4).

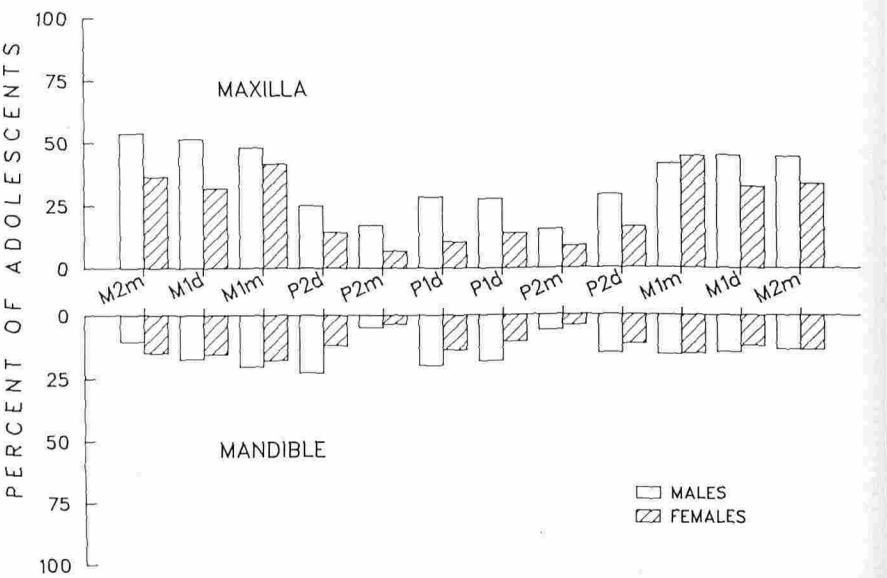

Fig. 2. Site-specific prevalence (percent) of bone loss by arch and sex.

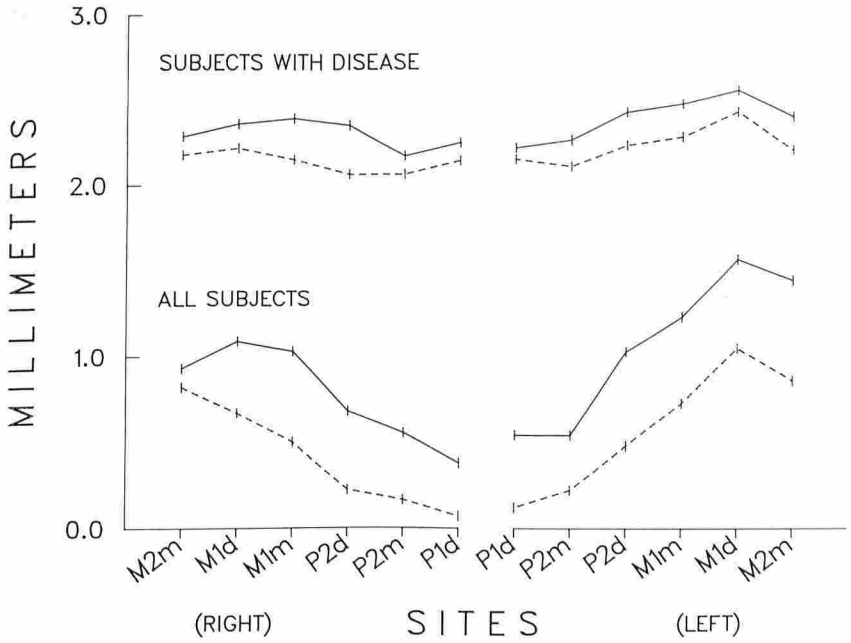

Fig. 3. Site-specific mean severity (millimeters) of attachment loss by arch for all subjects, and for those with disease at that site (— maxilla, --- mandible).

Morphology of interproximal bone

Of 7416 interproximal areas where both the mesial and distal site were readable, 2129 (28.7%) had bone loss at one or both sites. The six morphologic classifications that were used are illustrated in Fig. 5. Overall, horizontal bone loss (Type 1) was seen at 16.3% of the areas, and vertical bone loss (Type 2) at 26.5% of the areas (Table 7). Very few areas (5.5%) were of the cupped variety, either one or two-walled (Types 3 and 6 respectively). Two-walled horizontal or vertical lesions (Types 4 and 5) were seen at 51.6% of these areas.

Only one morphologic type had a consistent age-specific pattern; older subjects tended to have more interproximal areas with horizontal (Type 1) lesions than younger subjects. Generally, boys had a slightly higher percent of interproximal areas exhibiting each type of morphology than girls except in the case of two-walled vertical (Type 5) where, in each age group, females had a clearly higher percent of areas with this type of morphology.

Discussion

It is evident that signs of incipient and, in several subjects, established periodontitis were widespread in this adolescent population. However, epidemiologic descriptions of the prevalence, distribution, and severity of early periodontal disease are heavily influenced by the criteria used to define attachment loss and bone loss. The selection of diagnostic criteria beyond which clinical or radiographic measurements are considered indicative of pathology, is a continuing problem in epidemiologic studies of periodontal disease, especially if the intent is to detect disease in early stages. The term "disease", as used in this report, is an epidemiologic designation, defined by numerical thresholds. It does not assume the presence of active pathologic processes, nor does it imply any judgment about the need for treatment.

We have previously proposed (12) that the threshold for diagnosis of attachment loss be set at >1 mm, on the assumption that probing measurement errors are randomly distributed in the interval -1 to $+1$ mm. Support for this assumption lies in the fact that interexaminer estimates of attachment level have been shown to be highly reproducible within this range (12). In addition, it has been reported by several authors (13–15) that the standard deviation of intraexaminer replicate attachment level measurements is less than 1 mm, which was confirmed in this study. It should be noted that all probing measurements in this investigation were rounded to the nearest lower millimeter, which, in effect, established the diagnostic threshold at 2 mm or greater, an even more conservative criterion.

With respect to loss of alveolar bone, a CEJ-to-alveolar crest distance of 2 mm has been described as "normal" by STONER (16), and TEIWIK *et al.* (17). Therefore, in this study, a CEJ-to-crest

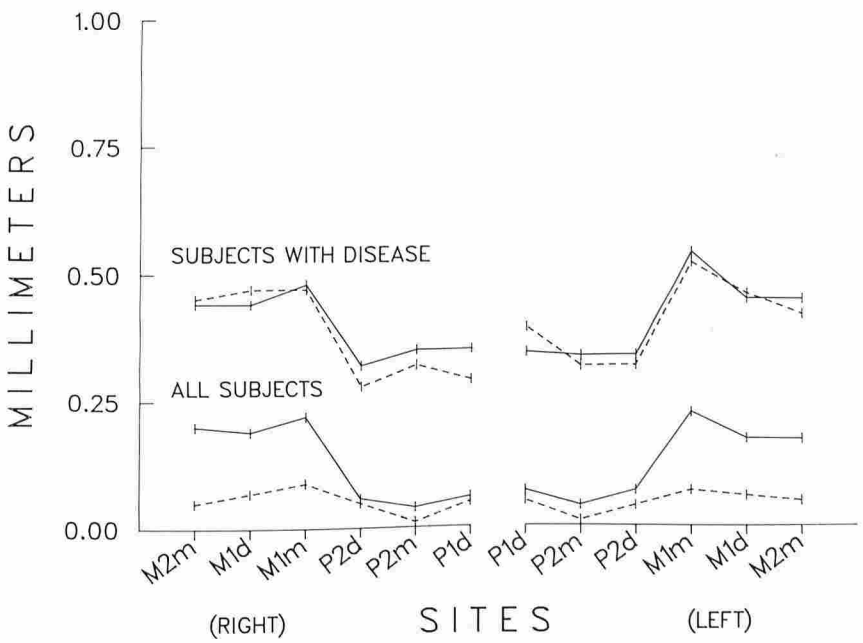

Fig. 4. Site-specific mean severity (millimeters) of bone loss by arch for all subjects, and for those with disease at that site (— maxilla, --- mandible).

measurement which exceeded 2 mm was considered diseased. Using this criterion, diagnoses for the presence of bone loss were also found to have a high level of intraexaminer reproducibility (kappa = 0.59).

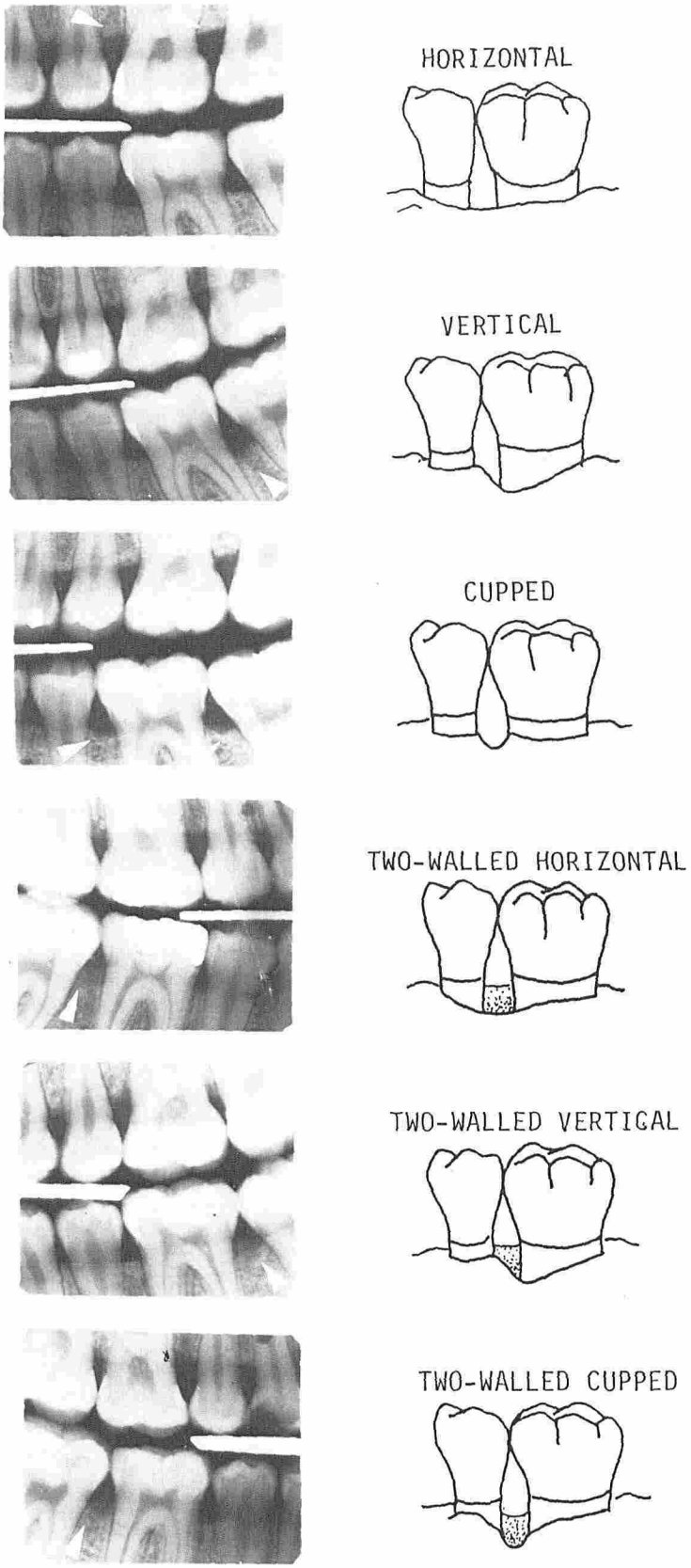

Fig. 5. Interproximal bone morphology from bitewing radiographs.

The lack of uniformity of criteria used in previous studies limits the comparisons which can be made among them or between those studies and this one. Of the several previously reported investigations of epidemiologic aspects of periodontal disease among these age groups, only two have used methods sufficiently similar to permit direct comparisons with the present findings. GJERMO *et al.* (18) found that 27.6% of 214 Brazilian children, ages 13–16, had radiographic evidence of alveolar bone level measurements exceeding 2 mm. Using the same methodology, HANSEN *et al.* (19) examined 2249 Norwegian 15-yr-olds, and reported the prevalence of bone loss was 11.3%. No subjects in either study had more than seven affected sites. In contrast, 89.2% of the Navajo adolescents in this study had some bone loss, 28.6% of those had eight or more affected sites, and 40 children had bone loss involving more than half (13 or more) of the examined sites (Table 4).

It also appears that loss of attachment among these subjects was more prevalent and, on the average, more severe than observed previously, although this conclusion is made tentatively because of some dissimilarities in the methods used. LENNON & DAVIES (20) used an equivalent threshold level to diagnose attachment loss, but examined only twelve sites; the mesial of all first molars, and the distal of all incisors. They found attachment loss in 7.4% of 15-yr-old English children and in 36% of subjects of the same age of West Indian or Indo-Pakistani origin. Others have reported the prevalence of attachment loss (attachment level *equal to* or greater than 1 mm) in 47.3% of 12–16-yr-olds in Pennsylvania (8), and in 11% of 14–16-yr-olds in Denmark (21). These prevalence estimates are sufficiently lower than observed in the present study to suggest that, slight differences in methods notwithstanding, real inter-population differences may exist with respect to both attachment loss and loss of interproximal alveolar bone in young subjects. However, until a greater uniformity of diagnostic methods is achieved in epidemiologic studies, these differences must remain unexplained.

In contrast, the prevalence of gingivitis (gingival bleeding) in this population was

Table 6. Number, cumulative frequency, and cumulative percent of subjects by severity (millimeters) of attachment loss and bone loss

Attachment loss				Bone loss			
Severity	No. of subjects with disease	Cumulative frequency	Cumulative percent of all subjects ($n=618$)	Severity	No. of subjects with disease	Cumulative frequency	Cumulative percent of all subjects ($n=618$)
2 mm	243	548	88.7	0.1–0.4 mm*	216	551	89.2
3 mm	204	305	49.4	0.5–0.9 mm	165	335	54.2
4 mm	82	101	16.3	1.0–1.4 mm	107	170	27.5
5 mm	16	19	3.1	1.5–1.9 mm	34	63	10.2
6 mm	2	3	0.2	2.0–2.4 mm	13	29	4.7
7 mm	1	1	0.2	2.5–2.9 mm	6	16	2.6
				3.0–3.4 mm	3	10	1.6
				3.5–3.9 mm	7	7	1.1
Total	548				551		

* Amount of loss beyond the 2 mm threshold level (see Methods).

remarkably similar to that reported by others in spite of the wide variation in the methods used to assess the condition (6, 8, 21, 22).

It should be pointed out, however, that prevalence estimates as usually calculated provide only a crude basis for comparisons of periodontal disease in different populations as this statistic reflects, with equal weight, individuals with a single affected site and those exhibiting generalized, severe lesions. It seems preferable that epidemiologic reports include information on the average extent of disease within the mouth and on the average severity of the lesions observed. This has only occasionally been done in past studies.

Only a few investigators have reported the relative prevalence of various types of interproximal bone morphology in adolescents (6, 18–19). In most cases, the criteria for categorization differed from those used in this study, and fewer classifications (usually horizontal and vertical only) were defined. The relatively high prevalence of two-walled vertical lesions in females has not been reported before. Further studies are necessary to determined if this and other morphologic types of early bone loss have any predictive significance.

Whether the relatively extensive signs of incipient periodontitis found among these Navajo adolescents are associated with specific etiologic factors, and whether these conditions are prognostic of more serious, progressive periodontal disease are questions requiring intensive longitudinal study of this and other adolescent groups. Answers to both questions would facilitate the development of efficient strategies for programs to prevent more advanced forms of periodontal disease.

Table 7. Age- and sex-specific percent of interproximal areas with bone loss by morphologic classification

Morphologic classification of bone loss		Age in yr						
		14	15	16	17	18	19	Total
1 (Horizontal)	M	10.0	18.9	17.8	19.8	20.5	20.3	19.2
	F	9.4	11.9	10.4	9.4	16.0	24.1	12.2
	Both	9.6	15.6	14.9	14.9	19.0	21.3	16.3
2 (Vertical)	M	37.5	26.9	29.2	25.8	26.8	26.9	28.0
	F	25.0	18.7	22.5	27.7	29.3	24.1	24.5
	Both	28.7	23.0	26.5	28.1	27.7	26.3	26.5
3 (Cupped)	M	–	0.5	0.4	1.1	1.3	2.2	1.1
	F	1.0	2.1	–	0.9	1.3	–	1.0
	Both	0.7	1.2	0.2	1.1	1.3	1.7	1.0
4 (Two walled horizontal)	M	22.5	23.6	26.9	19.7	28.5	26.9	25.6
	F	28.1	28.5	24.3	19.6	16.0	20.7	22.8
	Both	26.5	25.9	25.9	20.7	24.3	25.4	24.4
5 (Two walled vertical)	M	20.0	25.9	21.2	22.7	17.1	19.8	21.5
	F	32.3	28.5	39.9	36.2	32.7	29.3	35.1
	Both	28.7	30.1	28.6	30.5	22.3	22.1	27.2
6 (Two walled cupped)	M	10.0	4.2	4.5	3.0	5.7	3.8	4.6
	F	4.2	4.7	2.9	6.3	4.7	1.7	4.4
	Both	5.9	4.2	3.9	4.8	5.4	3.3	4.5

Acknowledgments – We are grateful to Dr John Nasi and Dr Guillermo Porro for their help in arranging this study, and to Charlotte Begaye, Mary Lynne Brunner, Blanche Choyou, Casey Keams, Sadie Livingston, and Ada Naranjo, who provided on-site assistance.

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