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The Association Between Oral Chronic Infectious Focus and Adverse Pregnancy Outcomes

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Abstract

Objectives: The purpose of the study is to identify the correlation of some clinical and laboratory parameters characterizing oral chronic infectious focus, on the timing of labour in parturient women.

Materials and Methods: The study was conducted in 88 pregnant women in the third trimester of pregnancy. Parturient women were divided into 2 groups: group A-56 of pregnant women with normal terms labor and group B-32 pregnant women with preterm labor to assess the chronic infectious course of the oral cavity, determined the indicators of damage to the teeth and periodontium, and some cellular blood parameters was carried out using the following indicators.

Results: In group B the indicators of damage to the teeth and periodontium significantly exceed the sum of the same-name indicators obtained in group A. In group B, an analysis of the index values of blood cells describing endogenous intoxication shows that during third trimester the phenomena of infectious intoxication was noted.

Conclusion: In those with preterm birth (unlike in those with term labor) index values describing chronic oral infectious focus, show more tangible correlations with the term of delivery, which indicates the significant role of the chronic infectious focus in the preterm birth.

Keywords: chronic oral infectious focus; endogenous intoxication; preterm labor; relationship

Introduction

The association between periodontal disease and systemic diseases has been proposed in the literature owing to the former's chronic state of inflammation, and adverse pregnancy outcomes are no exception. Several studies have hypothesized that oral infection may affect pregnancies [1-5]. Results of many clinical-experimental and epidemiological researches testify, that the infectious diseases of tissues of oral cavity /especially inflammatory lesions of periodontium/ form so-called "chronic odontogenic infection focuses" which are the risk factors for the development of many systematic illnesses or for the deterioration of their clinical course [6,7]. According to the American Dental Association, about 60-75% of pregnant women suffer from gingivitis, which can be exacerbated by hormonal changes during pregnancy [8]. During pregnancy, oral diseases can cause pre-eclampsia, preterm birth, low birth weight, and stillbirth. Periodontitis is a possible risk factor for pregnancy outcomes, including preterm birth [9-12]. In the diagnosis of endogenous intoxication caused by foci of chronic infection, an index assessment of cellular components plays a special role, which is performed on the basis of data from the analysis of results of clinical blood test: Leucocyte index of intoxication, Dashtayants nuclear index, lymphocyte-to-monocyte ratio and etc. These indicators are often used in the assessment and presence of intoxication during and outcome of pregnancy (labor prematurity) [13-15]. The scientific literature periodically mentions the effect of common inflammatory periodontal lesions on the course and outcome of pregnancy, but there are few works that substantiate the role of some cellular blood parameters that characterize endogenous intoxication during labor and preterm labor. Taking into account above written, on our side clinical and laboratory studies were carried out, the aim was to investigate and reveal the ratio of some of the cellular parameters of blood that characterize endogenous intoxication and indices characterizing oral chronic infectious focus in time labor and preterm birth treatment of oral infection during pregnancy a preventive strategy that reduces oral bacterial load. Given the above, the aim of the study is to identify the correlation of some clinical and laboratory parameters characterizing oral chronic

infectious focus, on the timing of childbirth in parturient women.

Materials and Methods

The study was conducted in 88 pregnant women aged 20 to 40 years in the third trimester of pregnancy (period 2019-2024). Parturient women were divided into 2 groups: group A-56 of pregnant women with normal terms labor and group B-32 pregnant women with preterm labor. To assess the clinical state of the periodontium, a standard set of index indicators was used - bleeding gums, depth of pathological pockets (ac-95 SCIENCE. EDUCATION. PRACTICE cording to Kotschke), tooth mobility, gum inflammation (PMA according to Parma and GI according to Loe-Silness), oral hygiene (OHI-S index according to Green- Vermillion). Periodontal indicators were determined during the last week of the gestational period. To assess the chronic infectious course of the oral cavity, determined the indicators of damage to the teeth and periodontium, and some cellular blood parameters characterizing endogenous intoxication was carried out using the following indicators: Leukocyte index of intoxication (LII by Kalf-Khalifa), its modification by Ostrovski (LIIm), white blood cells count shift index (WBC shift index), Dashtayants nuclear index, allergization index (AI), neutrophil-to-monocyte ratio index (NMR), lymphocyte-to monocyte ratio index (LMR), lymphocyte-to-granulocyte index (LGI), leucocyte shift index (LSI), Garkavi index (GI), reactive neutrophil

response index by Khabirov. For the assessment of chronic infectious oral focus the index of oral chronic septicemia risk (COSR) by Yudina and Leus was used [16]. As the index assessment implies a detailed observation of periapical periodontium, therefore in determination of DMF index from the filled and caries-affected teeth the chronic periodontitis was separated and determined, which is the same time was included in the DMF total index.

Statistical Analysis

The data obtained were organized and the statistical analysis was performed using the SPSS program (IBM Statistics 21.0). P values < 0.05 were considered statistically significant. The results of clinical studies were statistically processed and analyzed according to the student's method (with the compilation of variation series and the calculation of mean values, mean error, etc.), as well as the calculation of the coefficient of reliability of the difference in indicators (t), analysis of variance (ANOVA, F-test), correlation analysis and determination of chances -odds/ratio indicator.

Results

In the study groups the average terms of labor were; in case of preterm labor 35,91 + 0,30 weeks, and 39,25 + 0,13 weeks in case of normal terms of labor (t = 10,12). The distribution of index values describing the defeat of dental-periodontal complex and endogenous intoxication by groups is presented in Table 1.

Table 1: Index values describing the defeat of dental-periodontal complex and endogenous intoxication by groups is presented.

Indicator	Normal Value	Groups		t	F	P
		A2 Women in labor/n=32/	B2 Women in labor/n=56			
1	2	3	4	5	6	7
Age	-	28,87±0,74	28.09±0,62	0,81	1,979	<0,5
Weight of Newborn	2500 and more	2766,00±103,51	3321,25±64,55	4,55	3,878	<0,001
LII	0,09	2,32±0,15	2,16±0,14	0,80	0,659	<0,5
Index of Leucocyte Count Shift	0,06	0,15±001	0,13+0,01	1,43	0,856	<0,1
LIIM	1,0-1,6	2,28±0,19	2,31±0,13	0,13	2,286	>0,5
NI	Up to 0,05	0,34±0,03	0,29±0,02	1,39	1,007	<1
AI	0,79-1,08	0,17±0,02	0,58±0,05	8,20	0,899	<0,001
Neutrophil-to-Monocyte Ratio Index	11,83	10,89±1,49	10,28±0,98	0,34	1,764	>0,5
LMR	5,34	3,61±0,47	3,45±0,28	0,29	0,878	>0,5
LGI	4,56	0,36±0,02	0,35±0,02	0,36	1,429	>0,5
Index of Blood Leucocyte Shift	1,96	2,26±0,02	2,37±0,14	0,46	2,702	>0,5
Garkavi Index	0,3-0,5	0,42±0,02	0,40±0,02	1,43	2,132	<0,1
Reactive Neutrophil Response	10,6	15,50±1,67	13,99±1,18	0,74	0,873	<0,25
0	0	1,87±0,18	1,57±0,17	1,20	0,656	>0,1
D	0	3,19±0,25	2,23±0,15	3,31	2,341	<0,01

Filling	0	2,09±0,17	1,68±0,09	2,16	3,675	<0,05
DMF	0	9,97±0,62	6,39±0,33	5,11	2,281	<0,001
Periodontitis	0	2,81±0,25	0,91±0,09	7,31	12,190	<0,001
Caries Intensity Level	0	0,34±0,02	0,23±0,01	5,00	3,146	<0,001
Bleeding	0	2,19±0,13	0,93±0,07	8,40	10,458	<0,001
OHI	0	2,03±0,15	1,24±0,08	4,65	10,446	<0,001
PMA	0	2,31±0,1	1,13±0,08	9,08	20,654	<0,001
GI	0	2,31±0,13	1,32±0,10	6,19	12,856	<0,001
Teeth Mobility	0	1,26±0,12	0,31±0,06	7,31	5,210	<0,001
Pathological Pocket Dept	0	4,00±0,37	1,36±0,27	5,74	22,144	<0,001
Index of Oral Chronic Septicemia Risk	0	23,53±1,09	11,93±0,87	8,34	8,732	<0,001

The data in the table 1 indicates that in the group of persons with preterm labor, the indicators of damage to the teeth and periodontium significantly exceed the sum of the same-name indicators obtained in the comparative group; in all cases the difference is statistically reliable (except for 0 component of DMF index). In women with normal labor terms the DMF index averaged 6,39, which corresponds to a high intensity of decay (according to WHO), but in group with preterm labor (birth) this index is 9,97, a very high intensity. The assessment of the caries intensity level shows, that in women with preterm labor is marked moderate level caries (CIL > 0,3) and in the comparative group a low level of caries intensity (CIL < 0,3). Special attention is paid to the evaluation of periapical chronic lesions, which is not carried out in such studies, but such lesions are the main indicators describing the focus of infection of the oral cavity and as a separate component are included in the composition of Index of Oral chronic septicemia risk (COSR). In our study this indicator in the group with preterm labor significantly and reliably exceeds the comparative group (t = 7,31), which significantly influenced the value of Index of Oral chronic septicemia risk (COSR). In the group with preterm labor index values describing clinical state of periodontium also differed with worst values, especially in terms of gingival bleeding, level of gingival inflammation, destructive changes in periodontal disease. Finally, the index values of the presence of a chronic focus of infection of the oral cavity, which is essentially the sum of all previous tooth-periodontal indices, indicates that in the group with premature birth the oral chronic septicemia risk (COSR)was at high-risk zone (23,53 points), when in the group with normal term of labor this indicator was close to the lower border of the middle risk zone (11,93 points).

As the table data show, the values of blood cellular indices describing endogenous intoxication in almost all cases (in both groups) are outside the borders of the normal (ordinary) (norm) zone of these indicators (except Garkavi index). The indices describing the presence of chronic and purulent inflammation in organism (LII, LSII (index of leucocyte count shift), LIIM) in both groups exceed the normal values, which corresponds to low degree of endogenous intoxication, but inter group differences are not distinguished by statistical validity (reliability) (t < 2): The same can be seen in the case of such index values as NI (Nuclear Index), Index of blood leucocyte shift, reactive neutrophil response. Based on the clinical interpretation of the Dashtayants nuclear index, it should be noted, that the value exceeding 1,0 indicates a severe state of health of the patient (in our study the values was correspondingly 0,29 and 0,34). Most authors think that definition of one individual index is not enough to represent the state of health of the patient, therefore it is necessary to take a complex approach using several indices describing the same phenomenon. In the study groups in those who gave birth prematurely the value of reactive neutrophil response (RNR) indicates the presence of compensated endogenous intoxication (index value is 15 and more). More significant results were obtained when determining the allergization index (AI). Particularly, in two studied groups revealed significant decrease of the index value, which represents the ratio of lymphocytes and eosinophils to the other cells of the white blood. This difference is especially noticeable in those who gave birth prematurely, in the case of which the index value is inferior to the similar index of women with normal labor terms more than, 70% (t = 8,2). Index values of neutrophil-to-monocyte ratio index (NMR), lymphocyte-to-monocyte ratio index (LMR), lymphocyte-to-granulocyte ratio index (LGI) were below the clinical norms. From this point of view a significant result was obtained in determination of lymphocyte-to-granulocyte ratio index, which is determined by the ratio of lymphocytes to other cellular elements, which makes possible to differentiate autointoxication from

infectious intoxication. In this case the results of study indicate mainly the presence of infectious intoxication in pregnant women. Quite interesting results were obtained during correlation analysis of data, which was carried out between all the studied indicators. But since for our study the main indicators are those characterizing the chronic focus of infection of dental-periodontal complex, the term of delivery and endogenous intoxication, therefore, first of all, we present the value of the correlation coefficient of these indicators in the two studied groups.

As the data show, in the group of women with term labor the term of labor has a weak positive or negative correlation with all indicators. In particular, with an indicator of the oral infectious focus it had only -,0,13 value. While in the group with preterm labor between the same indicator's higher values of the correlation coefficient were revealed, which ranged from the upper limit of weak ties to the lower limit of medium ties (,232-,307). As expected, the term of labor to the indicator of chronic oral infectious focus shows an inverse relation of medium value (magnitude) (-,305), which suggests that as the indicator of chronic infectious focus increases the term of labor decreases. In this case, regression analysis shows that with an increase in the index of oral chronic septicemia risk (COSR) by one unit, the term of labor is reduced by 0.08 weeks. It is especially characteristic that in the group with preterm labor Index of Chronic Oral Septicemia Risk (COSR) showed a moderate correlation with blood index values describing endogenous intoxication in the organism, while in the group with term labor these relationships had an exceptionally weak or low degree character. Analysis of correlations between individual (separate) indicators describing the clinical condition of the teeth, periodontium and endogenous intoxication also indicates a clearer expression of these relationships in the group with preterm labor. In particular in the group of individuals listed above, the index revealed a correlation of medium or high value with indicators describing periodontitis (685), gingival bleeding (,745), condition of oral hygiene (,735), inflammation of the gums (PMA, ,628 and GI, ,680), the destructive component of periodontal tissues (,625 and ,674), when the relationship with caries, DMF, Caries intensity level was of a weak or medium value (respectively: -0,47, -,318, -,266).In the group with term labor the same trend was noted(in terms of direct or reverse nature of relationship),but with the value of correlation coefficient within the

limits of the severity of a low degree(except for the connection between LII and periodontitis, when the correlation coefficient had a ,337 value).

Discussion

The study of the possible influence of periodontal disease on the course and outcome of pregnancy is one of the urgent problems of practical and scientific dentistry, and is also of general medical importance. From this point of view, it is especially important to study the influence of a chronic odontogenic focus during pregnancy, in particular, on preterm birth with prematurity. In recent years, there have been many reports in scientific publications in which, based on a comparative analysis of scientific data, an attempt is made to substantiate the presence or absence of clear links between periodontal disease and preterm birth [17-20]. Mechanisms, association between odontogenic chronic infection and preterm birth are not clearly defined, various hypotheses were put forward hypotheses - bacterial spreading; inflammatory products dissemination; and role of fetomaternal immune response against oral pathogens. The relationship between periodontal diseases and preterm birth is explained by the possible spread of oral bacteria, including periodontal pathogens, through the circulation into the amniotic fluid, leading to chorioamniotic infection [21,22]. Pathogens can provoke an inflammatory response inside the uterus and thereby increase the synthesis of inflammatory cytokines and neutrophil activation, which can induce the process of preterm birth. Analysis of the amniotic fluid or placenta indicates the presence of various oral pathogens such as Bergeyella, Eikenella, Fusobacterium nucleatum or Porphyromonas gingivalis [23-26]. Studies have shown that in periodontitis, there is increased secretion of cytokines (prostaglandin E2 (PGE-2), tumor necrosis factor-α, interleukin 6 (IL-6) or interleukin 1β (IL-1β)) in the gingival sulcus fluid, similarly, elevated levels these cytokines in the amniotic fluid increases the risk of preterm birth [27-29]. The immune characteristics of pregnant women with periodontal disease are also one potential mechanism preterm birth. Elevated IgM levels as an immune response against oral pathogens increases the risk of preterm birth [30]. Prophylaxis during pregnancy may reduce adverse prenatal outcomes, treatment of oral infection during pregnancy a preventive strategy that reduces oral bacterial load [31-34].

Given the above, we conducted clinical and laboratory studies the purpose of which was to study and identify the ratio of some cellular blood parameters characterizing endogenous intoxication, and indicators characterizing the oral chronic infectious focus during time labor and preterm birth. Clinical and laboratory studies were carried out in 88 parturient women to determine the ratio of individual blood parameters in case of endogenous intoxication to indicators of chronic oral infection in full-term and preterm births. Correlation analysis of the study data showed that in the group of people who gave birth in a normal period, the period of childbirth had very weak positive or negative correlations with all indicators of periodontal and integral hematopoiesis. Higher values of the correlation coefficient between the same indicators were found in the group of women in labor with preterm birth. Studies have shown that the clinical condition of the oral cavity has a significant impact on the outcome of pregnancy. Complications of caries and inflammatory periodontal diseases are of particular importance in this case, since the degree of dependence of preterm birth depends on the likelihood of developing chronic infections. In the organism of those with term labor and those with preterm labor, an analysis of the index values of blood cells describing endogenous intoxication shows that during third trimester the phenomena of infectious intoxication was noted, which especially noticeable in those with preterm labor, but in those with term labor when comparing the same indicators, they are not separated whit statistical significance. The practical significance of the study lies in the fact that by assessing the presence of chronic oral infection in the oral cavity, it was possible to predict its possible impact on the outcome of pregnancy, which, in turn, requires a special professional (dental and obstetric-gynecological) attitude towards such pregnant women. Studies confirm to reduce the negative impact of periodontal disease on PB before pregnancy, during pregnancy, it is necessary to establish dispensary control over the clinical condition of the teeth and periodontal tissues, and, if necessary, provide appropriate specialized medical care. Studies confirm that before pregnancy, during pregnancy, it is necessary to establish dispensary control over the clinical condition of the teeth and periodontal tissues, and, if necessary, provide appropriate specialized medical care, which can prevent a negative outcome of pregnancy. Every pregnant woman should be screened for oral risk as there is a study showing that periodontitis is associated with preterm birth. To reduce the negative impact of periodontal disease on preterm birth, periodontal disease should be treated in pregnant women in the early stages of pregnancy and they should be taken for dispensary observation for the entire period of pregnancy, which can prevent a negative outcome of pregnancy.

Conclusion

In those with preterm birth (unlike in those with term labor) index values describing chronic oral infectious focus, show more tangible correlations with the term of delivery, which indicates the significant role of the chronic infectious focus in the preterm birth.

Declarations

Conflict of Interest

No Conflict of Interest.

Consent Statement

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

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The work was not funded.

Ethical Approval

The study was approved by University Ethics Committee, in accordance with the 2008 Declaration of Helsinki, written informed consent was obtained from all surveyed participants to participate in the study.

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