# CURRENT TOPICS in review

# Periodontal epidemiological indices for children and adolescents: I. gingival and periodontal health assessments

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## Abstract

*Gingivitis and periodontitis are usually reversible conditions in children and should be detected early and treatment rendered promptly. Hence appropriate clinical indices must be available to record these conditions accurately and to assess treatment success or failure. This paper reviews the existing gingival and periodontal indices and discusses their potential for clinical use in children.*

## Introduction

Gingivitis and periodontitis are generally thought of as diseases of adulthood. Pedodontists and general practitioners have traditionally paid little attention to the gingival and periodontal health status of children.[1] Due to the widespread use of water fluoridation, topical fluoride, fluoride dentifrices and other preventive measures, the prevalence of dental caries has shown a dramatic drop in countries that traditionally had very high caries levels — Switzerland, Australia and New Zealand[2] for example. In the United States, where the dental caries rate has been moderate, there are indications that the caries rate in 1980 is considerably lower than two decades ago.[3,4] However, the incidence of gingivitis in children has shown a significant increase. Similarly, gingival health in adults in Switzerland and other countries has shown little if any improvement despite efforts of the public health and dental professions.[5]

Although plaque indices such as the simplified[6,7] oral hygiene index have been used for some time, a definitive recording of the gingival and periodontal health in children has not usually been carried out in pedodontic clinics or in private dental practices. Most clinical indices have been developed in order to assess the gingival and periodontal health in experimental or epidemiological studies. Recordings of gingival and periodontal health in clinical practice may require a

high degree of intraexaminer reproducibility and should be simple, accurate and meaningful tools in assessing the status of oral health or disease.[8,9]

The purposes of this paper are to review the existing gingival and periodontal indices, assessing their potential as indices for use in children, and to focus greater attention on the gingival and periodontal health of children and adolescents. The international designations for tooth numbers have been used in the paper in compliance with W.H.O. recommendations.

## Classification and Characteristics

Indices may be classified into four categories; 1) gingival indices, 2) periodontal indices, 3) oral hygiene indices, and 4) miscellaneous indices such as retention index, alveolar bone loss and mobility index.

According to Russell,[9] an index is a numerical value describing the relative status of the population on a scale with a definitive upper and lower level. By using indices which have been carefully defined, comparisons can be made between different population groups of the severity of a disease since the same criteria and methodologies have been adopted. An adequate index is both reliable and has validity. Unfortunately many disease entities are not easily quantifiable by objective means. Consequently the results of clinical trials are not only affected by the shortcomings of the indices themselves, but are also subject to examiner variations such as training, and clinical experience. Furthermore, the analysis of data is complicated by the fact that most index systems follow an ordinal scale and are non-parametric in nature.

### Gingivitis
*PMA Index (Schour and Massler[10-13])*
One of the first quantitative gingival indices is the

P-M-A Index developed by Schour and Massler in 1944-1947, probably derived from the index suggested by King.[14] The degree of gingivitis for each of the papillary (P), marginal (M) and attached (A) gingival units was defined as in Table 1.

**Table 1. PMA Index of Schour and Massler.[10-13]**

| P | 0 = Normal; no inflammation. |
|---|---|
| | 1 + = Mild papillary engorgement; slight increase in size. |
| | 2 + = Obvious increase in size of gingival papilla; hemorrhage on pressure. |
| | 3 + = Excessive increase in size with spontaneous hemorrhage. |
| | 4 + = Necrotic papilla. |
| | 5 + = Atrophy and loss of papilla (through inflammation). |
| M | 0 = Normal; no inflammation visible. |
| | 1 + = Engorgement; slight increase in size; no bleeding. |
| | 2 + = Obvious engorgement; bleeding upon pressure. |
| | 3 + = Swollen collar; spontaneous hemorrhage; beginning infiltration into attached gingivae. |
| | 4 + = Necrotic gingivitis. |
| | 5 + = Recession of the free marginal gingiva below the CEJ due to inflammatory changes. |
| A | 0 = Normal; pale rose; stippled. |
| | 1 + = Slight engorgement with loss of stippling; change in color may or may not be present. |
| | 2 + = Obvious engorgement of attached gingivae with marked increase in redness. Pocket formation present. |
| | 3 + = Advanced periodontitis. Deep pockets evident. |

The index was designed primarily for the examination of gingivitis in children. It was developed with the purpose of quantifying the number of gingival units affected in the mandibular and maxillary incisor areas.

*Modifications of the PMA Index.* Several modifications of the PMA Index have been suggested. For example, Parfitt[15] added the buccal and lingual gingivae and divided the degree of inflammation into five arbitrary levels. The severity of inflammation in each gingival area for both buccal and lingual aspects were evaluated separately.

Further modifications of the P-M-A Index have been described by Mühlemann and Mazor,[16] Arno, et al.,[17] Heylings,[18] Jackson,[19] and others.[20]

*Modified PMA-I (Mühlemann and Mazor[16]).* Mühlemann and Mazor, in a study on the prevalence of gingivitis in a population of Zurich school children measured gingivitis by concentrating on the P and M units and discarding the A units. In addition, the severity of gingivitis was evaluated (Table 2).

**Table 2. Modified PMA-I of Mühlemann and Mazor.[16]**

| | |
|---|---|
| I: | Bleeding from the gingival sulcus on gentle probing, the P-M showing no change of color and no swelling. The papillary and marginal gingivae have a "normal appearance." |
| II. | Bleeding from the gingival sulcus on probing plus change of color due to inflammatory disturbances of P-M Units. No swelling or miscroscopic edema. |
| III. | Bleeding plus change of color plus edematous swelling of P-M Units. For example: P(I) means healthy papilla. PM(II): papilla and marginal gingivae, bleeding and hyperemic. A(II) Attached gingivae with inflammatory color change. |

Degree I was the criterion of beginning gingivitis and an individual showing a single P(I) or M(I) unit was classified as having localized gingivitis.

*Sulcus Bleeding Index (SBI, Mühlemann and Son[21]).* More than a decade later, Mühlemann and Son modified the index and suggested the use of a "sulcus bleeding index" (SBI) because they believe that bleeding from the sulcus is the earliest clinical symptom of gingivitis and that it even precedes discoloration and swelling. The major characteristics of the SBI were:

1. For all severity scores, diagnosis of inflammation is made only if bleeding occurs upon gentle probing of the sulcus.
2. Apparently healthy gingival units without color changes or swelling are diagnosed as inflammed — score 1 if bleeding occurs upon gentle probing.
3. The SBI uses 8 maxillary and mandibular anterior teeth, and 4 gingival units are scored for each tooth: M labial, M lingual, P mesial, P distal.

*Papillary Bleeding Index (PBI, Mühlemann[22]).* The SBI was further modified in 1977 when Mühlemann[22] suggested the use of a papillary bleeding index (PBI) as an effective index to motivate patients for improving their gingival health (Table 3).

The rationale of this index is that marginal periodontitis and alveolar bone loss begin interproximally and the effectiveness of preventive procedures are more easily related to the presence or absence of interdental plaque. The results are translated into numerical scores which are easily comprehensible by the patient.

*Gingivitis Index (Suomi and Barbano[23]).* Another modification of the P-M-A Index was described by

**Table 3.** Papillary Bleeding Index of Mühlemann.[22]

| Score | Bleeding on gentle probing |
|-------|---------------------------|
| 0 | No bleeding. |
| 1 | Only one bleeding point appearing. |
| 2 | Several isolated bleeding points or a small blood area appearing. |
| 3 | Interdental triangle filled with blood soon after probing. |
| 4 | Profuse bleeding when probing, blood spreads towards the marginal gingiva. |

Suomi, Suomi and Barbano.[23,24] Initially the facial and lingual surfaces of all teeth were measured but were subsequently modified to include only tooth numbers 16, 21, 24, 26, 36, 31, 44, and 46. A scale of 0-2 was used (Table 4).

**Table 4.** Gingivitis index of Suomi and Barbano.[23]

0 = Absence of inflammation — gingiva is pale pink in color and firm in texture. Swelling is not evident and stippling can usually be noted.

1 = Presence of inflammation — a distinct color change to red or magenta is evident. There may be swelling and loss of stippling. The gingiva may be spongy in texture.

2 = Presence of severe inflammation — a distinct color change to red or magenta is evident. There is swelling, loss of stippling and a spongy consistency. There is either gingival bleeding upon gentle probing with the side of an explorer or the inflammation has spread to the attached gingiva.

*Gingival Index (G.I., Löe-Silness[25])*

One of the most commonly used indices for assessing the status of gingival health or inflammation is the Gingival Index (G.I.) by Löe and Silness (Table 5).

While all the indices published prior to 1963 were based on the single tooth as a unit, the GI was the first index to evaluate every single tooth surface.

Each of the buccal, mesial, lingual and distal surfaces of the gingival tissues is given a score of 0-3. This then constitutes the GI for the area, and scores from the 4 areas of the tooth are added and divided by four to give the GI for the tooth. Scores for individual teeth may be grouped to designate the GI for the group of teeth such as incisors, premolars and molars. The scores may be added and divided by the number of teeth examined to derive the GI for the individual. Usually all tooth surfaces are included or designated and single tooth surfaces may be selected. The major

difference between the SBI (Mühlemann and Son[21]) or the PBI (Mühlemann[22]) is that there is a score (1) for initial color and texture change in the tissues without the development of bleeding on gentle probing. The GI has gained wide acceptance as a simple, accurate and reproducible method for evaluating gingival health or disease in epidemiological and clinical research.

*Gingival Periodontal Index (GPI, O'Leary[26,27])*

The GPI was developed to screen the need for periodontal treatment. Probing is restricted to the mesial-facial line angle of each tooth. The mouth is divided into six segments, and the highest score found for any one of the teeth in a segment is recorded as the score for that segment (Table 6).

**Table 5.** The Gingival Index of Löe and Silness.[25]

0 = Normal gingiva.

1 = Mild inflammation — slight change in color, slight edema. No bleeding on probing.

2 = Moderate inflammation — redness, edema and glazing. Bleeding on probing.

3 = Severe inflammation — marked redness and edema. Ulceration. Tendency to spontaneous bleeding.

**Table 6.** Gingival Periodontal Index (GPI, O'Leary).

0 = Tissue tightly adapted to the teeth, firm consistency with physiologic architecture.

1 = Slight to moderate inflammation as indicated by changes in color and consistency, involving one or more teeth in the same segment but not completely surrounding any one tooth.

2 = The above changes singularly or combined completely encircle one or more teeth in a segment.

3 = Marked inflammation as indicated by loss of surface continuity (ulceration), spontaneous hemorrhage, loss of facio-lingual continuity or any interdental papilla, marked deviation from normal contour, such as gross thickening or enlargement covering more than one third of the anatomic crown, recession, and clefts.

Scores of 4, 5, and 6 are given to periodontal disease segments.

4 = When the probe extends up to 3 mm apical to the CEJ of any tooth in the segment.

5 = When the probe extends from 3 to 6 mm apical to the CEJ of any tooth in the segment.

6 = When the probe extends 6 mm or more apical to the CEJ of any tooth in the segment.

The highest score found for each dentulous segment is recorded and the sum divided by the number of segments to give the GPI score for the individual.

*Gingival Bleeding Index (G.B.I., Ainamo and Bay[28])*

Because of the subjective nature of many of the earlier indices, and observations that bleeding is a simple reliable indicator of gingival inflammation, Ainamo and Bay[28] simply used the presence or absence of bleeding on gentle probing as the only criterion for their index.

A blunt periodontal probe is passed along the gingival crevice and if bleeding occurs within 10 to 15 seconds, a positive score is given. The number of positive units is divided by the number of gingival margins examined and the result is multiplied by 100 to express the index as a percentage. This index has been adopted in several epidemiological and clinical studies in Scandinavia with a relatively high degree of reliability.

*Gingival Exudate (Löe and Holm-Pedersen[29])*

The flow of fluid from the gingival crevice has been

**Table 7.** Indices developed by various investigators to measure gingival inflammation.

| Name of Index | Tissues Noted | Author/Year | Location or Criteria | References |
|---|---|---|---|---|
| PM | papilla/marginal | King, 1945 | Incisor and canine regions | 14 |
| PMA | papilla/marginal/ alveolar mucosa | Schour & Massler, 1947, 1948, 1950 | Labial gingiva of anterior teeth | 10, 11, 12, 13 |
| PI | gingival part of PI | Russel, 1956, 1967 | all teeth | 32, 33 |
| PMA (modified) | buccal and lingual P, M & A | Parfitt, 1957 | buccal, maxillary incisors only | 15 |
| MOD PMA-I | papilla, marginal gingiva mainly | Mühlemann & Mazor, 1958 | anterior teeth, labial gingiva, PM-index? | 16 |
| | gingival margin surfaces | Arno, Waerhaug, Lovdal, Schei, 1958 | all teeth or selected | 17 |
| PDI | gingival margin tooth is unit | Ramfjord, 1959, 1967 | selected teeth | 34, 35 |
| PMA | papilla/marginal alveolar mucosa | Heylings, 1961 | anterior teeth labial gingiva | 18 |
| PM | papilla/marginal | Jackson, 1962, 1965 | anterior teeth labial gingiva | 19, 20 |
| GI | gingival margin surface is unit | Löe & Silness, 1963 | all tooth surfaces or selected surfaces | 25 |
| PMA (simplified) | papilla, marginal and alveolar mucosa | Lobene, 1964 | all teeth, buccal and lingual surfaces included | 21 |
| Gingival Exudate | pocket exudate on strips in mm | Löe & Holm-Pederson, 1965 Oliver, Holm-Pedersen, Löe, 1969 | all teeth or selected teeth | 29, 30 |
| GPI | marginal gingivae of mesial facial line angle of each tooth | O'Leary, 1963, 1967 | mouth divided into six segments, all teeth are measured | 26, 27 |
| GI (gingivitis index) | facial and lingual marginal, papilla & attached gingivae | Suomi & Barbano, 1968, Suomi, 1969 | all 124 marginal and papillary units of 32 teeth | 23, 24 |
| SBI | sulcus bleeding 4 surfaces/tooth | Mühlemann & Son, 1971 | 8 maxillary and mandibular anterior teeth | 21 |
| GBI | marginal gingival crevice | Ainamo & Bay, 1975 | all teeth or selected teeth | 28 |
| PBI | interdental papilla only | Mühlemann, 1977 | interdental papillae bleeding only. | 22 |

used as an indication of gingival inflammation. Using filter paper strips placed over the labial surfaces or at the orifice of the sulcus of the maxillary teeth, gingival exudates have been sampled intra- and extracrevicularly. The strips are collected after a defined time period (usually three minutes) and stained. Löe and Holm-Pedersen[29] demonstrated that healthy gingivae did not exhibit any crevicular flow while Oliver, et al.[30] showed that the gingival index score (GI) of Löe and Silness[31] was strongly correlated with the amount of gingival exudate flow rate. Furthermore, with increasing GI scores, there is a corresponding increase in the density and the area of inflammatory cells in histologic specimens.

This type of evaluation of the buccal gingiva is time consuming but rather objective. Hence it is most often used in small selected sample numbers for research purposes, particularly if gingival biopsy specimens are included.

Table 7 lists the various indices cited previously with others less commonly used.

### Periodontal Indices

*Periodontal Index (PI, Russell[32,33])*

The periodontal index (PI) of Russell was developed for epidemiological purposes and assumes a progression of gingivitis to pocket formation leading to advanced destruction with loss of masticatory functions with age. The scoring and criteria for the periodontal index of Russell are presented in Table 8.

**Table 8.** Periodontal Index (PI, Russell[32]).

| Score | Criteria |
| --- | --- |
| 0 | Negative. There is neither overt inflammation in the investing tissues nor loss of function due to destruction of supporting tissue. |
| 1 | Mild gingivitis. There is an overt area of inflammation in the free gingivae which does not circumscribe the tooth. |
| 2 | Gingivitis. Inflammation completely circumscribes the tooth, but there is no apparent break in the epithelial attachment. |
| 6 | Gingivitis with pocket formation. The epithelial attachment has been broken and there is a pocket (not merely a deepened gingival crevice due to swelling in the free gingivae). There is no interference with normal masticatory function, the tooth is firm in its socket, and has not drifted. |
| 8 | Advanced destruction with loss of masticatory function. The tooth may be loose; may have drifted; may sound dull on percussion with a metallic instrument; may be depressible in its socket. |

The scoring intervals of 0, 1, 6, and 8 have been proposed in order to fit a linear correlation between periodontal disease and aging. Scoring for each tooth is carried out and the scores are totaled and divided by the number of teeth present to obtain the average GI for each patient. According to Russell a mean PI score ranging from 0 to 0.2 may be obtained for clinically normal gingival tissue. Persons with simple gingivitis usually register with 0.3 to 0.9. Subjects with significant gingivitis ranging upwards towards incipient destructive disease usually score in the range of 0.7 to 1.9. Those persons with established destructive periodontal disease should score approximately 1.6 to 3.0, whereas those in the terminal stages of periodontal disease would register a score of 3.8 to 8.0.

The Russell's PI has been used extensively in epidemiological studies for large populations and for all age groups. This simple index uses the tooth as the unit of measure. No special equipment is needed and it can be applied rather quickly since pocket depths do not have to be assessed accurately.

*Periodontal Disease Index (PDI, Ramfjord[34,35])*

The periodontal disease index (PDI) of Ramfjord has, like the PI, a gingival and periodontal component. Only six selected teeth, namely numbers 16, 21, 24, 36, 41, and 44 are used. For the gingival status of health or disease, the assigned value represents essentially a combination of the P-M-A (without the part of the attached gingiva) and the PI index. Again the tooth represents the unit evaluated (Table 9).

**Table 9.** Periodontal Disease Index (PDI, Ramfjord[34]).

0 = Absence of signs of inflammation.

1 = Mild to moderate inflammatory changes not extending around the tooth.

2 = Mild to moderately severe gingivitis extending all around the tooth.

3 = Severe gingivitis characterized by marked redness, swelling, tendency to bleed and ulceration.

Most of the criteria are based on subjective evaluations. The gingival tissues are first gently dried and changes in color are measured by comparing the color corresponding to the buccal, lingual and interproximal surfaces of adjacent teeth. Emphasis is placed on the uniformity or lack of uniformity of color rather than to the different shades of color hues. Color changes are usually towards redness, however severe inflammatory changes may lead to a blueish or purplish hue. Contour changes in the papilla such as blunting or rounding of the margin of the gingivae and thickening of the papilla are also recorded. The score of 3 is usually used only when there is ulceration with bleeding upon

gentle touching with the side of a periodontal probe or the redness or change in gingival contour is very severe.

For the periodontal component of the PDI the loss of periodontal attachment is classified into three categories. In order to assign a tooth into the correct category, the distance from the free gingival margin to the CEJ and the distance from the free gingival margin to the bottom of the gingival crevice or pocket have to be recorded for the mesial, buccal, distal, and lingual aspects of each tooth examined. The interproximal recording has to be secured at the buccal aspect of the interproximal contact areas with the probe pointing in the direction of the long axis of the tooth

A. If the gingival margin is on enamel:
 1. Measure from gum margin to CEJ and record the measurement on the crown of the schematic tooth. If the epithelial attachment is on the crown and the CEJ cannot be felt by the probe, record the depth of the gingival crevice on the crown.
 2. Measure from the gingival margin to the bottom of the pocket when the crevice extends apically to the CEJ — the measurement should be recorded on the root of the schematic tooth. (The distance from the CEJ to the bottom of the pocket can then be found by subtracting measurement number 1 from measurement number 2.)

B. If the gingival margin is on cementum:
 1. Measure from the CEJ to the gingival margin. Record as minus value on the root of the schematic tooth.
 2. Measure from the CEJ to the bottom of the gingival crevice. Record value on the root.

The first part of this index is reversible and scores of 1, 2, and 3 represents a measurement of gingivitis with little or no periodontal involvement. On the other hand, scores of 4-6 are used to measure loss of periodontal attachment and are essentially irreversible. A score of 4 is assigned if the loss of attachment is 3 mm or less, a score of 5 is assigned if the loss of attachment is greater than 3 mm but less than 6 mm. If the loss of attachment is 6 mm or more, a score of 6 is given to a particular tooth.

*Periodontal Disease Rate (PDR, Sandler and Stahl[*])*

The periodontal disease rate is a relatively simple index where the number of diseased teeth are counted and then divided by the total number of teeth present in the mouth. It is expressed as a percentage. The authors claim that the simple index gives a very high correlation with Russell's PI. It is expressed by the formula:

$$PDR = \frac{a}{a + b}$$

Where a is the number of teeth af-

fected by periodontal disease, and b is equal to the number of unaffected teeth.

The following criteria are used to indicate whether the tooth is affected by periodontal disease or not:
 1. Gingival necrosis, hypertrophy, or inflammation encircling the teeth or a purulent exudate from the gingival crevice.
 2. A gingival crevice depth of 3 mm or more.
 3. Tooth mobility greater than 1 mm in any direction.
 4. Radiographic evidence of resorption of alevolar bone extending more than 3 mm apically from the CEJ.

*Pocket Depth and Loss of Attachment (Glavind and Löe[*])*

Both Russell's PI and Ramfjord's PDI have qualitative and quantitative criteria and a gingival and a periodontal component. The pocket depth and loss of attachment in relation to the CEJ as a fixed point of reference are expressed in millimeters. The criteria of pocket depth and loss of attachment measurements are defined as follows.

***Pocket depth*** refers to the distance from the gingival margin to the bottom of the clinical pocket. Mesial and distal pockets are measured from the buccal aspect and as close as possible to the contact points. Facial and oral pockets were measured at the midline of the roots. Buccal and lingual pockets of multirooted teeth were measured at the mesial roots in order to avoid the furcation areas. Efforts were made to insert the probe parallel to the axes of the roots. A force of approximately 10 grams was used during the introduction of the probe to the bottom of the pocket.

***Loss of attachment*** refers to the distance from the CEJ to the bottom of the clinical pocket. The loss of attachment was assessed on the same surfaces of the same teeth and with the same probe as used for pocket depth assessments.

Following the recognition of the CEJ, the distance from the gingival margin to the CEJ was measured. When the CEJ was located apical to the gingival margin, the loss of attachment would be the difference between the previously recorded depth of the pocket (A) and the distance (B) from the gingival margin to the CEJ: A - B = loss of attachment.

In cases where the marginal gingiva had been subject to recession and the CEJ was exposed, the loss of attachment equaled the sum of the pocket depth and the distance from the gingival margin to the CEJ: A + B = loss of attachment.

The measurements were carried out with a 0.8 mm thick pocket probe which was marked at each mm from 1 to 12. Pocket depth or loss of attachment of 1 mm or less was recorded as 1 mm, measurements exceeding 1 mm, but less than 2mm, were recorded as 2 mm, etc.

*Navy Periodontal Disease Index (NPDI[*])*

As for the Ramfjord PDI, this index consists of two components, a gingival score and a pocket score of six selected teeth, namely tooth numbers 16, 21, 24, 36, 41,

and 44 (Table 10).

The periodontal disease index is based on the sum of the gingival score and the pocket to derive the tooth score.

Table 11 is summary of the periodontal indices described above.

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## References

1. Wei, S. H. Y. Opening Remarks — in International Symposium on the Prevention of Periodontal Disease in Children and Adolescent, Ed. S. H. Y. Wei, Pediatr Dent, 3:79 (Special Supplement), 1981.
2. Infirri, J. S. and Barmes, D. E. Epidemiology of oral diseases — differences in national problems, Int Dent J, 29:183-189, 1979.
3. Glass, R. Increases in caries prevalence, Fourth annual Conference on Foods, Nutrition and Dental Health. (FNDH), October 1-3, 1980. Proceedings, In Press.
4. Hughes, J. T., Rozier, R. G. and Bawden, J. W. A survey of periodontal disease in a state population — an emphasis on children. In Special Supplement to Pediatr Dent, Ed. S. H. Y. Wei, Vol. 3, 1981. In Press.
5. Curilovic, Z. Gingivitis bei zürcher vorschulkinder. "Acta Parodontiologica" in Schweit Mschr Zahnheilk, 85:1105-1111, 1975.
6. Greene, J. C. and Vermillion, J. R. Oral Hygiene Index: A method for classifying oral hygiene status, JADA, 61:172-179, 1960.
7. Greene, J. C. and Vermillion, J. R. The simplified oral hygiene index. JADA, 68:7-13, 1964.

**Table 10.** Criteria for the Navy Periodontal Disease Index.[38]

*Gingival Score*

0   Gingival tissue is normal in color and tightly adapted to the tooth — tissue is firm and no exudate is present.

1   Inflammatory changes are present, but do not completely encircle the tooth. Changes may include one or a combination of the following:
   Any change from normal gingival color,
   Loss of normal density and consistency,
   Slight enlargement or blunting of the papilla or gingiva,
   Tendency to bleed upon palpation or probing.

2   Inflammatory changes listed above completely encircle the tooth.

*Pocket Score*   With calibrated periodontal probe take six measurements of each designated tooth — mesial, middle, and distal areas of the facial and lingual surfaces. The greatest single measurement determines the pocket score for the tooth.

0   Probing reveals sulcular depth not over 3 mm.

5   Probing reveals pocket depth greater than 3 mm, but not over 5 mm.

8   Probing reveals pocket depth greater than 5 mm.

**Table 11.** Commonly used periodontal indices.

| Name of Index | Tooth Surfaces | Author and Year | Comment | References |
|---|---|---|---|---|
| PI | all teeth tooth is unit when in doubt, lower score | Russell, 1956 | revisible/irreversible | 32, 33 |
| PDI | selected teeth tooth is unit | Ramfjord, 1959 | first part reversible second part irreversible | 34, 35 |
| PDR | periodontal disease rate percentage of teeth affected with periodontal disease | Sandler & Stahl, 1959 | reversible/irreversible | 36 |
| Pocket depth & Loss of surface attachment in mm | all teeth or selected teeth is unit | Glavind & Löe, 1967 | irreversible | 37 |
| NPDI | six selected teeth | Glossman, 1974 | pocket score, irreversible, gingival portion of score reversible | 38 |

8. Davies, G. N., Kruger, B. J., and Homan, B. T. An epidemiological training course, Aust Dent J, 7:17-28, 1967.

9. Russell, A. L. Epidemiology and the rational bases of dental public health and dental practice, in The Dentist, His Practice, and His Community, Young and Striffler, Philadelphia, London, Toronto: W. B. Saunders Company, 1969, pp 35-62.

10. Schour, I. and Massler, M. Gingival disease in postwar Italy (1945). I. Prevalence of gingivitis in various age groups, JADA, 35:475-482, 1947.

11. Schour, I. and Massler, M. Prevalence of gingivitis in young adults, J Dent Res, 27:733-734, 1948.

12. Massler, M., Schour, I. and Chopra, B. Occurrence of gingivitis in suburban Chicago school children, J Periodontol, 21:146-164, 1950.

13. Massler, M. The P-M-A Index for the assessment of gingivitis, Part II, J Periodontol, 38:592-598, 1967.

14. King, J. D. Gingival disease in Dundee, Dent Record, 65:9, 32, 55, 1945.

15. Parfitt, G. J. A five-year longitudinal study of the gingival condition of a group of children in England, J Periodontol 28:26-32, 1957.

16. Mühlemann, H. R. and Mazor, Z. S. Gingivitis in Zurich school children, Helv Odont Acta, 2:3-12, 1958.

17. Arno, A., Waerhaug, J., Lovdal, A., and Schei, O. Incidence of gingivitis as related to sex, occupation, tobacco consumption, toothbrushing and age, Oral Surg, 11:587-595, 1958.

18. Heylings, R. T. A study of the prevalence and severity of gingivitis in undergraduates at Leeds University (1960), Dent Pract, 12:129-132, 1961.

19. Jackson, D. The efficacy of 2 percent sodium ricinoleate in toothpaste to reduce gingival inflammation, Brit Dent J, 112: 487-493, 1962.

20. Jackson, D. The measurement of gingivitis, Brit Dent J, 118: 521-527, 1965.

21. Mühlemann, H. R. and Son. Gingival sulcus bleeding — a leading symptom in initial gingivitis, Helv Odont Acta, 15:107-113, 1971.

22. Mühlemann, H. R. Psychological and chemical mediators of gingival health, J Prev Dent, 4:6-17, 1977.

23. Suomi, J. D. and Barbano, J. P. Patterns of gingivitis, J Periodontol, 39:71-74, 1968.

24. Suomi, J. D. Periodontal disease and oral hygiene in an institutionalized population: report of an epidemiological study, J Periodontol, 40:5-10, 1969.

25. Löe, H. and Silness, J. Periodontal disease in pregnancy. I. Prevalence and severity, Acta Odont Scand, 21:533-551, 1963.

26. O'Leary, T. J., Gibson, W. A., Shannon, I. L., Schuessler, C. F., and Nabers, C. L. A screening examination for detection of gingival and periodontal breakdown and local irritants, Periodontics, 1:167-174, 1963.

27. O'Leary, T. The periodontal screening examination, J Periodontol, 38:617-624, 1967.

28. Ainamo, J. and Bay I. Problems and proposals for recording gingivitis and plaque, Int Dent J, 25:229-235, 1975.

29. Löe, H. and Holm-Pederson, P. Absence and presence of fluid from normal and inflammed gingivae, Periodontics, 3:171-177, 1965.

30. Oliver, R. C., Holm-Pederson, P., and Löe, H. The correlation between clinical scoring, exudate measurements and microscopic evaluation of inflammation in the gingivae, J Periodontol, 40: 201-209, 1969.

31. Lobene, R. R. The effect of an automatic toothbrush on gingival health, J Periodontol, 35:137-139, 1964.

32. Russell, A. L. A system of classification and scoring for prevalence surveys of periodontal disease, J Dent Res, 35:350-359, 1956.

33. Russell, A. L. The Periodontal Index, J Periodontol, 38:586-591, 1967.

34. Ramfjord, S. P. Indices for prevalence and incidence of periodontal disease, J Periodontol, 30:51-59, 1959.

35. Ramfjord, S. P. The Periodontal Disease Index (PDI), J Periodontol, 38:602-610, 1967.

36. Sandler, H. C. and Stahl, S. S. The measurement of periodontal disease prevalence, JADA, 58:93-97, 1959.

37. Glavind, L. and Löe, H. Errors in the clinical assessment of periodontal destruction, J Periodont Res, 2:180-184, 1967.

38. Grossman, Navy Periodontal Screening Exam, J Am Soc Prev Dent, 3:41-45, 1974.

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# Quotable Quote

One Saturday morning last winter the three networks carried 154 commercials: 72 for sugared cereals, 35 for candy, 23 for fast-food restaurants, five each for cookies, powdered soft drinks and toaster tarts . . . Now everyone knows that sugary foods promote tooth decay; they also can help a kid along to obesity. And a Yale clinician, Dr. Robert Abramovitz, has pointed out that such commercials intensify the tendency toward instant self-gratification, just what kids of this age are supposed to be learning to control.

This issue may be resolved soon when the Federal Trade Commission rules on TV ads for kids, but, in the meantime, America's fat children with rotten teeth, rendered dumber than needed by society's acts, might well look up at society and say, "Gee, thanks Dad and Mom."

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