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PERIODONTAL DISEASE IN PREGNANCY

II. CORRELATION BETWEEN ORAL HYGIENE AND PERIODONTAL CONDITION

by

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In the first paper of this series it was shown that the frequency of occurrence as well as the degree of severity of periodontal disease increase in pregnancy. It was also shown how both the distribution and the severity of the inflammatory changes vary during the course of pregnancy (*Löe & Silness* 1963).

Recent research on the epidemiology of periodontal disease has demonstrated a close correlation between periodontal disease and oral debris (*Lövdal et al.* 1958, *Schei et al.* 1959). Histological (*Waerhaug* 1952, 1955) and biochemical (*Schultz-Haudt* 1961) research have corroborated these observations and offered some explanation of the mechanisms involved. There is a substantial amount of evidence to the effect that »bacterial plaque and calculus are the most common direct causes of periodontal

disease» (*WHO* 1961), and therefore any epidemiological study with the aim of broadening the understanding of periodontal disease should include an assessment of the oral hygiene status of the patients under examination. Previous investigations on the periodontium in pregnancy did not take this into consideration. The purpose of the present study was, therefore, to assess the distribution and character of oral debris in pregnant and post partum patients, and to correlate these findings with the available data on the periodontal condition in the same patients.

MATERIAL AND METHODS

One hundred and twenty-one pregnant and sixty-one post partum patients were examined for their oral hygiene status as part of an examination of their periodontal condition. Detailed descriptions of the grouping of the patients and the examination of the periodontium were given in the first article (*Löe & Silness*, 1963) to which the reader is referred.

A measure of the state of oral hygiene was obtained by recording both soft debris and mineralized deposits. The teeth which were examined were the same as those used for the gingival condition assessment:

maxillary right first molar

maxillary right lateral incisor

maxillary left first bicuspid

mandibular left first molar

mandibular left lateral incisor

mandibular right first bicuspid.

Missing teeth were not substituted.

Assessment of soft deposits was made according to a plaque index system proposed by the authors:

The Plaque Index System

Scores	Criteria
0	No plaque.
1	A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen *in situ* only after application of disclosing solution or by using the probe on the tooth surface.
2	Moderate accumulation of soft deposits within the gingival pocket, or on the tooth and gingival margin which can be seen with the naked eye.
3	Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.

Mineralized deposits were scored according to the calculus index system of *Ramfjord* (1959):

Calculus Index System

Scores	Criteria
0	No calculus.
1	Supragingival calculus extending only slightly below the free gingival margin (not more than 1 mm).
2	Moderate amount of supra- and subgingival calculus, or subgingival calculus only.
3	Abundance of supra- and subgingival calculus.

Each of the four surfaces of the teeth (buccal, lingual, mesial and distal) is given a score from 0—3, *the plaque or calculus index for the area.* The scores from the four areas of the tooth are added and divided by four in order to give the *plaque or calculus index for the tooth.* The indices for the teeth (incisors, premolars and molars) may be grouped to designate the *index for the group of teeth.* By adding the indices for the teeth and dividing by six *the index for the patient* is obtained. The index for the patient is thus an average score of the number of areas examined.

Prior to examination the gingivae and the teeth were dried by a blast of air. No cotton was used in order not to interfere with the soft deposits. For the assessment of plaque it was found that running an explorer along the surfaces of the teeth both supra- and subgingivally gave better results than the use of disclosing solution and was, therefore, the method of choice. Calculus was probed by a sharp explorer.

The time required for the examination for plaque index amounted to 2 minutes, for calculus a little more. The examination of all patients was carried out by the same examiner. The observations were dictated to a dental nurse who recorded the scores.

FINDINGS

Soft deposits

All pregnant and post partum patients showed plaque of varying amounts on the six teeth under investigation.

The mean plaque index in women during pregnancy and after parturition is shown in Table I.

Table I.

Mean plaque index for 182 patients.

Pregnancy	Post partum
0.85±0.024[1]	0.88±0.049[1]

[1] Standard error of the mean.

There was no significant difference between the two groups as to quantities of plaque.

The relationship between plaque index and progress of pregnancy and post partum period is shown in Table II and Fig. 1.

Table II.

Mean plaque index of the patient in relation to months of pregnancy and post partum.

Months	Plaque index
of pregnancy	
2	0.73±0.042[1]
3	0.97±0.072
4	0.75±0.046
5	0.78±0.087
6	0.84±0.036
7	0.86±0.075
8	0.98±0.087
9	0.81±0.046
post partum	
2	0.86±0.114
3	0.90±0.115
4	0.88±0.092
5 or more	0.90±0.081

[1] Standard error of the mean.

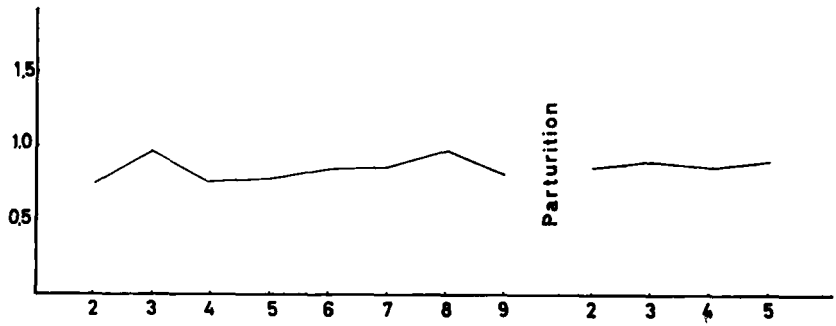

Fig. 1. The relationship between mean plaque index (ordinate) and months of pregnancy and post partum (abscissa).

The amount of plaque increased up to the 8th month of pregnancy with a peak in the 3rd and 8th months, after which a decrease occurred; this did not, however, fall to the level of the 2nd or 4th months. The plaque indices of the post partum group were constant and were exceeded only by those of the 3rd and 8th months of pregnancy.

The plaque indices for the different groups of teeth relating to the months of pregnancy and post partum are shown in Table III and Fig. 2.

Table III.

Mean plaque index of groups of teeth in relation to months of pregnancy and post partum.

Months	Incisors	Premolars	Molars
of pregnancy			
2	0.57	0.65	1.00
3	0.84	0.91	1.18
4	0.57	0.68	1.01
5	0.54	0.72	1.09
6	0.57	0.88	1.07
7	0.76	0.82	1.01
8	0.92	0.83	1.19
9	0.61	0.73	1.09
post partum			
2	0.78	0.76	1.05
3	0.69	0.92	1.09
4	0.62	0.73	1.28
5 or more	0.67	0.86	1.16

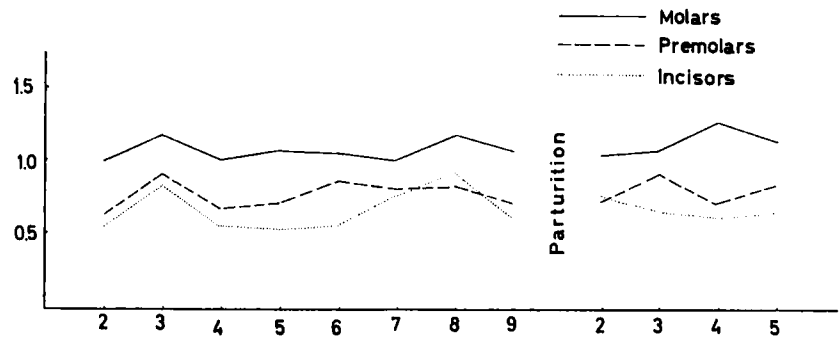

Fig. 2. Mean plaque index of molars, premolars and incisors (ordinate) in relation to months of pregnancy and post partum (abscissa).

The highest plaque indices were found for the molars, and the lowest for the incisors. This holds for both the pregnant and the post partum groups. The premolars scored at a level which up to the 7th month of pregnancy exceeded that of the incisors. In the 8th month the plaque index of the incisors was higher than that of the premolars.

The plaque index of the different areas of teeth in relation to months of pregnancy and post partum is shown in Table IV and Fig. 3.

Table IV.

Mean plaque index of different areas of teeth in relation to months of pregnancy and post partum.

Months	Buccal	Lingual	Interproximal
of pregnancy			
2	0.20	0.53	1.10
3	0.35	0.84	1.35
4	0.28	0.50	1.10
5	0.36	0.59	1.09
6	0.33	0.68	1.16
7	0.38	0.66	1.20
8	0.50	0.75	1.33
9	0.32	0.68	1.11
post partum			
2	0.36	0.81	1.13
3	0.44	0.76	1.19
4	0.38	0.92	1.09
5 or more	0.36	0.69	1.26

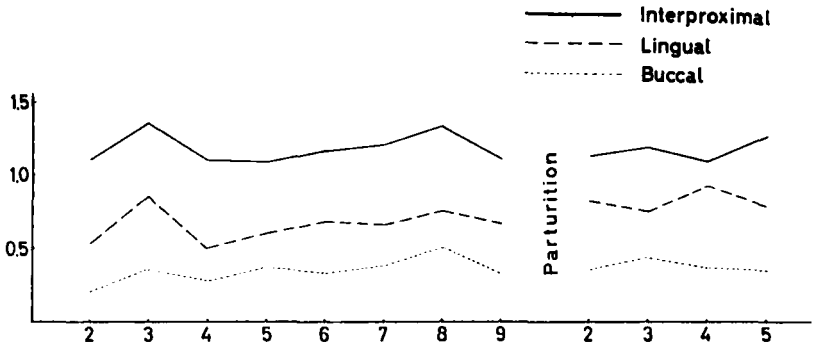

Fig. 3. Mean plaque index of buccal, lingual and interproximal areas of teeth (ordinate) in relation to months of pregnancy and post partum (abscissa).

The highest plaque index was found for the interproximal areas which accounted for approximately 70 per cent of the total amount of plaque on the teeth. The lingual and buccal areas accounted for about 20 and 10 per cent respectively. All areas showed increasing scores throughout pregnancy with peaks in the 3rd and 8th months.

Mineralized deposits

The mean calculus index for pregnant and for post partum patients is shown in Table V.

Table V.

Mean calculus index for 182 patients.

Pregnancy	Post partum
0.35±0.025[1]	0.41±0.046[1]

[1] Standard error of the mean.

The calculus index was higher in the post partum than in the pregnant patients, but the difference was not significant. The calculus indices during pregnancy and post partum are shown in Table VI and Fig. 4.

Table VI.

Mean calculus index for the patient in relation to months of pregnancy and post partum.

Months	Calculus index
of pregnancy	
2	0.38±0.055[1]
3	0.42±0.105
4	0.29±0.063
5	0.40±0.098
6	0.32±0.041
7	0.30±0.067
8	0.37±0.061
9	0.34±0.084
post partum	
2	0.40±0.088
3	0.38±0.101
4	0.34±0.090
5 or more	0.43±0.085

[1] Standard error of the mean.

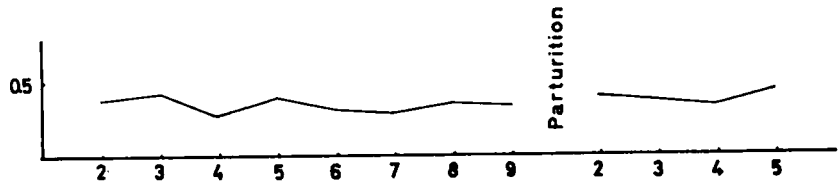

Fig. 4. The relationship between mean calculus index (ordinate) and months of pregnancy and post partum (abscissa).

Fluctuations of the calculus index during pregnancy did not show any consistent trends.

The calculus indices of the different groups of teeth in relation to the months of pregnancy and post partum are shown in Table VII and Fig. 5.

Table VII.

Mean calculus index for groups of teeth in relation to months of pregnancy and post partum.

Months	Incisors	Premolars	Molars
of pregnancy			
2	0.31	0.27	0.57
3	0.35	0.30	0.60
4	0.23	0.23	0.41
5	0.27	0.35	0.58
6	0.23	0.28	0.44
7	0.30	0.28	0.33
8	0.34	0.25	0.54
9	0.30	0.25	0.48
post partum			
2	0.34	0.37	0.52
3	0.34	0.30	0.50
4	0.22	0.20	0.61
5 or more	0.27	0.45	0.58

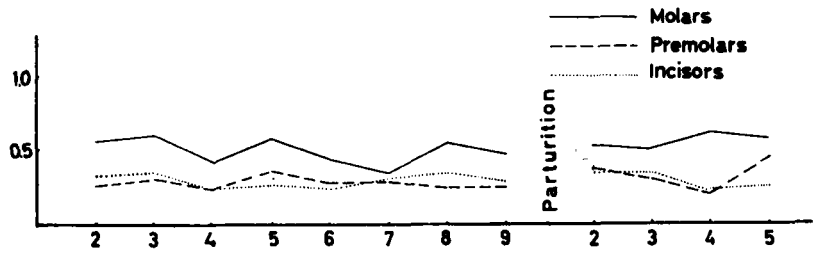

Fig. 5. Mean calculus index of incisors, premolars and molars (ordinate) in relation to months of pregnancy and post partum (abscissa).

The highest calculus index was found in molars. Premolars and incisors scored approximately at the same level.

The calculus scores for the different areas of the teeth in relation to months of pregnancy and post partum are shown in Table VIII and Fig. 6.

Table VIII.

Mean calculus index for different areas of teeth in relation to months of pregnancy and post partum.

Months	Buccal	Lingual	Interproximal
of pregnancy			
2	0.10	0.53	0.45
3	0.18	0.49	0.50
4	0.06	0.33	0.38
5	0.19	0.55	0.43
6	0.10	0.44	0.36
7	0.12	0.42	0.33
8	0.11	0.43	0.47
9	0.17	0.38	0.41
post partum			
2	0.13	0.54	0.48
3	0.11	0.52	0.44
4	0.15	0.32	0.44
5 or more	0.13	0.47	0.57

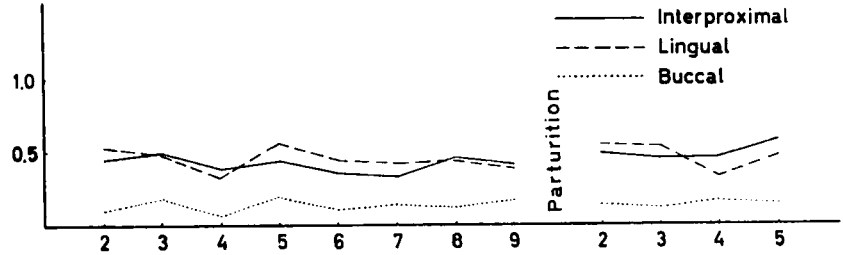

Fig. 6. Mean calculus index of buccal, lingual and interproximal areas of teeth (ordinate) in relation to months of pregnancy and post partum (abscissa).

The interproximal and lingual areas show equally high calculus scores. Approximately 60 per cent of the total amount of calculus was located in the interproximal areas, about 30 per cent on the lingual, and about 10 per cent on the buccal surfaces.

Correlation of the data

Correlation coefficients were calculated for the gingival index (GI) (*Löe & Silness* 1963) and the plaque and calculus indices according to the formula: $r = \dfrac{\frac{\Sigma x \times y}{N} - \overline{X}_x \overline{X}_y}{\sigma_x \sigma_y}$ (*Garn 1951*). They are listed in Table IX.

Table IX.

Correlation between the gingival index and plaque and calculus indices in 182 pregnant and post partum patients.

	Correlation coefficients	
	Pregnancy	Post partum
GI/Plaque	0.730	0.995
GI/Calculus	0.530	0.754
GI/Plaque + Calculus	0.706	0.939

As seen from Table IX higher correlation coefficients are obtained for all variables post partum than during pregnancy. The highest correlation coefficient was found for GI/plaque post partum. It should be noted that this was higher than for GI/plaque + calculus.

DISCUSSION

The present investigation shows that there is no significant difference in the *quantity* of deposits on the teeth of pregnant as compared with post partum patients. Nor is the *character* of the deposits altered since the *distribution* of plaque and calculus showed no significant difference in the two groups.

The general trend in the distribution of both soft and hard deposits on the different surfaces of teeth during pregnancy does not seem to deviate from that of non-pregnant patients (*Lövdal et al.* 1958), namely that the interproximal surfaces are the most frequent sites of debris.

In the course of pregnancy, however, the plaque index increased, but during the last month of gestation the scores leveled off well above the point for the onset of pregnancy. This shows that although there may be characteristic variations in the accumulation of soft debris in the course of the gestation period, oral hygiene is no better or worse during pregnancy than after parturition.

The graphs for gingival, plaque and calculus indices (Fig. 7), make it evident that the accumulation of plaque parallels the gingival changes during pregnancy, while calculus does not. However, whereas the gingival index was significantly higher in pregnant than in post partum patients, a similar difference could

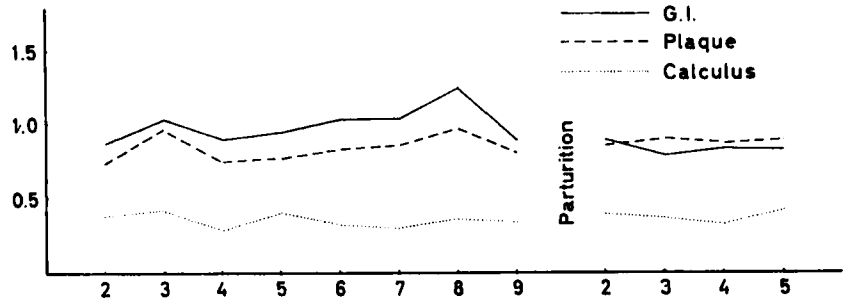

Fig. 7. The relationship between mean gingival, plaque and calculus indices (ordinate) and months of pregnancy and post partum (abscissa).

not be found for the plaque index. This discrepancy is also indicated by the difference in the relevant correlation coefficients. The fact that the GI/plaque correlation coefficient is higher for post partum than for pregnant patients indicates that the correlation between gingival changes and the presence of soft deposits is closer after parturition (0.995) than during pregnancy (0.730). The fact that the inflammatory changes round about the time of parturition fall to a level at which the GI/plaque correlation coefficient approaches unity, strongly suggests that in pregnancy some other factor is introduced, which together with the bacterial plaque may be responsible for the accentuated inflammatory changes in the gingivae. This factor cannot be calculus, since there was no significant difference in the calculus indices of the two groups. In a following paper the response of the gingiva to local treatment will be shown, and the relative importance of these factors will be discussed.

Oral cleanliness is usually evaluated on the basis of the quantity of soft and mineralized deposits. To this end, oral hygiene indices have been computed by adding plaque and calculus scores (*Greene & Vermillion* 1960, *Ramfjord* 1959). The present investigation indicates that the presence and amount of plaque alone gives an adequate expression of the state of oral hygiene. This is in keeping with recent research which has shown that calculus is always covered with a layer of soft matter (*Waerhaug* 1952, *Theilade* 1960).

SUMMARY AND CONCLUSIONS

One hundred and twenty-one pregnant and sixty-one post partum patients were examined for occurrence and amount of soft and hard deposits on the teeth. Assessments of plaque were made by means of an index system proposed by the authors. Calculus was recorded according to *Ramfjord*'s method. The data obtained were correlated with data on the gingival conditions of the same patients. The following conclusions may be drawn:

1. The quantity and character of oral debris did not differ in pregnant and post partum patients. Therefore, oral hygiene in general seems to be no better or worse during pregnancy than after parturition.
2. The accumulation of bacterial plaque during pregnancy showed variations which corresponded to the gingival changes, but the correlation between gingival inflammation and soft deposits was closer after parturition than during pregnancy.
3. It is suggested that in pregnancy some other factor is introduced which together with the bacterial plaque may be responsible for the accentuated inflammatory changes in the gingiva.
4. The suggestion is offered that oral hygiene is adequately expressed by the presence and amount of soft debris (plaque index).

RÉSUMÉ

AFFECTIONS PARODONTALES PENDANT LA GROSSESSE

II. CORRÉLATION ENTRE L'HYGIÈNE BUCCO-DENTAIRE ET LES AFFECTIONS PARODONTALES

Cent-vingt et une femmes enceintes et soixante et une accouchées ont été examinées en ce qui concerne la présence et la quantité de dépôts du type materia alba et de dépôts tartriques sur les dents. L'évaluation des plaques a été faite au moyen d'un système d'indice proposé par les auteurs. L'enregistrement concernant le tartre a été fait suivant la méthode de Ramfjord. Les renseignements obtenus ont été mis en corrélation avec les

renseignements sur les affections parodontales des mêmes patientes et les conclusions suivantes en sont ressorties:

1. La quantité et le caractère des débris buccaux ne diffèraient pas parmi les femmes enceintes et les accouchées. L'hygiène bucco-dentaire ne semblait donc être ni meilleure ni plus mauvaise pendant la grossesse qu'après l'accouchement.

2. L'accumulation de plaque microbienne pendant la grossesse présentait des variations qui correspondaient aux altérations gingivales, mais la corrélation entre l'inflammation gingivale et les dépôts de type materia alba était plus étroite après l'accouchement que pendant la grossesse.

3. Il semblerait que, pendant la grossesse, un autre facteur interviendrait à côté de la plaque microbienne et pourrait avec elle être responsable des altérations inflammatoires gingivales accentuées.

4. Il semblerait que la présence et la quantité de dépôts du type materia alba puissent servir pour donner une expression juste de l'hygiène bucco-dentaire (indice-plaque).

ZUSAMMENFASSUNG UND SCHLUSSFOLGERUNGEN

PARODONTALE ERKRANKUNGEN UND SCHWANGERSCHAFT
II. ZUSAMMENHANG ZWISCHEN MUNDHYGIENE UND PARODONTAL-VERHÄLTNISSE

Einhunderteinundzwanzig schwangere und einundsechzig post partum Patienten wurden auf Menge und Typ weicher und harter Beläge auf den Zähnen untersucht.

Das Schätzen von Plaque wurde mittels eines von den Verfassern in Vorschlag gebrachten Indexes gemacht. Zahnstein wurde nach dem Verfahren Ramfjords registriert. Die gefundenen Werte wurden mit denen des gingivalen Zustandes derselben Patienten verglichen, und folgende Schlüsse dürfen gezogen werden:

1) Quantität und Charakter der oralen Beläge wichen bei schwangeren und post partum Patienten nicht ab. Die Mundhygiene scheint deshalb während der Schwangerschaft weder schlechter noch besser als nach der Niederkunft.

2) Die Akkumulation des bakteriellen Plaques während der Schwangerschaft zeigte Variationen, die den gingivalen Veränderungen entsprachen. Die Korrelation zwischen gingivaler Inflammation und weichen Belägen war aber enger nach der Niederkunft als während der Schwangerschaft.
3) Es wird angenommen, dass während der Schwangerschaft irgendein Faktor erscheint, ein Faktor, welches gemeinschaftlich mit dem bakteriellen Plaque für die akzentuierten inflammatorischen Veränderungen der gingivalen Gewebe verantwortlich sei.
4) Die Annahme ist aufgeworfen, dass Mundhygiene mit der Anwesenheit und Menge der weichen Beläge (Plaque-Index) eindeutig ausgedrückt sei.

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