

Short Communication

The Influence of Environmental Factors on the Dentition of Pregnant Women

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Abstract

The state of dentition of pregnant women influences both the woman's health and the baby's health, even in its prenatal life. The aim of our study was to evaluate environmental factors influencing the state of dentition of pregnant women.

The studies were conducted among 101 pregnant women from the Lublin region. Essentially, more decayed teeth were found in women smoking before pregnancy. Significantly more filled teeth were found in women not smoking before pregnancy.

The number of missing teeth and the mean number of decayed, missing, and filled teeth increased with women's age. No correlation was stated between the state of dentition and a women's education and living environment. During pregnancy, 43.56% women did not report for a dental check-up.

Keywords: smoking, environment, dental status, pregnancy

Introduction

Dental caries is a multifactorial disease developed by lack of proper oral hygiene, a diet rich in carbohydrates, and the presence of cariogenic bacteria in the oral cavity. As a result of the action of bacteriogenic acids a demineralization of dental enamel takes place and the carious process is initiated. Untreated carious lesions may cause ache and inflammatory processes localized in the oral cavity or expanding beyond its area. In consequence, the administration of antibiotic therapy may be necessary, which in pregnant women must be thought over to consider its influence on the fetus, carrying out appropriate treatment or teeth extraction. The optimal time for dental treatment is the second trimester of pregnancy, already after organogenesis, while in the third trimester an unnatural body position during dental treatment may cause discomfort and the risk of the inferior vena cava compression. It should be stressed

that urgent dental care can be performed in each pregnancy period [1-3].

The state of dentition of a pregnant woman is essential both for a woman's health and baby's health, even in its prenatal life. Dental caries and periodontal diseases may, among others, increase the risk of arteriosclerosis and rheumatoid arthritis. Periodontal disease in a mother may be related to pre-term delivery (before the 37th week of pregnancy) and the development of preeclampsia, one of the symptoms of which is hypertension in a mother or low birth weight of a newborn. There are hypotheses concerning correlation between periodontal disease and a higher risk of gestational diabetes mellitus (GDM). Transmission of cariogenic bacteria through the saliva from mothers to babies may lead to the development of early caries of milk teeth in children [4-7].

Tobacco smoking is a risk factor of systemic diseases, including diseases of the oral cavity. It is also one of the risk factors of a child's health, among others, intrauterine growth retardation (IURG), decrease of a newborn's birth

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weight, and pre-term delivery. Nicotine passes to the mother's and baby's circulations, causing the symptoms of fetal anoxia and metabolic acidosis [8-10].

The aim of our study was to evaluate the state of dentition of pregnant women as well as environmental factors influencing it, such as place of residence, education level, and tobacco use.

Material and Methods

The studies were conducted in 2010 in a group of 101 women from Lublin voivodeship residing at hospital departments in Lublin and its region. In the investigated group there were 79.21% pregnant women and 20.79% women up to several days after delivery. 10.89% women reported the status of being single mothers, the remaining women had normal families. The research project obtained positive opinion of the Bioethics Board of the University of Medicine in Lublin.

The survey examination was performed on the basis of a questionnaire elaborated upon the study. Questions concerned, among others, socio-demographic data (age, place of residence, education), status of tobacco smoking defined as smoking before pregnancy, smoking in pregnancy, and reasons for dental appointments of pregnant women.

Dental examination of the oral cavity was performed with the use of a mirror and dental probe in artificial lighting. On the basis of this examination, an assessment of the state of dentition was made and DMF values and its components were calculated (D – a tooth with one or several primary or secondary carious lesions, M – a missing tooth, F – a tooth with one or several fillings but without secondary carious lesions).

Obtained data were submitted to statistic analysis with the use of descriptive statistics, Spearman correlation coefficient and Mann-Whitney test. Correlation coefficients were recognized as statistically important with the attained value of $p < 0.05$.

Results

Mean age of the investigated women was 27.89. In the investigated group the number of decayed teeth was 3,65 (min.-0.00, me.-3.00, max.-19.00), the mean number of filled teeth had the value of 8,63 (min.0.00, me.-9.00, max.-19.00), and the mean number of missing teeth was 2.28 (min.-0.00, me.-2.00, max.-12.00). The value of mean DMF number was 14.65 (min.-4.00, me.-15.00, max.-27.00). Analysis of the correlation of age and the number of decayed teeth revealed no relation between these features (Spearman correlation coefficient, $R_{xy}=0.004$). An essential correlation was stated between the age and the number of missing teeth – the number of missing teeth increases with age (Spearman correlation coefficient, $R_{xy}=0.26$). The analysis of correlation of age and filled teeth revealed no relation between the features (Spearman correlation coefficient, $R_{xy}=0.12$). A crucial correlation was stated between age and mean DMF, which is the

Table 1. Characteristics of the examined group.

Variables	N	Mean	Me	Min	Max	SD
Age	101	27.89	27.00	18.00	44.00	5.01
Decayed teeth (D)	91	3.65	3.00	0.00	19.00	3.81
Missing teeth (M)	91	2.29	2.00	0.00	12.00	2.31
Filled teeth (F)	91	8.63	9.00	0.00	19.00	4.19
DMF	91	14.66	15.00	4.00	27.00	4.53

N – number of patients, Me – Median, Min – minimum value, Max – maximum value, SD – standard deviation

increasing with age mean DMF number (Spearman correlation coefficient, $R_{xy}=0.27$) (Table 1).

30.77% of women reported smoking before pregnancy. The number of decayed teeth presented as Me was 4.00, missing teeth 2.00, filled teeth 7.00. For non-smoking women these values were 2.00, 2.00, and 10.00, respectively. More decayed teeth ($Z=2.13$, $p < 0.05$) were stated in women smoking before pregnancy. Significantly more filled teeth were stated in women not smoking before pregnancy ($Z=2.51$, $p < 0.05$) (Table 2).

Analysis of data concerning the number of decayed, missing and filled teeth depending on the place of residence revealed no statistically essential differences between the groups. The mean number of teeth involved in carious process in women living in the city presented as a mean value and Me was 4.23 and 3.0, whereas for women living in the country it was 2.84 and 1.50, respectively, for the missing teeth 2.15 and 2.00 and 2.47 and 2.00, respectively. The mean number of filled teeth for women living in the city was 8.50 and the median 9.00; for women living in the country it was 8.78 and 8.50, respectively. Value of the mean DMF number for women living in the city was 14.86, median 16.00; for women living in the country 14.36 and the median 14.00 (Table 3).

In women with higher education the mean number of decayed teeth was 2.84, median 2.00; with incomplete higher education 4.14 and 4.00, respectively; with secondary education 3.46 and 3.00; with technical education 5.64 and 4.00; and with primary education 6.00 and 6.00. No statistically essential differences between the features were stated. In the group of women having higher education the mean number of missing teeth had the value of 1.92, median 2.00; with incomplete higher education 1.00 and 1.00, respectively; with secondary education 2.70 and 2.00; technical education 2.86 and 2.50; and primary education 3.50 and 3.50 (no statistically essential differences between the features). In the group of women having higher education the mean number of filled teeth was 9.53 and median 9.50; with incomplete higher education 9.57 and 10.00, respectively; with secondary education 8.87 and 9.00; with technical education 6.07 and 6.00; and with primary 2.50 and 2.50 (no statistically essential differences between the features) (Table 4).

Table 2. The state of dentition versus tobacco smoking by women before pregnancy.

Tobacco smoking before pregnancy	Mean	N (%)	SD	Me	p
Decayed teeth					
Yes	4.75	28 (30.77)	3.82	4.00	Z = 2.13 (*) p<0.05
No	3.16	63 (69.23)	3.74	2.00	
Total	3.65	91 (100.0)	3.81	3.00	
Missing teeth					
Yes	2.29	28 (30.77)	2.35	2.00	Z = 0.09 (-) p>0.05
No	2.29	63 (69.23)	2.30	2.00	
Total	2.29	91 (100.0)	2.31	2.00	
Filled teeth					
Yes	7.07	28 (30.77)	3.21	7.00	Z = 2.51 (*) p<0.05
No	9.32	63 (69.23)	4.41	10.00	
Total	8.63	91 (100.0)	4.19	9.00	
Mean DMF number					
Yes	14.43	28 (30.77)	4.12	14.50	Z = 0.18 (-) p>0.05
No	14.76	63 (69.23)	4.73	15.00	
Total	14.66	91 (100.0)	4.53	15.00	

(*) indicates a difference between medians on the level of p<0.05

(-) indicates no differences between the medians p>0.05

% – percentage of the investigated

Table 3. The state of women's dentition versus place of their residence.

Residence	Mean	N (%)	SD	Me	p
Decayed teeth					
City	4.23	53 (58.24)	4.25	3.00	Z = 1.57 (-) p>0.05
Country	2.84	38 (41.76)	2.98	1.50	
Total	3.65	91 (100.0)	3.81	3.00	
Missing teeth					
City	2.15	53 (58.24)	2.20	2.00	Z = 0.61 (-) p>0.05
Country	2.47	38 (41.76)	2.47	2.00	
Total	2.29	91 (100.0)	2.31	2.00	
Filled teeth					
City	8.51	53 (58.24)	3.98	9.00	Z = 0.23 (-) p>0.05
Country	8.79	38 (41.76)	4.51	8.50	
Total	8.63	91 (100.0)	4.19	9.00	
Mean DMF number					
City	14.87	53 (58.24)	4.61	16.00	Z = 0.63 (-) p>0.05
Country	14.38	38 (41.76)	4.46	14.00	
Total	14.66	91 (100.0)	4.53	15.00	

(-) indicates no differences between the medians p>0.05

Table 4. State of dentition versus women's education.

Education	Mean	N (%)	SD	Me	p
Decayed teeth					
Higher	2.84	38 (41.76)	3.30	2.00	Z = 1.33 (-) p>0.05
Incomplete higher	4.14	7 (7.69)	2.79	4.00	
Technical	5.64	14 (15.38)	5.46	4.00	
Secondary	3.47	30 (32.97)	3.25	3.00	
Primary	6.00	2 (2.20)	8.49	6.00	
Total	3.65	91 (100.0)	3.81	3.00	
Missing teeth					
Higher	1.92	38 (41.76)	1.84	2.00	Z = 1.08 (-) p>0.05
Incomplete higher	1.00	7 (7.69)	0.82	1.00	
Technical	2.86	14 (15.38)	2.51	2.50	
Secondary	2.70	30 (32.97)	2.72	2.00	
Primary	3.50	2 (2.20)	4.95	3.50	
Total	2.29	91(100.0)	2.31	2.00	
Filled teeth					
Higher	9.53	38 (41.76)	3.93	9.50	Z = 0.16 (-) p>0.05
Incomplete higher	9.57	7 (7.69)	5.38	10.00	
Technical	6.07	14 (15.38)	3.95	6.00	
Secondary	8.87	30 (32.97)	3.78	9.00	
Primary	2.50	2 (2.20)	3.54	2.500	
Total	8.63	91 (100.0)	4.19	9.00	

The mean DMF value in women with higher education had a value of 14.29, median 14.00; with incomplete higher education it was 14.71 and 13.00, respectively; with secondary education 15.33 and 16.50; with technical 14.57 and 14.50; and with primary 12.00 and 12.00 (no statistically essential differences were stated between the features) ($Z=0.24$, $p<0.05$) (Table 5).

In pregnancy 36.63% of the examined women confirmed making dental appointments for a check-up of their oral health. Other reasons for reporting to the dentist given by the women are: toothache – 14.85%, continuation of dental treatment – 0.99%, loss of dental filling – 0.99%, and tooth fracture – 0.99%. 43.56% women did not report to the dentist for a check-up during pregnancy (Table 6).

Sources concerning oral hygiene most frequently mentioned by women are, among others: dental surgeon (63.37%), the press (35.64%), mother (30.69%), and television (29.70%) (Table 7).

Discussion

Dental examinations of oral health are particularly important factor of dental caries prophylaxis, periodontal

diseases, and other pathological states of hard and soft tissues of the oral cavity.

Pregnant women require continuous dental care. At this time changes of estrogen levels, vascular changes, and changes in subgingival flora are described, which may lead to increased gingival bleeding and increased reaction of the soft tissues to local irritants. Nausea and vomiting in pregnancy may contribute to teeth erosion [11].

Brushing teeth directly after vomiting may cause mechanical damage of tooth hard tissues because of its previous exposure to endogenous acids, therefore it should be carried out after 30 minutes. Our earlier studies revealed that in the group of women who vomited during pregnancy 54.84% declared teeth brushing directly after vomiting and, at the same time, only 3.23% of women saw the dentist [12].

The increased risk of dental caries development in pregnant women is caused, among others, by the change of dietary habits. Bachanek et al. [13] studies revealed consumption of larger numbers of meals, sneaking sweets between meals, sneaking food at night while the frequency of teeth brushing did not change, despite the increased number of meals and change in the quality of the consumed food.

Table 5. Mean DMF number versus education.

Education	Mean	N (%)	SD	Me	p
Higher	14.29	38 (41.76)	4.55	14.00	Z = 0.24 (-) p>0.05
Incomplete Higher	14.71	7 (7.69)	3.90	13.00	
Technical	14.57	14 (15.38)	3.98	14.50	
Secondary	15.33	30 (32.97)	4.75	16.50	
Primary	12.00	2 (2.20)	9.90	12.00	
Total	14.66	91 (100.0)	4.53	15.00	

Heimonem et al. [14] when analyzing the state of oral health in women after delivery stated dental caries in 93.5% mothers of premature newborns and 85.3% in mothers of full-term newborns.

In our studies the number of carious teeth in pregnant women reached values within the range of 0-19.

Pregnant women should obtain information concerning proper management depending on individual dental problems during their dental appointment. However, in our studies only 36.63% of the examined women confirmed reporting to the dentist for a check-up of their oral health.

In the studies of Boggess et al. [15] from 2008, among the reasons for neglecting routine dental care during pregnancy, women mentioned, among others, no dental problems (45%), no dental insurance (31%), and fear of going to the dentist (8%).

Studies conducted in Australia among 388 women within 5 months after their delivery revealed that problems perceived by women in the last 12 months concerned, among others, pain or gingival bleeding (59.5%) and unpleasant taste in the mouth (26.5%) [16].

The studies of Saddka et al. [17] conducted in 124 women in the third trimester of pregnancy revealed that one problem connected with the state of oral cavity was reported by 31.5% of the examined women, two or more by 28.2% of the women. The types of health problems reported by women are, among others, dental lesions (43.5%), gingival pain (6.5%), gingival swelling (8.9%), gingival bleeding (21%), bad breath (10.5%), and tooth mobility (5.6%). Sources of knowledge mentioned by women are: dentists (60%), magazines (48.6%), television (42.9%), newspapers (40.0%), brochures (34.3%), radio (22.9), and the Internet (20.0%).

Data from our studies indicate inadequate participation of the dentists and media in the promotion of oral health knowledge among women in the reproductive age.

Results of the studies conducted in Japan in the years 2004-05 revealed that the spread of tobacco smoking among women before pregnancy, during pregnancy, and after the delivery was 29.3%, 9.8%, and 23.1%, respectively [18]. The authors noticed a considerable decrease in smoking in pregnant women, but a considerable increase after delivery.

Results of the studies conducted in Barcelona revealed that the percentage of women smoking at the beginning of pregnancy had the value of 41 (942 smokers among 2,295

Table 6. Reasons for dental appointments of pregnant women.

Reasons given by women	N (%)
Dental check-up	37 (36.63)
Toothache	15 (14.85)
Gingival bleeding	1 (0.99)
Continuation of dental treatment	1 (0.99)
Loss of filling	1 (0.99)
Tooth fracture	1 (0.99)
No dental appointment	44 (43.56)
No answer	1 (0.99)

Table 7. Sources of women's knowledge about oral hygiene-multiple choice answers.

Sources of knowledge	N (%)
Dentist	64 (63.37%)
Press	36 (35.64%)
Mother	31 (30.69%)
TV programmes	30 (29.70%)
School	16 (15.84%)
Radio programmes	14 (13.86%)
Internet	5 (4.95%)
Brochures	2 (1.98%)

women), from among which 40% (377 women) smoked until delivery [19].

The studies point out that women smoking tobacco from the 25th week of pregnancy or above increase the risk of delivering a baby with low birth weight and pre-term delivery, whereas passive smoking at this time is related to an increase in the risk of low birth weight of a newborn. Therefore, women should be motivated to quit smoking even in early pregnancy and not only limit the number of smoked cigarettes [20].

The analysis of risk factors and the assessment of the state of dentition favors proper orientation of the prophylactic and therapeutic activities in women during their pregnancy, including modification of improper health behaviors.

Oral health promotion spread by the dentists among women in the reproductive age, including propagation of a healthy lifestyle – without a cigarette – will have a positive effect on women's health as well as children's health, even in their prenatal life.

Conclusions

1. In the group of women smoking before pregnancy a worse state of their dentition was stated than in the group of non-smokers.
2. Living environment and the level of education do not influence women's state of dentition.
3. Women in the reproductive age planning to have a baby and women who are pregnant should be motivated to quit smoking and to have dental check-ups as well as to start dental treatment.

References

1. FONTANA M., ZERO D.T. Assessing patients' caries risk. *J Am Dent Assoc* **137**, (9), 1231, **2006**.
2. SILK H., DOUGLASS A.B., DOUGLASS J.M., SILK L. Oral Health During Pregnancy. *Am Fam Physician* **77**, (8), 1139, **2008**.
3. GIGLIO J.A., LANNI S.M., LASKIN D.M., GIGLIO N.W. Oral health care for the pregnant patient. *J Can Dent Assoc* **75**, (1), 43, **2009**.
4. BOGGESS K.A., EDELSTEIN B.L. Oral Health in Women During Preconception and Pregnancy: Implications for Birth Outcomes and Infant Oral Health *Matern Child Health J* **10**, S169, **2006**.
5. CAUFIELD P.W., CUTTER G.R., DASANAYAKE A.P. Initial acquisition of mutans streptococci by infants: evidence for a discrete window of infectivity. *J Dent Res* **72**, 37, **1993**.
6. BRAMBILLA E., FELLONI A., GAGLIANI M., MALERBA A., GARCÍA-GODOY F.D., STROHMENGER L. Caries prevention during pregnancy: results of a 30-month study. *JADA* **129**, 871, **1998**.
7. XIONG X., ELKIND-HIRSCH K.E., VASTARDIS S., DELAROSA R.L., PRIDJIAN G., BUEKENS P. Periodontal disease is associated with gestational diabetes mellitus: a case-control study. *J Periodontol* **80**, (11), 1742, **2009**.
8. SOMOGYI A., BECK H. Nurturing and Breast-feeding: Exposure to Chemicals in Breast Milk. *Environ Health Perspect* **101**, (Suppl. 2), 48, **1993**.
9. REEVES S., BERNSTEIN I. Effects of maternal tobacco-smoke exposure on fetal growth and neonatal size. *Expert Rev Obstet Gynecol* Nov1, **3**, (6), 719, **2008**.
10. MARITZ G.S., HARDING R. Life-long programming implications of exposure to tobacco smoking and nicotine before and soon after birth: evidence for altered lung development *Int. J. Environ. Res. Public Health*, **8**, 875, **2011**.
11. MICHALOWICZ B.S., DIANGELIS A.J., NOVAK M.J., BUCHANAN W., PAPAPANOU P.N., MITCHELL D.A., CURRAN A.E., LUPO V.R., FERGUSON J.E., BOFILL J., MATSEOANE S., DEINARD A.S. JR., ROGERS T.B. Examining the safety of dental treatment in pregnant women. *JADA* **139**, (6), 685, **2008**.
12. NAKONIECZNA-RUDNICKA M., BACHANEK T., JEZIEKSKA-JAKIMIUK A., JAKIMIUK A.J. Vomiting in the pregnant as a risk factor of enamel erosion – a pilot study. *Pol. J. Environ. Stud* **18**, (1A), 562, **2009**.
13. BACHANEK T., JEZIEKSKA-JAKIMIUK A., NAKONIECZNA-RUDNICKA M. Dietary habits in pregnant women versus the frequency of oral hygiene procedures. *Pol. J. Environ. Stud*, **18**, (1A), 566, **2009**.
14. HEIMONEN A., RINTAMÄKI H., FURUHOLM J., JAN-KET S., KAAJA R., MEURMAN J.H. Postpartum oral health parameters in women with preterm birth. *Acta Odontologica Scandinavica* **66**, 338, **2008**.
15. BOGGESS K.A., URLAUB D.M., MASSEY K.E., MOOS M.K., MATHESON M.B., LORENZ C. Oral Hygiene Practices and Dental Service Utilization Among Pregnant Women. *J Am Dent Assoc* **141**, 553, **2010**.
16. THOMAS N.J., MIDDLETON P.F., CROWTHER C.A. Oral and dental health care practices in pregnant women in Australia: a postnatal survey. *BMC Pregnancy Childbirth* **21**, 8, 13, **2008**.
17. SADDKI N., YUSOFF A., HWANG Y.L. Factors associated with dental visit and barriers to utilisation of oral health care services in a sample of antenatal mothers in Hospital Universiti Sains Malaysia. *BMC Public Health* **10**, 75, **2010**.
18. KANEKO A., KANEITA Y., YOKOYAMA E., MIYAKE T., HARANO S., SUZUKI K., IBUKA E., TAMAKI T., NAKAJIMA H., OHIDA T. Smoking trends before, during, and after pregnancy among women and their spouses. *Pediatr Int* **50**, (3), 367, **2008**.
19. VILLALBÍ J.R., SALVADOR J., CANO-SERRAL G., RODRÍGUEZ-SANZ M.C., BORRELL C. Maternal smoking, social class and outcomes of pregnancy. *Paediatr Perinat Epidemiol* **21**, 441, **2007**.
20. JADDOE V.W., TROE E.J., HOFMAN A., MACKENBACH J.P., MOLL H.A., STEEGERS E.A., WITTEMAN J.C. Active and passive maternal smoking during pregnancy and the risks of low birthweight and preterm birth: the Generation R Study. *Paediatr Perinat Epidemiol* **22**, 162, **2008**.