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The oral health status of postpartum mothers in South-East Hungary

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Objectives: This study was carried out to assess the oral health status of new mothers, following not more than three days post-delivery, in South-East Hungary. An additional aim was to examine the effect of socioeconomic status on the oral health of the 169 women who volunteered, all of whom were healthy. ***Material and Methods:*** Socioeconomic data were collected via a questionnaire, and patients were examined according to WHO guidelines. The state of the periodontium was described by examining the plaque, calculus, probing depth and bleeding on probing. The mean age of the women was 27.5 yrs, representing all educational levels and professional categories of the country. ***Results:*** The mean DMFT was 12.57, and the mean DMFS was 26.26. The plaque index was 0.68, the calculus frequency 20.22%, the mean probing depth 1.65mm and bleeding on probing occurred in 36.27% of teeth. Regression analyses demonstrated that caries levels were mostly related to age and plaque scores, while the state of the periodontium was mostly related to educational level, age and profession. The number of pregnancies had no significant influence on the caries nor on the periodontal status of these women. ***Conclusions:*** It was concluded that the oral health status of these mothers was mainly age- and socioeconomically-related, and that the dental needs of women during pregnancy must be emphasized, both to the dental profession and to the patients themselves.

Key words: caries, DMFT, periodontal status, pregnancy

An old English proverb states: "A tooth is lost for every child"! There is thus a belief that pregnancy is harmful to the teeth of mothers, although scientific proof is lacking. There are only a few related studies, which are mostly of a cross-sectional or short-term follow-up nature. The conclusion of these studies is controversial. Bánóczy *et al* (1978) found higher DMFT values in women with children, than in women with no children. However, more recently, Scheutz *et al* (2002) found no association between the number of pregnancies and mothers' caries frequency.

The improved oral health of mothers can be of great potential benefit e.g. as primary caretakers they may infect their children with *mutans streptococci (MS),* the transmission agent probably being the mother's saliva (Caufield, 1995). Caries preventive measures directed to pregnant women proved to be very effective for the caries status of both mother and child.

Other evidence indicates that the periodontal disease of pregnant women may be an independent risk factor for preterm labor and/or low birth weight (Offenbacher *et al*., 1998). However, changes in the state of the gingivae during pregnancy were observed as early as the 1960s (Löe and Silness, 1963) and it is established that at these times, increased levels of estrogen and progesterone are the cause of increased vascular permeability of the gingivae (Raber-Durlacher *et al*., 1994). Thus bacteria, and /or their products (lipopolysaccharides, enzymes etc.) can get through the ulcerated pocket wall into the bloodstream so reaching the feto-maternal unit and causing complications in the outcome of pregnancy. There is evidence that basic periodontal therapy significantly reduced the rates of preterm low birth weight in pregnant women (Jeffcoat *et al*., 2003). However other researchers have not found any relationship between mothers' periodontitis and preterm birth (Davenport *et al*., 2002).

For the above reasons it is important to focus on the oral health of pregnant women and to organize preventive programmes, with the aim of decreasing both the frequency of dental caries and improving the periodontal status of mothers. To undertake such a programme could possibly assure success as, if pregnant women understand that their oral health can influence the pregnancy outcome, as well as caries frequency of the mother (and later their children), then they could be highly motivated to improve their own oral health.

The purpose of the study was, therefore, to evaluate the caries and periodontal status of mothers shortly after delivery. A further aim was to determine if age, the socioeconomic status (educational level, profession, urban or rural residency) or the number of previous pregnancies could influence their oral health status. In Hungary, all pregnant women participate in the prenatal care programme provided by the Hungarian National Health Service, which generally begins prior to the 12th gestational week and focuses on the general health of both mother and fetus. As a part of this programme, pregnant women should take part in a dental screening examination during the first trimester of pregnancy, although any subsequent treatment requirement is not compulsory. The examinations are carried out in a general dental practice; where there is not enough time to motivate the women regarding the need for oral hygiene and acceptance of necessary treatment. According to our experience a high

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percentage of pregnant women do not go for any dental visit during pregnancy.

Materials and Methods

In total 169 women were included in the study, all of whom were volunteers and had delivery in the University of Szeged, Department of Obstetrics & Gynecology. Personal data and a full case history (including the number of previous pregnancies) were recorded at the time of the arrival in the Department of Obstetrics & Gynecology, by the gynecologist who treated the women. Only systemically healthy women carrying a single fetus were enrolled into this cross-sectional study. Patients with asthma, cardiac problems, diabetes, glomerulonephritis, hyperthyreosis, ulcers, chronic infectious disease or any kind of serious general disease were excluded. Women who would require prophylactic antibiotics for dental treatment, and patients receiving antibiotics at the time of the dental examination were also excluded. However, those who had to take antibiotics for any reason, more than four weeks prior to dental examination, could participate. The aim of the project was explained to the patients, and they signed a detailed Ethics Committee-approved Consent Form for dental investigation.

The collection of socioeconomic data was carried out by a questionnaire, which was completed in the Department of Obstetrics & Gynecology by the patients after they received necessary instruction by the dentist. Here, the socio-economic status was pursued and categorized by educational level, occupation, and residence area of the patient. The level of education was divided into four categories i.e. primary school (eight years), technical school (three years post- primary school), grammar-school (four years post-primary school), and higher education (university or college), as were three types of occupation i.e. manual workers, intellectuals or 'other occupations' (e.g. shop assistant, housewife, unemployed person, etc.). In the technical school, students learn to become skilled workers, in the grammar school they study theoretical knowledge and complete school with a final examination, which is necessary for entry to higher educational studies. Regarding their place of residence, patients were divided into urban and rural groups. Patients were also interviewed about their dental visits or treatment during pregnancy.

The examination was completed within three days postpartum by the same dental team-member. Reproducibility trials were performed on 20 subjects before the survey. The intra-class correlation coefficient was 0.94 or more for dental caries and periodontal scores. The caries examinations were conducted according to WHO guidelines (1987) in the Department of Obstetrics & Gynecology. Here, patients were seated in a comfortable chair with a head-support. A dental light-source was used to standardize examination conditions. Third molars were excluded, because they are often impacted, retained or extracted due to eruption problems. DMFT and DMFS indices were calculated, with retained roots and crowned teeth regarded as three carious and/or filled surfaces.

Periodontal status was also recorded, which included evaluation of plaque, calculus, and recession, tooth mobility, probing depth and bleeding on probing. Plaque was noted on a 0-3 scale, on Ramfjord teeth, at four surfaces per tooth and the plaque index was registered according to the criteria of Silness & Löe (1964). If the Ramfjord tooth was missing, the neighboring molar, premolar and central incisor was examined (Ramfjord, 1959). Recession was measured on the buccal aspects of the teeth between the marginal gingiva and the cemento-enamel junction (CEJ), in millimeters and rounded down to the next millimeter. Tooth mobility was recorded using the Miller scale (Lindhe, 1995). A disposable periodontal probe with a tip diameter of 0.5mm was employed to assess probing depth, which was measured in millimeters at six sites per tooth i.e. mesiobuccal, mid-buccal, distobuccal, mesiolingual, mid-lingual and distolingual. Probing depth was rounded down to the nearest millimeter. The presence of calculus and bleeding on probing (BOP) were registered dichotomously. The amount of calculus was not measured. Frequency of calculus was expressed in percentages for each person, then for the whole group. Bleeding on probing was assessed on the sites at which the probing depth was measured and it was regarded as positive if it occurred at any site of the tooth within 15 seconds post-probing-depth assessments.

All caries and periodontal data were analyzed for significant relationships with age, educational level, profession, place of residence and number of children.

Statistical Analysis

To compare demographic and socio-economic data, and clinical results, we used both univariate and multivariate statistical analyses. For the comparison of mean values, the t-test and one-way analysis of variance were used (for DMFT and DMFS), as well as the Mann-Whitney and Kruskal-Wallis tests in case of non-normality (for plaque index, frequency of calculus, probing depth, frequency of bleeding on probing). Normal distribution of samples was tested using the Kolmogorov-Smirnov test. The Spearman correlation coefficient was used to assess correlations between continuous and ordinal variables. Categorical data were analyzed using the chi-square and Fisher's exact test. The multivariable dependence of the target variable on both categorical and continuous data was analyzed using logistic regression with stepwise (forward) model selection based on the likelihood ratio criterion (pin=0.05, pout=0.10). Regression analyses were performed to examine the influence of the demographic, socioeconomic (educational level, profession, place of residence, number of children) and oral health factors, which can affect the caries status of pregnant women. Regression analyses were made also for the periodontal status, to find the most important influencing factors within the limits of this study.

Results

The mean age was 27.5 yrs, and the age distribution was found to be normal. The youngest mother was 15.7yrs and the oldest 41.1yrs, with 69.4% aged between 20-30 yrs, only 4.7% being <20 yrs and 25.9% were >30 yrs of age. Regarding their educational levels 28 (16.56%) patients only completed primary school, 40 (23.66%) attended a technical school, 64 (38.86%) had completed a grammar school course, and 37 (21.89%) had a university or college degree (Table 1).

There were 59 (34.91%) manual workers and 64 (37.86%) intellectuals amongst the patients. The number of mothers belonging to the "other" category was 46 (27.21%), i.e. housewives, shop assistants, unemployed persons, etc.

More patients were urban (93; 55.02%) than rural dwellers (76; 44.98%). At the time of the survey, almost half the subjects had only their first infant (84; 49.70%), less than one third were undergoing their second pregnancy (49; 28.99%), while less had three (20; 11.83 %), or four (16; 9.47%) children. The study group was thus deemed representative of the Hungarian population regarding educational level, profession, place of residence and the number of children.

In spite of the provision of prenatal care provided by the Hungarian National Health Service, not all mothers visited a dentist during pregnancy. While most (117; 69.2%) went for a dental examination or treatment course, almost one third (52; 30.8%) did not. Among those who visited the dentist, 75 (63.6%) had had higher education (grammar school and university or college degree). Regarding the professional categories, 74.6% of manual workers, 70.3% of the intellectuals, and 60.9% of those in the 'other' category underwent a dental examination during pregnancy.

The mean DMFT for the whole sample was 12.57, and the DMFS was 26.26. The average number of decayed teeth was 1.89, filled teeth 6.37, and the mean for missing teeth was as high as 2.98. Patients had a mean of 0.75 crowned teeth and 0.53 retained roots present. Only one patient had an entirely caries-free dentition. Three patients had one edentulous jaw, had worn a complete prosthesis and were of low social status (completed only primary school, physical workers). In 30.7% of the cases, there was no need for conservative dental treatment, but 117 (69.3%) women required one or more restorations. On average, more than two teeth per patient needed some attention, excluding the replacement of missing teeth.

Data in Table 1 summarize the caries status of the women according to age groups, educational level, profession, place of residence and the number of children. The t-test and one-way analyses showed that there was a significant difference between the DMF indices according to the age groups (p=0.000) and according to the number of children (p=0.000). There was no significant relationship between DMF indices and educational level, professional status or place of residence, as shown also in Table 1.

The regression analysis (Table 2) examining age, number of pregnancies, educational level, professional status, place of residence and plaque index, showed that the DMFT index was influenced mostly by the mother's age (p=0.000) and amount of plaque (p=0.007), while the number of pregnancies was not among the most important factors (p=0.198).

The mean plaque index was 0.68, calculus was found at 20.2% of the teeth (Table 3). The mean probing depth was 1.65mm and bleeding on probing occurred

Table 1. Caries indices according to age, educational level, profession, place of residence and number of pregnancies

	n	*DMFT Mean ± SD*	*p-Value*	*Stat**	*DMFS Mean ± SD*	*p-Value Mean ± SD*	*Stat**
Age groups			0,000			0,000	
15-19	9	6.25±4.13		1 vs. 3,4,5	9.50±8.33		
20-24	36	10.50±5.98		2 vs. 4,5	20.36±13.62		1 vs. 3,4,5
25-29	79	12.69±5.65			25.93±14.47		2 vs. 4,5
30-34	34	14.68±5.37			33.88±15.56		3 vs. 4,5
≥35	11	16.00±6.22			35.60±15.71		
Education			0.469				
Primary school	28	12.39±6.82			26.07±18.35	0.283	
Technical school	40	13.68±6.33			30.05±16.97		
Grammar school	64	12.05±5.66			25.31±14.31		
Higher education	37	12.15±5.40			23.38±13.07		
Profession			0.279				
Manual worker	59	13.17±5.86			28.36±15.44	0.112	
Intellectual	64	12.13±5.51			24.34±13.74		
Other	46	12.41±6.65			25.78±17.69		
Place of residence			0.448				
Village	76	12.86±6.17			27.03±16.31	0.513	
City	93	12.24±5.81			25.41±14.84		
Number of pregnancies			0.000				
1	84	11.15±5.83		1 vs. 4	22.07±13.81	0.000	
2	49	12.88±5.79		2 vs. 4	25.86±14.30		1 vs. 4
3	20	12.80±5.19		3 vs. 4	28.55±12.78		2 vs. 4
4	16	18.19±4.82			45.31±16.71		3 vs. 4
All	169	12.57±5.94			26.26±15.46		

DMFT=Decayed, Missing, Filled Teeth
DMFS= Decayed, Missing, Filled Surfaces
Stat* = Statistical Difference among Groups

Table 2. Results of the regression analysis examining the factors, which influenced the caries status

	Unstandardized Coefficients		*Standardized Coefficients*		
Predictors	*B*	*Std. Error*	*Beta*	*t*	*p-value*
(Constant)	1.659	3.492		0.475	0.635
Age (year)	0.444	0.103	0.350	4.294	0.000
Number of pregnancies	0.639	0.495	0.105	1.292	0.198
Plaque-index	3.165	1.156	0.209	2.738	0.007
Educational level	-0.485	0.499	-0.081	-0.972	0.333
Profession	-0.415	0.527	-0.055	-0.788	0.432
Place of residence	-0.074	0.840	-0.006	-0.088	0.930

Table 3. Means of plaque index, calculus, probing depth, bleeding on probing (BOP) according to age, educational level, profession, place of residence and number of pregnancies

	n	*Plaque Index Mean ± SD*	*p-Value*	*Freq. of Calculus Mean ± SD (%)*	*p-Value*	*Probing Depth Mean ± SD (mm)*	*p-Value*	*BOP Mean ± SD (%)*	*p-Value*
Age groups			0.912		0.040		0.358		0.237
15-19	9	0.65±0.45		6.32±7.09		1.44±0.48		22.59±33.42	
20-24	36	0.70±0.39		14.43±20.30		1.56±0.32		28.49±27.07	
25-29	79	0.69±0.41		23.10±25.50		1.63±0.45		37.81±34.01	
30-34	34	0.64±0.37		26.44±24.61		1.78±0.59		40.26±31.19	
≥35	11	0.68±0,19		23.20±30.83		1.62±0.47		49.49±42.75	
Education			0.000		0.000		0.000		0.000
Primary school	28	0.87±0.50		30.00±28.80		1.73±0.58		44.67±36.59	
Technical school	40	0.86±0.37		29.00±25.60		1.79±0.47		49.21±34.82	
Grammar school	64	0.58±0.32		19.22±20.64		1.65±0.44		36.60±30.08	
Higher education	37	0.49±0.26		8.65±15.12		1.38±0.26		15.45±20.80	
Profession			0.001		0.001		0.000		0.000
Manual worker	59	0.75±0.35		25.96±25.83		1.86±0.61		48.97±34.07	
Intellectual	64	0.53±0.32		12.62±16.46		1.51±0.41		22.98±25.89	
Other	46	0.81±0.46		23.66±24.79		1.57±0.36		39.01±32.38	
Place of residence			0.063		0.047		0.051		0.038
Village	76	0.75±0.41		23.55±22.20		1.69±0.43		41.20±31.09	
City	93	0.63±0.37		18.92±24.65		1.60±0.49		32.28±33.77	
Number of pregnancies			0.209		0.007		0.264		0.041
1	84	0.62±0.33		15.71±21.41		1.61±0.44		32.18±30.81	
2	49	0.71±0.39		22.24±21.63		1.59±0.43		34.06±33.96	
3	20	0.69±0.47		28.00±19.89		1.70±0.57		42.46±30.96	
4	16	0.90±0.55		36.25±35.19		1.85±0.53		56.99±35.68	
All	169	0.68±0.39		20.22±23.05		1.65±0.50		36.27±32.49	

at 36.27% of the teeth. Calculus was noted in 62.7% of the patients, and at least one pocket ≥4mm was found in 44.98% percent of the women. Deep pockets - i.e. ≥6mm - were found only in 10 patients (5.91%). Among these parameters, the frequency of calculus was only related significantly with the age (p=0.009). Periodontal scores correlated highly with educational level, and professional status (p=0.000; p=0.001 respectively). A significant difference was detected between the periodontal scores of manual workers, intellectuals and the 'other' group. No significant difference was found in the plaque index and probing depth regarding place of residence (p=0.063; p=0.051 respectively), but the difference was significant between rural and urban inhabitants for calculus frequency (p= 0.047) and for bleeding on probing (p=0.038), rural dwellers having more teeth with calculus, and bleeding on probing more frequently. The plaque index and the probing depth did not correlate with the number of pregnancies, while the presence of calculus and bleeding on probing had a significant relationship with the number of pregnancies (p=0.007; p=0.041). The Spearman correlation showed, that plaque index correlated significantly with the frequency of bleeding on probing (p=0.000) and the mean probing depth (p=0.000).

To examine the relationship among the demographic factors and the periodontal status, four regression analyses were undertaken with the dependent variables mean plaque index, frequency of calculus, mean probing depth

Table 4. Results of the regression analyses examining the factors, which influenced mostly the periodontal status

	Unstandardized Coefficients		*Standardized Coefficients*		
*Dependent variable**	*B*	*Std. Error*	*Beta*	*t*	*p-value*
Plaque-index					
(Constant)	1.076	0.080		13.505	0.000
Educational level	-0.149	0.028	-0.379	-5.287	0.000
Frequency of calculus					
(Constant)	6.855	10.598		0.647	0.519
Educational level	-9.481	1.748	-0.402	-5.425	0.000
Age (year)	1.348	0.373	0.268	3.617	0.000
Probing depth					
(Constant)	1.747	0.225		7.768	0.000
Educational level	-0.138	0.035	-0.295	-3.877	0.000
Profession	-0.122	0.043	-0.206	-2.831	0.005
Age (year)	0.017	0.008	0.170	2.234	0.027
BOP					
(Constant)	20.429	14.834		1.377	0.170
Educational level	-12.813	2.446	-0.391	-5.238	0.000
Age (year)	1.710	0.522	0.245	3.278	0.001

*Predictors in each regression analysis: age, educational level, profession, place of residence and the number of pregnancies.

and frequency of bleeding on probing, the predictors were age, educational level, profession, place of residence and the number of pregnancies (Table 4). Each periodontal score was influenced by the educational level (p=0.000 for each dependent variable). Bleeding on probing was related also to age (p=0.001), probing depth also to profession (p=0.005) and to age (p=0.027), and the frequency of calculus was also related to age (p=0.000). Tooth mobility and gingival recession occurred too rarely to permit further analyses.

Discussion

In this cross-sectional study, the caries and periodontal status of women soon after delivery in South-East Hungary was assessed and, with a mean DMFT of 12.57, varied little from data of other countries in the recent past.

According to a survey carried out in Brisbane, Australia, a population of 314 pregnant women had 15.8 DMFT in 1984 (Jago *et al*., 1984). In assessing the effectiveness of consuming fluoridated water continuously on caries frequency amongst mothers at term, Thomas *et al* found a mean DMFT value of 13.6 in Gwynedd (non-fluoridated) and 9.5 in Anglesy (fluoridated) in 1986-1987 (Thomas and Kassab, 1992). Brambilla *et al* (1998) carried out a preventive programme in Italy in 1993-1995, and noted a DMFT mean of 13.3 in a group of 65 pregnant women.

In comparing the current results with former Hungarian caries values, there is no sign of any improvement in caries frequency during the past twenty years in this particular group as, after examining 50 pregnant women in Budapest Orosz *et al.* (1980) reported mean DMFT and DMFS of 13.68 and 24.26 respectively, while the values of Papp *et al* (1990), also in Budapest, were 12.93 and 25.0 respectively in a population of 57 women. Comparing current DMFT data with an earlier 1991 investigation, it is evident that the caries status of these pregnant women is not worse than that of a mixed gender population aged 18-27 years, where the DMFT was then 13.82 (Radnai and Fazekas, 1999). Furthermore, although dental visits during pregnancy have long been provided in Hungary, there is not enough motivation relating to this, nor any sanction applied, if the opportunity is not taken.

The statistical analyses did not give evidence for the belief, which still exists, that pregnancy influences, negatively, the caries status of women. On the contrary it was shown by the regression analyses, that the most important influencing factors on caries status were the age of the women and the plaque index, and not the number of previous pregnancies. This result should remind the dental profession of the importance of dental education throughout adulthood, as well as during childhood.

The evaluation of the periodontal data showed a close relationship to socio-economic state and thus confirmed the results of other studies. Accordingly, the periodontal status of mothers was better if they were highly educated, worked as intellectuals, lived in cities, were younger and had fewer children.

In a London study, linear regression analyses demonstrated that probing depth was related to age, ethnicity and socioeconomic status, while bleeding on probing correlated with age and socioeconomic status (Moore *et al*., 2001). Similarly in the current study, probing depth was related to educational level, profession and age, bleeding on probing was related to educational level and to age.

Mitchell-Levis *et al* found the following periodontal data in a population of young ethnic minority women of low socioeconomic status in Harlem, New-York: plaque

index 1.3, bleeding on probing at 54% of sites, teeth with calculus 50%, and mean probing depth 2.7mm (Mitchell-Lewis *et al*., 2001). These results are worse than those in the present population (plaque index 0.68, bleeding on probing 36.27%, teeth with calculus 20.22%, mean probing depth 1.65mm), probably due to differences in the socioeconomic status of the examined population, as current study patients did not come solely from low socioeconomic circumstances, but all the educational levels and social classes were represented.

Conclusion

The caries status of the women studied was influenced by age and the amount of plaque present, while the periodontal status was affected mainly by educational level, age and profession. The regression analyses also showed that the number of pregnancies did not play an important role in the oral health status of these women.

We could conclude that, in spite of the possibilities available and current health regulations, many of the women did not attend a dentist during pregnancy and thus did not receive necessary dental or periodontal treatment. Since a high percentage of the examined mothers did not have acceptable oral hygiene, but had caries, signs of gingivitis, early or generalized periodontitis, they would have needed dental treatment. Simply making a service available and issuing regulations about its use is not sufficient for the aims of the service to be achieved; further motivation strategies are required. To improve the oral health status of this well-defined patient group, a well-organized, wide-ranging and effective preventive programme would be necessary in Hungary, since these programmes have proved to be useful in reducing caries and periodontitis (Axelsson and Lindhe, 1980). It would be also necessary to change the attitudes of pregnant women to this important health factor. Hence an educational system should be developed, which could give maximal information regarding the significance of oral health on pregnancy outcome and caries frequency in mothers and children, and thus motivate pregnant women to maintain a high level of oral health. The children of motivated mothers would also benefit from this, since mothers could teach them at young age, of the importance of oral hygiene procedures. In developing such a programme, close cooperation would be essential between obstetricians, dentists, oral hygienists and patients. Hence, ideally, specific dental care should be provided for pregnant women within their overall prenatal care, and in the same institute.

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