Medical Science

pISSN 2321–7359; eISSN 2321–7367

Influence of antenatal prevention on the state of the oral cavity of pregnant women

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To Cite:
Oksana IG, Doinitsa GR, Tetiana SK, Oleksandr OV. Influence of antenatal prevention on the state of the oral cavity of pregnant women. *Medical Science* 2023; 27: e102ms2531.
doi: https://doi.org/10.54905/disssi/v27i132/e102ms2531

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Peer-Review History
Received: 18 October 2022
Reviewed & Revised: 22/October/2022 to 13/February/2023
Accepted: 17 February 2023
Published: 20 February 2023

Peer-review Method
External peer-review was done through double-blind method.

URL: https://www.discoveryjournals.org/medicalscience

ABSTRACT

The use of an antenatal preventive complex, which includes mineral-vitamin and probiotic preparations, during pregnancy leads to a decrease in the intensity of dental caries and an improvement in the condition of periodontal tissues in women already during the last trimester of pregnancy and after childbirth. In particular, 2.22-10.58% lower indicators of dental caries intensity according to the data of the DMF index and 68.55-74.33% lower values of the PMA index are recorded, compared to women who did not take preventive measures. The study of the oral fluid of women in the dynamics of monitoring them during the implementation of antenatal prevention measures showed an increase in its mineralizing potential, which was characterized by an increase in the total level of calcium by 17.21-39.17% ($p < 0.05$), free calcium by – 20.00-45.76% ($p < 0.05$), phosphate ions by – 8.49-12.15% and preservation of protective properties at the stage of completion of the preventive course and a year after childbirth.

Keywords: Pregnant women, dental caries, periodontal tissues, mineralizing potential of saliva, antenatal prevention.

1. INTRODUCTION

The mother is the key person in the formation of a healthy lifestyle of the child and her own health is the guarantee of the health of her offspring. The knowledge and skills of the future mother regarding the prevention of dental diseases play an important role in the formation of the child's dental health, they are especially important in the development of early childhood caries (Manchanda et al., 2014; Hariyani et al., 2020; Ramadugu et al., 2021).

The experience of developed countries has shown that the most effective method of combating dental caries, both from a medical and economic point of view, is preventive (Manchanda et al., 2014). As it is known, germination, formation and primary mineralization of temporary teeth occur during pregnancy (Hariyani et al., 2020). It is in the antenatal period that the beginning of the prevention of dental caries in children is theoretically justified. Indirectly, due to the state of the mother's body, optimal conditions are created for the development of the child's tooth buds, which, in turn, leads to the formation of caries-resistant hard tissues of the tooth (Ramadugu et al.,

2021).

As evidenced by the research results, pregnant women have disorders of the macro- and micronutrient supply of the body, which leads to changes in mineralization processes, which, in turn, affects the condition of the teeth and periodontal tissues of the woman during pregnancy and will certainly have its consequences for the condition of the hard tissues of teeth in the future child (Ballestín et al., 2021; Beckett et al., 2022). Antenatal prevention measures are extremely important both for the dental health of the future child and for its preservation in the pregnant woman (Boustedt et al., 2020; Bashir et al., 2021). The aim of the work was to evaluate the impact of antenatal preventive measures on the condition of hard dental tissues and periodontal tissues in women during and after pregnancy.

2. MATERIALS AND METHODS

To achieve the outlined goal, 60 pregnant women were under our observation, from which two observation groups were formed: The main one, in which antenatal prevention measures were carried out and a comparison group, in which only generally accepted measures to prevent dental diseases were carried out. The antenatal prevention complex included the use of the mineral-vitamin preparation "Elevit Pronatal", "Iodomarin 200" one tablet daily in the morning after meals and the probiotic pills "BioGaia ProDentis" after evening tooth brushing for 20 days while II and III trimester of pregnancy. Women underwent a dental examination in each trimester of pregnancy and one year after the birth of a child, which included the determination of caries indices – DMF and D_sMF_s, PMA index and OHI-S hygienic index. Oral fluid was also examined, in particular, the level of inorganic phosphorus (phosphate ions), inorganic and ionized calcium was determined by standardized methods using diagnostic kits "Filicid-diagnostic" (Ukraine); sIgA content by the method of radial immunodiffusion according to Mancini. Statistically evaluated the probability of the obtained results in the case of normal distribution of both samples by Student Fisher test, in other cases – U-Wilkson for independent samples and T-Wilkson test for dependent samples using the program "STATISTICA 6.1" ("StatSoftInc") № AGAR909E415822FA (Stirling, 2013).

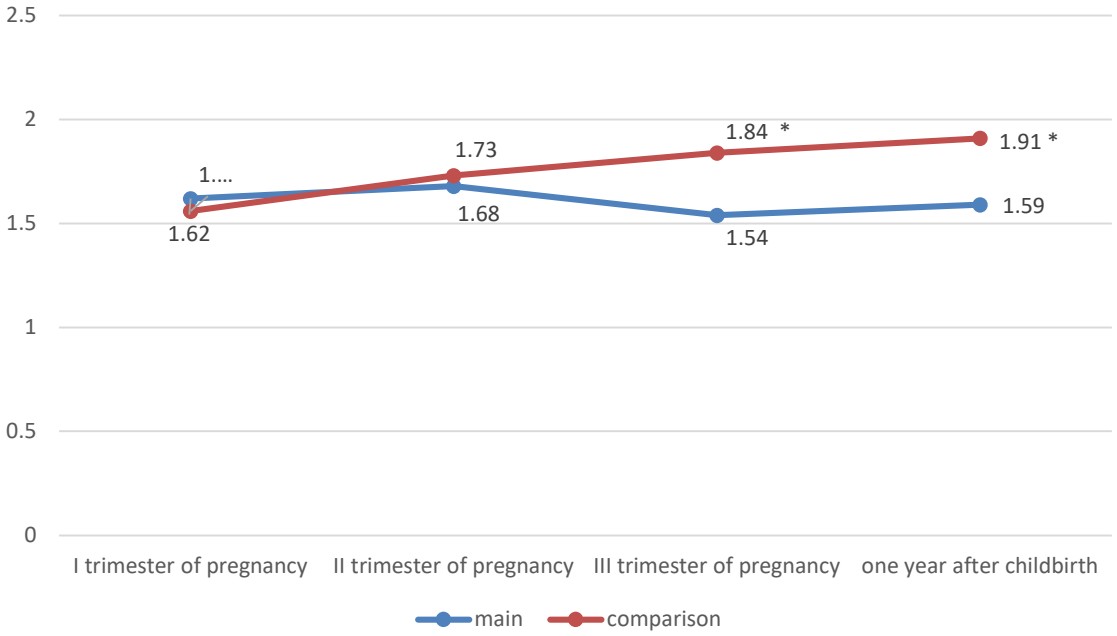
3. RESULTS AND DISCUSSION

Dental examinations of women during pregnancy and after childbirth made it possible to detect changes in the condition of women's oral cavity tissues and assess the impact of preventive measures on them. In particular, Table 1 shows the values of the caries indices, which illustrate the condition of the hard tissues of the teeth in women in the dynamics of monitoring them.

Table 1 Indicators of DMF/D_sM_s, indexes in women in the process of carrying out antenatal preventive measures, M ± m

Observation period	Groups		p
	Main	Comparison	
DMF			
I trimester of pregnancy	9.85 ± 0.54	9.74 ± 0.65	> 0,05
II trimester of pregnancy	9.89 ± 0.53	9.87 ± 0.51	> 0,05
III trimester of pregnancy	9.91 ± 0.72	10.13 ± 0.77	> 0,05
One year after childbirth	10.02 ± 0.95	11.08 ± 0.95	> 0,05
D_sMF_s			
I trimester of pregnancy	14.75 ± 1.03	14.88 ± 1.15	> 0,05
II trimester of pregnancy	15.01 ± 0.92	15.60 ± 1.15	> 0,05
III trimester of pregnancy	15.33 ± 1.02	16.05 ± 1.14	> 0,05
One year after childbirth	16.08 ± 1.01	17.14 ± 1.30	> 0,05

Despite the absence of a probable difference between the indicators in the observation groups and a common tendency for the index values to worsen, the intensity of dental caries at the end of pregnancy and after birth was lower in women who were given antenatal prevention measures than in women who were not given preventive measures. The increase in intensity in women of the main group was (0.17 ± 0.01) of affected teeth according to the DMF index and (1.33 ± 0.05) – according to the D_sMF_s index during the entire period of their observation. In the comparison group, these indicators were (1.34 ± 0.08) and (2.26 ± 0.15) affected teeth, respectively. The state of oral hygiene of women during their observation changed in the direction of its deterioration in the absence of the preventive measures proposed by us, which is illustrated in picture 1.



Note: * – there is a probable difference between the indicators of the main group and the comparison group, p < 0,05

Picture 1 The value of the oral hygiene index in women during antenatal preventive measures, M ± m.

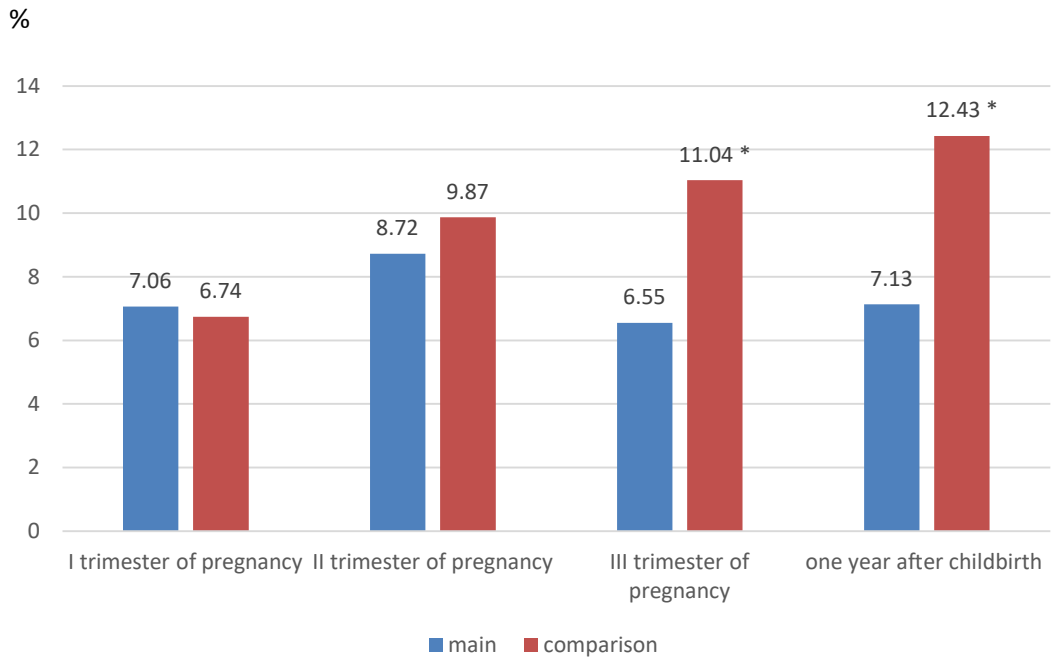
Diametrically opposite was the direction of changes in the values of the hygienic index in women who were subject to antenatal prophylaxis. An improvement in the state of oral hygiene was noted, which indicates the effectiveness of the preventive program. A probable difference was established between the values of the hygienic index in the groups during the third month of pregnancy, which amounted to 19.48% ($p < 0.05$) and during the examination of women a year after the birth of the child – 20.13% ($p < 0.05$).

The condition of the periodontal tissues also changed during the monitoring of women depending on the preventive measures taken. In particular, the PMA index was probably different in the groups starting from the III trimester of pregnancy, as shown in picture 2. In general, gum damage in the form of gingivitis was observed in 51.72% of women in the main group during the third trimester of pregnancy and 44.83% after childbirth. These indicators were significantly higher in the comparison group, namely: 82.14 and 76.92 %, which indicates a worse condition of the periodontal tissues in women who did not undergo the preventive measures proposed by us. Despite the fact that the complex of antenatal prevention was primarily developed to prevent the development of dental caries, at the same time it showed a certain periodontoprotective effect.

Another criterion for the positive effect of our proposed preventive complex on both the hard tissues of the teeth and the periodontal tissues are the dynamics of changes in sIgA, as the first humoral link of oral cavity protection and a marker of local inflammatory processes (Table 2).

The relatively stable level of immunoglobulin in women of the main group indicates the absence of changes in the dental health of women, on the other hand, in the comparison group, the activation of local protective mechanisms is noted, which is confirmed by a probable increase in the level of sIgA by 50.00% ($p < 0.05$) at the end of pregnancy and by 18.97% ($p < 0.05$) after the birth of a child. The mineralizing potential of the oral fluid of women in the observation groups also underwent significant changes under the influence of antenatal prophylaxis (Table 3).

In particular, the total level of calcium in the oral fluid of women in the main group was 39.17% ($p < 0.05$) higher compared to the comparison group in the III trimester of pregnancy and by 17.21% ($p < 0.05$) one year after the birth of the child. This was mostly due to the fraction of free calcium, which was quantitatively 45.76% ($p < 0.05$) higher in women under the conditions of preventive measures at the end of pregnancy and by 20.00% ($p < 0.05$) – after birth child. The content of bound calcium was also probably higher in women of the main group in the III trimester of pregnancy, namely by 32.79% ($p < 0.05$).



Note: * – there is a probable difference between the indicators of the main group and the comparison group, $p < 0.05$.

Picture 2 The value of the PMA index in women during antenatal preventive measures, M ± m.

Table 2 The content of sIgA in the oral fluid of women during antenatal preventive measures, %

Observation period	Groups		p
	Main	Comparison	
I trimester of pregnancy	0.55 ± 0.05	0.53 ± 0.03	> 0.05
II trimester of pregnancy	0.59 ± 0.03	0.61 ± 0.02	> 0.05
III trimester of pregnancy	0.52 ± 0.02	0.78 ± 0.05	< 0.05
One year after childbirth	0.58 ± 0.04	0.69 ± 0.04	< 0.05

Table 3 The content of mineralizing components in the oral fluid of women in the process of carrying out antenatal preventive measures, M ± m

Indicators	Groups	Pregnancy period			A year after childbirth	p_1	p_2	p_3
		I trimester	II trimester	III trimester				
Total level of calcium ions (mmol/l)	Main	1.32 ± 0.05	1.44 ± 0.09	1.67 ± 0.10*	1.43 ± 0.06	> 0.05	> 0.05	> 0.05
	Comparison	1.35 ± 0.06	1.23 ± 0.02	1.20 ± 0.08	1.22 ± 0.08	> 0.05	> 0.05	> 0.05
Free calcium (mmol/l)	Main	0.84 ± 0.06	0.89 ± 0.05	0.86 ± 0.06*	0.61 ± 0.02	> 0.05	> 0.05	> 0.05
	Comparison	0.89 ± 0.05	0.73 ± 0.03	0.59 ± 0.01	0.61 ± 0.02	> 0.05	> 0.05	> 0.05
Bound calcium (mmol/l)	Main	0.48 ± 0.04	0.55 ± 0.04	0.81 ± 0.05*	0.65 ± 0.04	> 0.05	< 0.05	> 0.05
	Comparison	0.46 ± 0.03	0.50 ± 0.02	0.61 ± 0.02	0.57 ± 0.03	> 0.05	> 0.05	> 0.05
Level of phosphate ions (mmol/l)	Main	3.41 ± 0.20	3.58 ± 0.15	3.60 ± 0.17	3.45 ± 0.18	> 0.05	> 0.05	> 0.05
	Comparison	3.37 ± 0.11	3.62 ± 0.09	3.21 ± 0.12	3.18 ± 0.22	> 0.05	> 0.05	> 0.05

Notes. * – comparison of indicators of the main group and the comparison group; p1 – comparison of indicators of the I and II trimesters of pregnancy; p2 – comparison of indicators of the II and III trimesters of pregnancy; p3 – comparison of indicators of the III trimester of pregnancy and after childbirth.

The level of phosphate ions in the oral fluid of women in observation groups was more stable, in particular, it fluctuated within (3.41 ± 0.20) - (3.60 ± 0.17) mmol/l in the main group and within (3.18 ± 0.22) - (3.62 ± 0.09) mmol/l – in the comparison group. In general, the obtained results indicate a greater mineralizing ability of saliva in women to whom the antenatal prevention complex developed by us was applied, which was reflected in the condition of the hard tissues of the teeth and is consistent with the results of clinical maternity examinations. Improving the mineralizing potential of women's oral fluid as a result of antenatal prophylaxis is certainly a positive criterion that reflects an additional preventive effect, but the main task of preventive measures was to influence the state of mineralization of the hard tissues of the future child's teeth.

4. CONCLUSIONS

The use of an antenatal preventive complex during pregnancy leads to a decrease in the intensity of dental caries and an improvement in the condition of periodontal tissues in women during the last trimester of pregnancy and after childbirth. In particular, 2.22-10.58 % lower indicators of dental caries intensity according to the data of the DMF index and 68.55-74.33% lower values of the PMA index are recorded, compared to women who did not take preventive measures. A study of the oral fluid of women in the dynamics of monitoring them during antenatal prevention measures showed an increase in its mineralizing potential, which was characterized by an increase in the total level of calcium, free calcium and phosphate ions and preservation of protective properties at the stage of completion of the preventive course and a year after childbirth.

Ethical approval

The research proposal was approved by the by the Medical Ethics Committee of Bukovynian State Medical University, Chernivtsi, Ukraine (registration number: 15.09.22/1).

Authors' contribution

Research concept and design, literature review, examination of patients – Doinitsa G Romaniuk; elaboration and generalization of the results – Oleksandr O Vitkovskyi; editing, preparation of materials for printing – Tetiana S Kitsak; provision of advisory assistance – Oksana I Godovanets.

Funding

This study has not received any external funding.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

REFERENCES AND NOTES

1. Ballestín SS, Campos MIG, Ballestín JB, Luesma Bartolomé MJL. Is Supplementation with Micronutrients Still Necessary during Pregnancy? A Review. Nutrients 2021; 13 (9):3134. doi: 10.3390/nu13093134
2. Bashir S, Menon I, Gupta R, Sharma A, Arora V, Varshney S. Dental Considerations in Pregnancy – A Systematic Review. J Pharm Res Intern 2021; 33(40A):82-100. doi: 10.9734/jpri/2021/v33i40A32224
3. Beckett DM, Broadbent JM, Loch C, Mahoney EK, Drummond BK, Wheeler BJ. Dental Consequences of Vitamin D Deficiency during Pregnancy and Early Infancy - An Observational Study. Int J Environ Res Public Health 2022; 19(4):1932. doi: 10.3390/ijerph19041932
4. Boustedt K, Roswall J, Kjellberg E, Twetman S, Dahlgren J. A prospective study of perinatal and metabolic risk factors for early childhood caries. Acta Paediatr 2020; 109(11):2356-61. doi: 10.1111/apa.15231
5. Hariyani N, Do LG, Spencer AJ, Thomson WM, Scott JA, Ha DH. Maternal caries experience influences offspring's early childhood caries - a birth cohort study. Community Dent Oral Epidemiol 2020; 48(6):561-9. doi: 10.1111/cdoe.12568
6. Manchanda K, Sampath N, Sarkar AD. Evaluating the effectiveness of oral health education program among mothers with 6-18 months children in prevention of early childhood caries. Contemp Clin Dent 2014; 5(4):478-83. doi: 10.4103/0976-237X.142815

7. Ramadugu K, Bhaumik D, Luo T, Gicquelais RE, Lee KH, Stafford EB, Marrs CF, Neiswanger K, McNeil DW, Marazita ML, Foxman B. Maternal Oral Health Influences Infant Salivary Microbiome. J Dent Res 2021; 100(1):58-65. doi: 10.1177/0022034520947665