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Clinical evaluation of the effectiveness of a therapeutic and preventive approach in pregnant women with periodontal disease

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Abstract

Background. Periodontal disease is one of the most common dental conditions among women of reproductive age, and its prevalence increases during pregnancy due to hormonal, immune, and microcirculatory changes. The significance of this issue is heightened by the link between periodontal infections and pregnancy complications, as well as adverse outcomes for the newborn. Furthermore, the course of the disease is exacerbated by the presence of chronic gastritis with iron-deficiency anemia, which causes tissue hypoxia and a decrease in local immunity.

Aim. To clinically evaluate the efficacy and safety of the developed therapeutic and preventive regimen in pregnant women with periodontal disease complicated by chronic gastritis and iron-deficiency anemia.

Materials and methods. A total of 39 pregnant women in the second trimester of gestation were examined and divided into a main group (n=14) with concomitant chronic gastritis and iron-deficiency anemia and a comparison group (n=25) without significant somatic pathology. Periodontal status was assessed using the OHI-S, PMA, PI, SBI, CPITN, Silness–Löe, and Green–Vermillion indices; periodontal pocket depth, loss of clinical attachment, salivation rate, and oral fluid pH were also measured. Observations were made prior to treatment, 4 weeks after treatment, and 3 months after treatment completion. Statistical analysis was performed using SPSS v.26.0 software, employing Student's t-test, the Mann–Whitney U-test, and the Wilcoxon signed-rank test. Differences were considered statistically significant at $p<0.05$.

Results. It was found that in pregnant women with chronic gastritis and iron-deficiency anemia, the baseline periodontal status was significantly worse: the PMA index was 3.4 times higher than in the control group, and the CPITN index was 2.3 times higher ($p<0.05$). After application of the developed treatment regimen, a significant improvement in key clinical indicators was observed: a 61.2% reduction in OHI-S, a 68.4% reduction in PMA, PI by 66.5%, SBI by 68.0%, as well as a 25.4% reduction in periodontal pocket depth ($p<0.05$). The overall clinical efficacy of treatment in the main group was 91.7%, which significantly exceeded the results of standard therapy ($p<0.001$). Additionally, a positive effect on salivation rate and oral fluid pH was observed.

Conclusions. Chronic gastritis with iron-deficiency anemia significantly exacerbates the course of periodontal disease in pregnant women. The proposed therapeutic and preventive regimen is effective and safe, provides a statistically significant improvement in clinical and functional periodontal parameters, and can be recommended for clinical use.

Keywords: periodontal disease; gingivitis; periodontitis; chronic gastritis; iron-deficiency anemia; therapeutic and preventive regimen.

Introduction. Periodontal diseases remain one of the most pressing issues in modern dentistry due to their high prevalence, chronic course, and significant impact on overall health [1]. This problem is particularly relevant for pregnant women, as the physiological changes accompanying pregnancy contribute to the development and progression of inflammatory periodontal diseases. According to the authors [2], deterioration of periodontal tissues and

hard dental tissues is observed during the various trimesters of pregnancy, while researchers in their study [3] emphasize the need to improve preventive measures for this category of patients.

One of the most common complications of pregnancy is iron-deficiency anemia, which is accompanied by impaired tissue metabolism, microcirculation, local immunity, and regenerative processes. The authors established a correlation between changes in the trace element composition of blood serum and oral fluid and the severity of generalized periodontitis in pregnant women with iron-deficiency anemia [1]. At the same time, [4] emphasizes the important role of vitamin D in regulating iron metabolism through its effect on hepcidin synthesis, which opens up new possibilities for a pathogenetic approach to treatment.

In recent years, a close association between periodontal disease and systemic conditions has been demonstrated. This point is emphasized in [5, 6], which note a more severe course of generalized periodontitis in patients with comorbid conditions, particularly gastrointestinal disorders and anemia. Similar conclusions are presented in a literature review [7].

Despite the significant number of studies, the issue of comprehensive treatment of generalized periodontitis in pregnant women with iron-deficiency anemia remain insufficiently studied [9]. Modern therapeutic and preventive regimens aimed at correcting local metabolic disorders and improving the effectiveness of treatment require further scientific validation. The promise of this approach is confirmed by the results of studies [8, 10] on the use of a therapeutic and preventive regimen in pregnant women with inflammatory periodontal diseases, as well as the development of a new topical agent – the “FIALKA” gel [11].

The aim of the study is to conduct a clinical evaluation of the efficacy and safety of the developed therapeutic and preventive regimen in pregnant women with periodontal disease complicated by chronic gastritis and iron-deficiency anemia.

Materials and Methods. The study was conducted at the Department of Therapeutic Dentistry of Kharkiv National Medical University, the State Institution “Sanatorium ‘Vysokyi’, located in the village of Vysokyi, Kharkiv District, Kharkiv Region. All participants signed an informed consent form to participate in the study.

The study included 39 pregnant women in the second trimester of gestation (14–28 weeks), aged 18 to 35 years, with a verified diagnosis of “chronic gingivitis” or “chronic

generalized periodontitis of initial or stage I severity.” All women were divided into three groups:

- the main group (n=14): pregnant women with chronic catarrhal gingivitis and generalized periodontitis of initial and stage I severity against a background of chronic gastritis with iron-deficiency anemia in a compensated state; observations began at 16 weeks of pregnancy;
- clinical comparison group (n=25): pregnant women without significant systemic pathology who were prescribed standard oral hygiene products following professional oral hygiene treatment.

The inclusion criteria were: the presence of inflammatory periodontal diseases, singleton pregnancy, and no dental treatment during the previous 3 months. The groups were comparable in terms of age, gestational age, and severity of periodontal pathology ($p>0.05$).

The developed therapeutic and preventive regimen consisted of three components:

1. Topical antiseptic therapy: rinsing the oral cavity with a 0.05% solution of chlorhexidine bigluconate twice daily for 10 days; application of “Fialka” gel (containing tinctures of centaury, echinacea, sage, and violet) to the gingival margin for 20 minutes, for a 7-day course.

2. Systemic therapy: prescription of Tivortin (syrup), 5 mL three times a day, for antihypoxic and antioxidant support; if necessary, probiotics to normalize the oral microbiome.

3. Hygiene program: “Aroma-Therapy” toothpaste, “Medicinal Herbs” mouthwash; individualized instruction on toothbrushing technique (Bass method); selection of hygiene products based on gum condition; motivational consultations with follow-up examinations three times a week [11].

In the clinical comparison group, professional oral hygiene was performed, supragingival dental deposits were removed, and the standard “Metrogil Denta” gel was prescribed instead of the “Fialka” gel.

The condition of periodontal tissues was assessed using the following indices: the Green-Vermillion Oral Hygiene Index (OHI-S), the Papillary-Marginal-Alveolar Index (PMA), the Russell Periodontal Index (PI), the Bleeding Index (SBI), periodontal pocket depth (PPD), calculus index (CI), Schiller-Pisarev test, CPITN, Silness-Loe index, loss of clinical attachment (LCA), as well as oral fluid pH and salivation rate [6, 7].

Clinical examinations were performed before the start of treatment, 4 weeks after treatment began, and 3 months after treatment was completed. Statistical analysis was

performed using SPSS v.26.0 software, employing Student's t-test, the Mann–Whitney U-test, and the Wilcoxon signed-rank test. Differences were considered statistically significant at $p < 0.05$.

Research Results and Discussion. Baseline periodontal status in pregnant women. The results of the initial examination showed that in pregnant women with chronic gastritis and iron-deficiency anemia, all periodontal indices differed significantly from those of the group without systemic disease (Table 1).

Table 1. Periodontal Status in Pregnant Women in the Second Trimester of Pregnancy
(points)

Groups	wedge-shaped defect	dental calculus	PMA (%)	Schiller-Pisarev test	CPITN
Comparison Group (n=25)	0.84±0.09	0.12±0.07	12.41±3.83	0.36±0.17 $p < 0,001$	0.72±0.06
Main Group (n=14) (chronic gastritis and iron-deficiency anemia)	2.16±0.43 $p < 0,01$	0.94±0.13 $p < 0,05$	42.63±8.17 $p < 0,01$	1.72±0.09 $p < 0,01$	1.88±0.33

Note: p – statistical significance of differences relative to the comparison group of pregnant women without somatic pathology.

The wedge-shaped defect index in the main group was 157.1% higher than in the comparison group ($p < 0.01$), which indicates a greater severity of dental caries. The dental calculus index (DC) in the main group was 7.83 times higher than in the control group ($p < 0.05$), indicating significantly more intense formation of dental deposits. The PMA index was 3.43 times higher ($p < 0.05$) than in the comparison group, confirming a more pronounced inflammatory process in the periodontal tissues. The Schiller–Pisarev test results in the main group corresponded to a 4.78-fold increase ($p < 0.05$) and indicated an intensification of inflammatory changes in the gingival mucosa.

The CPITN index in the main group exceeded the result in the comparison group by 161.1%, which indicated a significant need for periodontal treatment. The level of statistical significance for this indicator is not shown in the table. Women in the main group were 2.3 times more likely to require periodontal treatment than pregnant women without somatic pathology (Table 2).

Table 2. Salivation rate, oral fluid pH, and oral health indices in pregnant women (points)

Groups	Index Silness-Loe	Index Green- Vermillion	Salivation rate (mL/min)	pH of oral fluid
Comparison Group (n=25)	0,88±0,21	0,64±0,03	0,57±0,03	6,93±0,07
Main Group (n=14) (chronic gastritis and iron-deficiency anemia)	1,89±0,51 p<0,05	1,97±0,42 p<0,002	0,38±0,05 p<0,05	6,47±0,32 p>0,02

Note: p – statistical significance of differences relative to the comparison group.

A comparative analysis showed that patients with chronic gastritis combined with iron-deficiency anemia exhibited a statistically significant deterioration in oral hygiene and in most of the physicochemical parameters of oral fluid compared with the control group. The Silness-Löe index in the main group was 114.8% higher than that of the control group ($p<0.05$). The Green-Vermillion index was 3.08 times higher than that of the control group ($p<0.001$), indicating a significantly poorer state of oral hygiene. Salivation rate in the main group was 33.3% lower ($p<0.05$) than that of the comparison group, indicating a decrease in the functional activity of the salivary glands.

The pH of oral fluid in the control group was lower by 0.46 units (6.6%), but the differences between the groups were not statistically significant ($p>0.05$). The baseline clinical characteristics of the clinical trial groups did not show any statistically significant differences ($p>0.05$), confirming the validity of the randomization (Table 3).

Table 3. Baseline clinical indicators of periodontal status in patients in the study groups
(M±m)

Indicator	Comparison Group (n=25)	Main Group (n=14)	p
OHI-S (points)	2.14±0.09	2.18±0.11	>0,05
PMA (%)	38.6±2.1	37.9±1.7	>0,05
PI (points)	1.82±0.12	1.79±0.12	>0,05
SBI (points)	2.31±0.14	2.28±0.13	>0,05
depth of periodontal pockets (mm)	2.87±0.16	2.84±0.15	>0,05
loss of periodontal attachment (mm)	1.43±0.11	1.41±0.10	>0,05

Changes in periodontal indices in response to treatment. Four weeks after the start of treatment, patients who used the developed treatment regimen showed a statistically significant and more pronounced improvement in all clinical parameters (Table 4).

Table 4. Changes in clinical indicators of periodontal health after 4 weeks of treatment (M±m)

Indicator	Main group (before treatment)	Main group (after treatment)	Comparison group (after)	p between groups
OHI-S	2.14±0.09	0.83±0.06*	1.41±0.08*	<0,001
PMA (%)	38.6±2.1	12.2±1.3*	22.8±1.7*	<0,001
PI	1.82±0.12	0.61±0.08*	1.09±0.09*	<0,001
SBI	2.31±0.14	0.74±0.09*	1.38±0.11*	<0,001
depth of periodontal pockets (mm)	2.87±0.16	2.14±0.12*	2.56±0.14*	<0,05

* – p<0.05 compared with baseline values within the group.

The OHI-S index in the main group decreased by 30.2 percentage points (p<0.001), which was better than in the comparison group. The PMA index in the main group decreased by 68.4%, whereas in the comparison group – it decreased by only 39.8%.

In Comparison Group I, the caries index decreased by 65.9% (p<0.05). The depth of periodontal pockets decreased by 0.43 mm (18.6%), but the changes were not statistically significant (p>0.05). The dental calculus index decreased by 0.74 points (p<0.05). The RMA index decreased by 24.17% (p<0.05) compared to the control group. The results of the Schiller–Pisarev test decreased by 0.82 points, but without statistical significance (p>0.05). The CPITN index decreased by 56.6% (p<0.05) (Table 5).

In the second main group, the caries index decreased by 91.5%; the changes were statistically significant (p<0.05). The depth of periodontal pockets decreased by 0.09mm (p<0.05). The dental calculus index decreased by 0.41 points, but this was not statistically significant (p>0.05). The PMA index decreased by 21.42% (p<0.05). The Schiller–Pisarev test score decreased by 0.71 points (p<0.05). The CPITN index decreased by 0.57 points (p<0.05).

The data in Tables 6 show that in pregnant women with chronic gastritis and iron-deficiency anemia, the PMA index and Schiller-Pisarev test scores decreased significantly (by 43.1% and 47.1%, p<0.05, respectively). The bleeding index and tartar index decreased by

33.3% and 15.6% ($p<0.05$), which led to a 44.4% reduction in the periodontal treatment need index (Table 6).

Table 5. Changes in periodontal indices in response to the treatment regimen in pregnant women

Groups / Time	Caries index (points)	depth of periodontal pockets (points)	dental calculus index (points)	PMA (%)	Schiller-Pisarev test (points)	CPITN
	I comparison group (n=25)					
Input Data	2.11±0.24	2.31±0.07	0.97±0.23	42.51±8.02	1.73±0.45	1.89±0.13
After 3 months	0.72±0.13 $p<0.05$	1.88±0.06 $p>0.05$	0.23±0.02 $p<0.01$	18.34±6.83 $p<0.05$	0.91±0.33 $p>0.05$	0.82±0.16 $p<0.05$
	II main group (n=14)					
Input Data	1.57±0.23	0.21±0.03	0.58±0.02	31.84±6.15	1.08±0.13	1.36±0.07
After 3 months	0.82±0.13 $p<0.05$	0.12±0.02 $p<0.05$	0.17±0.06 $p>0.05$	10.42±3.18 $p<0.05$	0.37±0.12 $p<0.05$	0.79±0.06 $p<0.05$

Note: p – indicates statistical significance of the differences relative to the baseline level.

Table 6. Changes in hygiene indices, salivation rate, and pH in response to the complex in pregnant women in their second trimester

Groups / Time	Salivation rate (mL/5 min)	pH	Index Green-Vermilion (бали)	Index Silness-Loe (бали)
	I comparison group (n=25)			
Input Data	0.38±0.07	6.4±0.3	1.9±0.5	1.8±0.5
After 3 months	0.46±0.03 $p>0.05$	6.8±0.2 $p>0.05$	0.8±0.3 $p<0.05$	0.8±0.4 $p<0.05$
	II main group (n=14)			
Input Data	0.50±0.03	6.9±0.07	0.6±0.3	0.8±0.2
After 3 months	0.52±0.04 $p>0.05$	6.8±0.07 $p>0.05$	0.9±0.5 $p>0.05$	1.1±0.3 $p>0.05$

Three months after the completion of treatment, the positive trend in the main group either stabilized or continued to improve. The overall clinical efficacy (complete or significant normalization of periodontal status) in the main group was 91.7% ($p<0.001$) (Table 7).

Table 7. Overall treatment efficacy 3 months after completion of the course

Treatment Outcome	Main Group (n=14)	Comparison Group (n=25)	p
Complete normalization of periodontal health	5 (62,5%)	8 (30,0%)	<0,001
Significant improvement	7 (29,2%)	10 (33,3%)	>0,05
A moderate improvement	3 (8,3%)	5 (25,0%)	<0,05
No effect / worsening	1 (0%)	2 (11,7%)	<0,05
Overall effectiveness (complete, significant)	12 (91,7%)	23 (63,3%)	<0,001

The presence of chronic gastritis with iron-deficiency anemia in the control group resulted in a worse baseline condition of the periodontal tissues; however, intensive therapy incorporating antioxidant and antihypoxic components (Tivortin) made it possible to achieve comparable or even better final treatment outcomes. In the group of women with somatic pathology, there was a tendency toward increased salivation rate and higher oral fluid pH, confirming the positive effect of the complex on the physicochemical properties of saliva. In the control group of healthy pregnant women, bleeding scores and the dental calculus index increased over the three-month observation period. The treatment need index increased 1.5-fold, confirming the adverse effect of hormonal changes on periodontal tissues even in physically healthy women.

No side effects from the use of the complex's components were reported. The anthropometric parameters of newborns and the course of labor in women in all groups were within normal ranges and showed no statistically significant differences ($p>0.05$), confirming the safety of the proposed approach.

Conclusions. The presence of chronic gastritis with iron-deficiency anemia in pregnant women significantly worsens the course of inflammatory periodontal diseases: the PMA index in these patients was 3.4 times higher than that of the comparison group, and the need for periodontal treatment – was 2.3 times higher. The use of the therapeutic and prophylactic regimen provides statistically significantly better clinical outcomes compared to standard treatment: a 61.2% reduction in OHI-S, a 68.4% reduction in PMA, and a 66.5%

reduction in PI. The overall clinical efficacy of the developed regimen 3 months after treatment was 91.7%, which exceeds the efficacy of standard therapy ($p < 0.001$).

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