

# Research on Clinical Aspects, Pathogenetic Treatment Methods and Preventive Measures Against Tooth Demineralization in Pregnant Women During the First Trimester with Toxicosis Symptoms

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**Abstract** The article examines the clinical aspects, pathogenetic treatment methods, and preventive measures against tooth demineralization in pregnant women during the first trimester with toxicosis symptoms. The study emphasizes the importance of early diagnosis and treatment of dental diseases to prevent potential complications in both the mother and the fetus. It discusses hormonal changes and their impact on dental health, the necessity of using safe treatment methods and anesthesia. The article analyzes the causes of accelerated tooth demineralization due to a deficiency of calcium and other minerals necessary for the formation of the fetal skeleton. Recommendations for oral hygiene and precautions for dental treatment during the first trimester of pregnancy are provided.

**Keywords** Tooth demineralization, Pregnancy, Anesthesia, Infectious diseases, Oral hygiene

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## 1. Introduction

Demineralization of teeth in pregnant women during the first trimester is an important clinical problem caused by significant hormonal changes in the body, accompanied by manifestations of toxicosis. These changes lead to disturbances in mineral homeostasis, significantly affecting the condition of the teeth and causing their accelerated destruction. The loss of calcium and other essential minerals from the dental tissues contributes to the development of caries, gingivitis, and other dental pathologies.

The importance of this research is due to the high frequency of dental diseases among pregnant women and their negative impact on the health of both the mother and the fetus. Untreated dental infections can trigger systemic inflammatory reactions, leading to body intoxication and potentially adversely affecting the developing embryo. During the first weeks of pregnancy, when the placenta is not yet fully formed, the risk of transmitting infections from mother to fetus significantly increases.

Special attention in the study is given to the development of recommendations for the safe conduct of dental procedures in pregnant women, including the use of modern

anesthesia methods that do not penetrate the placental barrier, and adapted hygiene measures. Based on the obtained data, clinical recommendations will be formulated to improve the dental health of pregnant women and reduce the risk of complications in the fetus.

This research provides scientifically substantiated data necessary to improve the quality of medical care for pregnant women, contributes to the optimization of clinical practice in the field of dentistry, and enhances overall health indicators for both the mother and the child.

Research on the clinical aspects, pathogenetic treatment methods, and preventive measures against tooth demineralization in pregnant women during the first trimester with manifestations of toxicosis is a relevant task in modern dentistry. The oral health of pregnant women is influenced by numerous factors, including hormonal changes and mineral deficiencies, necessitating a comprehensive approach to the prevention and treatment of tooth demineralization.

Hormonal changes occurring in the bodies of pregnant women significantly affect the condition of the oral cavity. Increased levels of estrogens and progesterone contribute to changes in microcirculation in the gums, which can lead to the development of gingivitis and the enhancement of the tooth demineralization process [1]. Studies show that hormonal fluctuations in the first trimester of pregnancy increase the risk of caries and other dental diseases [2].

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Special attention is paid to the role of mineral balance in maintaining dental health in pregnant women. The deficiency of calcium and other trace elements necessary for the formation of the fetal skeleton leads to an increase in the resorption of minerals from the mother's dental tissues [3]. This process is exacerbated by the presence of toxicosis, which reduces the absorption of essential trace elements and worsens the overall condition of the body [4].

Various methods are used to replenish mineral deficiencies and prevent tooth demineralization in pregnant women. The prescription of calcium and magnesium supplements, as well as the use of local remineralizing agents such as fluorides, has proven effective in clinical practice [5]. Vitamins also play an important role in improving mineral absorption and strengthening dental tissues [6].

Prevention of dental diseases in pregnant women includes regular professional examinations and hygiene procedures. Individual oral hygiene programs, adapted to the specific needs of pregnant women, help reduce the risk of caries and gingivitis [7]. Regular professional tooth cleanings, education on proper brushing techniques, and the use of additional oral care products such as dental floss and mouth rinses are important preventive measures [8].

The use of safe anesthesia methods in dental treatment for pregnant women is a critically important aspect. The use of drugs that do not penetrate the placental barrier, such as Ultracaine and Ubistesin, provides effective pain relief without risk to the fetus [9]. This allows necessary dental procedures to be performed at all stages of pregnancy, minimizing the risk of complications.

A comprehensive approach to the treatment and prevention of tooth demineralization in pregnant women during the first trimester, including early diagnosis, mineral deficiency replenishment, safe anesthesia application, and individual hygiene programs, is an effective and safe method for ensuring the dental health of this patient group.

## 2. Purpose of the Research

The aim of this study is to comprehensively examine the clinical aspects, pathogenetic treatment methods, and preventive measures aimed at preventing demineralization of teeth in pregnant women during the first trimester with manifestations of toxicosis. The study will analyze the pathophysiological mechanisms underlying the demineralization of dental tissues and investigate modern approaches to the treatment and prevention of this pathology.

## 3. Materials and Methods

The study was conducted at the Department of Hospital Therapeutic Dentistry of the Tashkent State Dental Institute. The study involved 120 pregnant women with gestational ages ranging from 4 to 12 weeks who exhibited symptoms of toxicosis and signs of tooth demineralization.

The diagnosis of dental conditions included a clinical examination, radiological investigation, and laboratory analysis of saliva to determine its mineral composition. Clinical assessment of the oral cavity was performed using standard dental methods, including indices of caries, gingivitis, and dental plaque. Radiological investigation was carried out using a digital radiovisiograph, providing minimal radiation exposure, with mandatory use of protective aprons to prevent radiation impact on the fetus.

Laboratory studies included determining the levels of calcium, phosphorus, and magnesium in saliva, as well as assessing the activity of enzymes involved in the metabolism of these minerals. Atomic absorption spectroscopy and colorimetric analysis methods were used for laboratory analyses.

To study pathogenetic treatment methods, various approaches to replenishing mineral deficiencies were used, including the prescription of calcium and magnesium supplements and the application of local remineralizing agents. Additional measures included vitamins and minerals aimed at improving the overall health status of pregnant women.

Preventive measures included the development and implementation of individualized oral hygiene programs adapted to the specific needs of pregnant women. These programs provided for regular professional teeth cleaning, training in proper brushing techniques, and the use of additional oral care products such as dental floss and mouth rinses.

The effectiveness of the proposed methods was evaluated through repeated clinical examinations, radiological control, and laboratory analysis of saliva three months after the start of treatment. Comparative analysis of the obtained data allowed assessing the dynamics of changes in the condition of the teeth and oral cavity in pregnant women and determining the most effective methods of treatment and prevention of tooth demineralization in the first trimester of pregnancy.

In our study, we used the Icon technology and sublingual plates. Icon technology was employed for the treatment of early stages of caries. The procedure included etching the enamel with Icon-Etch gel, rinsing, drying, applying the infiltrative composition Icon-Infiltrant, and light polymerization. This method provided mechanical stabilization of demineralized enamel and sealing of micropores.

Sublingual plates were used to neutralize the acidity of the oral cavity and strengthen the enamel of the teeth. The main components of the plates were calcium gluconate (500 mg), sodium fluoride (1 mg), sodium phosphate (200 mg), and sodium bicarbonate (100 mg). These substances contributed to the remineralization and restoration of enamel. The plates were used three times a day after each meal, placed under the tongue until completely dissolved.

Additionally, participants in the study were provided with oral care recommendations, including proper brushing techniques and the use of dental floss. Dental examinations were conducted every two weeks to assess the condition of the oral cavity and the effectiveness of the treatment.

## 4. Results and Discussion

The study involved 120 pregnant women in the first trimester of pregnancy with manifestations of toxicosis. The average age of the patients was  $28.5 \pm 4.2$  years. All participants were divided into two groups: the main

group (n=60), which received pathogenetic treatment and preventive measures, and the control group (n=60), which received standard dental treatment.

The clinical indicators of the condition of the teeth and gums in the patients at the beginning and at the end of the study are presented in Table 1.

**Table 1.** Clinical indicators of oral health in pregnant women

Indicator	Start of Study (n=120)	End of Study (Main Group, n=60)	End of Study (Control Group, n=60)
Caries Index (DMFT)	$4.8 \pm 1.2$	$2.3 \pm 0.9^*$	$3.9 \pm 1.1$
Gingivitis Index (GI)	$1.6 \pm 0.4$	$0.8 \pm 0.3^*$	$1.3 \pm 0.5$
Plaque Index (PI)	$2.4 \pm 0.6$	$1.1 \pm 0.4^*$	$2.0 \pm 0.6$
Salivary Calcium Level (mmol/L)	$1.2 \pm 0.3$	$1.8 \pm 0.4^*$	$1.3 \pm 0.3$
Salivary Phosphorus Level (mmol/L)	$0.8 \pm 0.2$	$1.3 \pm 0.3^*$	$0.9 \pm 0.2$

The differences are statistically significant compared to the control group,  $p < 0.05$ .

The study results demonstrated significant improvement in the clinical indicators of the oral cavity condition in patients of the main group who received pathogenetic treatment and preventive measures.

The caries index (DMFT) in the main group decreased from  $4.8 \pm 1.2$  to  $2.3 \pm 0.9$ , corresponding to a 52% reduction compared to the beginning of the study ( $p < 0.05$ ). In the control group, the decrease in the caries index was only 19% (from  $4.8 \pm 1.2$  to  $3.9 \pm 1.1$ ). This indicates that pathogenetic treatment and preventive measures are significantly more effective in reducing caries in pregnant women than standard treatment.

The gingivitis index (GI) in patients of the main group decreased by 50% (from  $1.6 \pm 0.4$  to  $0.8 \pm 0.3$ ), whereas in the control group, the decrease was 19% (from  $1.6 \pm 0.4$  to  $1.3 \pm 0.5$ ) ( $p < 0.05$ ). This underscores the importance of specialized treatment and prevention in reducing inflammatory processes in the gums of pregnant women.

The plaque index (PI) in the main group decreased by 54% (from  $2.4 \pm 0.6$  to  $1.1 \pm 0.4$ ), while in the control group, the reduction was 17% (from  $2.4 \pm 0.6$  to  $2.0 \pm 0.6$ ) ( $p < 0.05$ ). The significant reduction in plaque in the main group highlights the importance of preventive measures such as professional teeth cleaning and proper oral hygiene.

The calcium level in the saliva of patients in the main group increased from  $1.2 \pm 0.3$  to  $1.8 \pm 0.4$  mmol/L, which is 50% higher than the baseline level ( $p < 0.05$ ). In the control group, the calcium level increased by only 8% (from  $1.2 \pm 0.3$  to  $1.3 \pm 0.3$  mmol/L). This result demonstrates the effectiveness of pathogenetic treatment in replenishing mineral deficiencies in pregnant women.

Similar results were obtained for the phosphorus level in saliva: an increase of 63% (from  $0.8 \pm 0.2$  to  $1.3 \pm 0.3$  mmol/L) in the main group and 13% (from  $0.8 \pm 0.2$  to  $0.9 \pm 0.2$  mmol/L) in the control group ( $p < 0.05$ ). This emphasizes the importance of replenishing mineral deficiencies to maintain dental health in pregnant women.

The study results confirm the high effectiveness of pathogenetic treatment and preventive measures in preventing dental demineralization in pregnant women during the first

trimester with signs of toxicosis. The significant reduction in caries, gingivitis, and plaque indices, as well as the increase in calcium and phosphorus levels in saliva in the main group patients, indicate the positive impact of the proposed methods on oral cavity condition.

The prescription of calcium and magnesium supplements, the use of local remineralizing agents such as fluorides, and the application of vitamins that enhance mineral absorption and strengthen dental tissues proved effective in reducing the risk of dental demineralization in pregnant women. Additionally, the implementation of individualized oral hygiene programs, including regular professional teeth cleaning, education on proper brushing techniques, and the use of additional care products such as dental floss and mouth rinses, showed significant improvement in dental health.

The use of safe anesthesia methods, such as Ultracaine and Ubistesin, allowed for the necessary dental procedures to be performed without risk to the fetus. These methods minimized pain and stress in the patients, contributing to their overall well-being.

The implementation of a comprehensive approach to the treatment and prevention of dental demineralization in pregnant women, which includes early diagnosis, mineral deficiency replenishment, safe anesthesia methods, and individualized hygiene programs, is an effective strategy for ensuring dental health in this patient group. The study results highlight the need for further research and the development of recommendations to optimize dental care for pregnant women.

The chosen treatment strategy achieved the following results. The use of Icon technology for the treatment of early caries stages provided mechanical stabilization of demineralized enamel and sealing of micropores, significantly reducing the risk of caries progression. Procedures using Icon-Etch gel, Icon-Infiltrant composition, and light polymerization demonstrated high effectiveness and minimal side effects, such as increased tooth sensitivity.

The use of sublingual plates containing calcium gluconate, sodium fluoride, sodium phosphate, and sodium bicarbonate contributed to the neutralization of oral acidity and the

strengthening of tooth enamel. Regular use of the plates three times a day after each meal led to noticeable remineralization and restoration of damaged enamel.

Additional recommendations for oral care, including proper brushing techniques and the use of dental floss, improved oral hygiene among the study participants. Regular dental check-ups every two weeks allowed for timely monitoring of the oral cavity condition and adjustment of therapy as needed.

The combined use of Icon technology and sublingual plates, along with proper oral hygiene, significantly improved the condition of teeth and gums in the study participants, reducing the risk of caries and other dental diseases.

## 5. Conclusions

The results of the study on the clinical aspects, pathogenetic treatment methods, and preventive measures against dental demineralization in pregnant women in the first trimester with manifestations of toxicosis demonstrated the high effectiveness of the proposed comprehensive approach. The study revealed that pathogenetic treatment aimed at replenishing mineral deficiencies significantly reduces the risks of developing caries, gingivitis, and other dental pathologies in this category of patients. The introduction of calcium and magnesium supplements, local remineralizing agents, and vitamins contributed to the improvement of mineral balance and strengthening of dental tissues, as confirmed by a significant increase in calcium and phosphorus levels in saliva.

Additionally, the implementation of individualized oral hygiene programs, including regular professional cleanings, education on proper brushing techniques, and the use of additional care products, showed a significant reduction in plaque and gingivitis indices. This underscores the importance of preventive measures and regular monitoring of the dental health of pregnant women.

The use of safe anesthesia methods, such as Ultracaine and Ubistesin, allowed for the effective and safe performance of necessary dental procedures without risk to the fetus, reducing pain and stress in the patients. This aspect is particularly important for maintaining the overall well-being of pregnant women and preventing potential complications associated with oral infections.

The study results confirm the appropriateness and necessity of implementing a comprehensive approach to the treatment and prevention of dental demineralization in pregnant women in the first trimester with manifestations of toxicosis. Including early diagnosis, replenishment of mineral deficiencies, safe anesthesia methods, and individualized oral hygiene programs in clinical practice is an effective strategy for ensuring the dental health of this patient group. The need for further research in this area remains relevant to develop more precise

recommendations and optimize dental care for pregnant women.

Continued research will allow for the improvement of prevention and treatment methods for dental diseases in pregnant women, as well as the development of new protocols and recommendations aimed at minimizing risks and improving the overall health of the mother and child. In the future, such studies will help create more effective dental health management strategies that take into account the physiological condition of pregnant women.

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