



## Periodontal diseases in pregnant women as a risk factor: a concise systematic review

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### Abstract

This study highlighted that periodontal diseases in pregnant women can be one of the determinants of low birth weight. Studies were carried out to verify the existence of an association between maternal periodontal disease and low birth weight. Gestational period, where the occurrence of periodontal diseases (PD) is more likely, due to its hormonal and physiological changes. Therefore, pregnant women must be alert and take proper care, have prenatal care with their dentist, in addition to their oral care, they must be alert to the risks of low birth weight and premature births. Infections in regions of the genitourinary tract, such as PD, may be associated with the occurrence of low birth weight newborns through the same mechanisms as other maternal and preterm birth infections. The contraction of the uterus and cervical dilation, acting as a trigger for premature birth, can be caused by inflammatory stimuli, which can induce hyperirritability of the uterine smooth muscles. The infection and the resulting inflammatory process can cause damage to the placenta, thereby restricting fetal development. Throughout life, a woman goes through several phases of hormonal fluctuations that, in addition to interfering with the reproductive system, exert influence on other organs and systems, such as the periodontium, particularly in the presence of preexisting gingival inflammation induced by plaque. During pregnancy, a woman is exposed to several significant hormonal changes, as the placenta produces high amounts of estrogen and progesterone, which in turn affect the oral tissues. It was concluded that black women aged over 40 years old are more likely to have PD, having a higher

risk of low development to the fetus.

**Keywords:** Periodontal disease. Inflammatory periodontal diseases. Pregnant women.

### Introduction

Periodontal disease (PD) encompasses a series of pathological changes that occur in the periodontium, that is, the tissues that surround the teeth. Among them, the periodontal ligament, cementum, alveolar bone, and gingiva stand out [1]. The imbalance of defense and aggression actions on the tooth's protective and supporting tissue has as its main determinant the bacterial plaque in a response given by the host. Sex hormones are influencing factors such as periodontal immune responses, due to changes in the subgingival plaque. The disease is a clinical picture of the patient already showing a lack of plaque control. Several factors determine periodontal disease in Brazil, as periodontal socio-economic conditions are not determined because of the gestational period but aggravate it because of cultural -cultural, smoking, and lack of knowledge about patient care [1].

There is evidence of the existence of an association between maternal PD and low birth weight and that its effect was enhanced by the low level of maternal education [2]. During pregnancy, a woman enters a period in which oral health must be one of her priorities when being cared for. During this period, estrogen and progesterone, which are her sex hormones, potentially increase over time and are harmful to tissue metabolism. The prevalence of these alterations varies between 35 and 100%, and their severity gradually increased until the 36th week of pregnancy. One of its

aggravating factors for the increase in the incidence of periodontal diseases during this period, as well as for the increase in the severity of the disease when it has already been installed.

During this period, the pregnant woman must be overly careful with her oral health based on two main reasons: pregnant women must eat correctly and, therefore, it would not be acceptable for them to have tooth pain and/or mobility, and periodontal infections could spread throughout the bloodstream and stimulate the production of inflammatory cytokines. Pregnancy represents a complex human experience that involves a social dimension, in which there is the influence of various external factors, and a biological one, in which a balance between the organic conditions for the development of the fetus and the mother's immune system is necessary [3].

In this sense, the routine of oral hygiene cleaning and plaque control with reinforced oral hygiene can also be performed during any trimester of pregnancy, since gingivitis in pregnancy is the most common condition, where the gingiva becomes vascularized, swollen and sensitive. The gingival margin with the tooth structure becomes erythematous and bleeds frequently during brushing and chewing, which may occur in 50 to 100% of pregnant patients [4].

Therefore, the present study performed a concise systematic review of periodontal diseases in pregnant women.

## Methods

### Study Design

The present study followed a systematic review model, following the rules of systematic review - PRISMA (Transparent reporting of systematic review and meta-analysis, access available in: <http://www.prisma-statement.org/>).

### Data Sources

The search strategy was performed in the PubMed, Scielo, Cochrane Library, Web of Science and Scopus, and Google Scholar databases, using scientific articles from 2018 to 2021.

### MeSH Terms

The main MeSH Terms used were "*Periodontal disease. Inflammatory periodontal diseases. Pregnant women*". For greater specification, the description "*inflammatory processes*" for refinement was added during the searches, following the rules of the word PICOS (Patient; Intervention; Control; Outcomes; Study

Design).

### Specifications

This is a study that shows the severities of Periodontal Diseases (PD) in pregnant women, such as high blood pressure, cytokines, and others; and possible risks it brings to your fetuses, such as difficulty in fetal development, low birth weight, and premature birth. Aiming to demonstrate the hormonal changes in the woman's gestational period, which may influence periodontal tissue, the onset of periodontal disease, and the risk that the fetus may have if the disease is not treated immediately, causing complications.

These physiological changes that the woman receives during pregnancy, some changes are essential for the development of the fetus still in the mother's womb. They provide the essential requirements for metabolic requests, tissue formation, and the constitution of reserves for neonatal life.

When the mother is diagnosed and is in agreement with the oral treatment and is aware of its benefits, she should be referred to start treatment immediately, being passed on and noted to her trusted obstetrician. The pregnant woman must be accompanied by a health professional in the field of dentistry until the end of pregnancy.

## Results and Discussion

A total of 104 articles were found involving periodontal diseases in pregnant women. Initially, the duplication of articles was excluded. After this process, the abstracts were evaluated and a new exclusion was performed, based on the elimination of articles with biases that could compromise the reliability of the results, according to the rules of the Cochrane instrument, as well as articles that presented low quality in their methodologies, according to the GRADE classification. A total of 36 articles were fully evaluated and 12 were included in this study.

### Pre-eclampsia

Pre-eclampsia is a disease of blood pressure, which from the 20th week of pregnancy, in proteinuria. Pre-eclampsia is one of the main causes of maternal and perineal morbidity and mortality, affecting 5% to 8% of pregnant women in Brazil. Some risk factors associated with preeclampsia are the etiology of this alteration, some inflammatory aspects, and its correlation with endothelial dysfunction. During pseudovasculogenesis that occurs in pregnancy, trophoblast migration and remodeling of spiral arterioles, phenomena that 20 Introduction would provide a local system of low

arteriolar resistance, are processes that seem to be altered in pregnant women with pre-eclampsia [1].

This local defect leads to the second phase of the disease, in which maternal systemic responses result in hypertension, proteinuria, and alterations in several organs, mainly due to endothelial dysfunction. The possible role of inflammatory cytokines in endothelial dysfunction induced some authors to evaluate the polymorphism of their encoding genes [1].

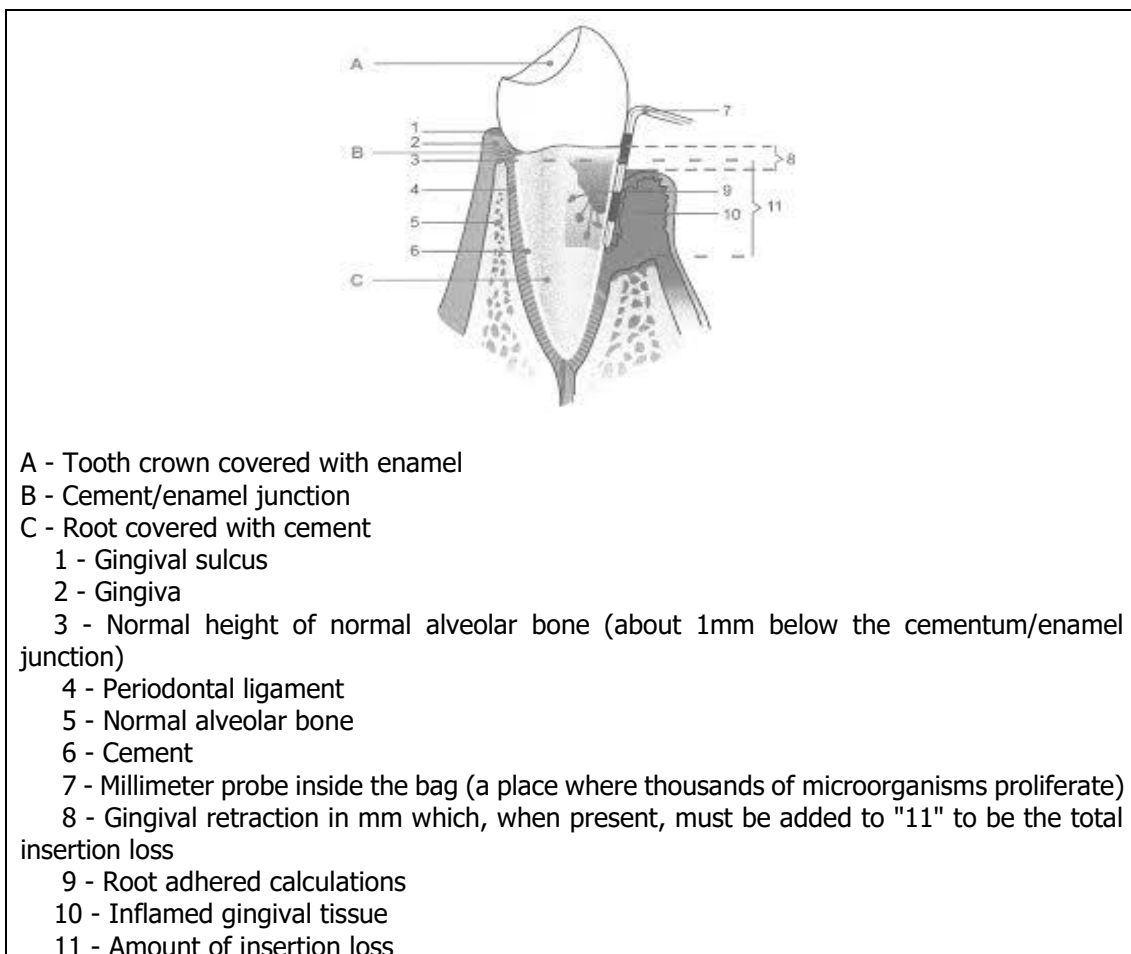
Even though pre-eclampsia is a partially unknown subject and little discussed among society, some risk factors are related, such as primiparity, obesity, kidney alterations, among others. However, in recent years, it has been shown that the influence of infections on pre-eclampsia, including as possible its relationship with periodontal disease [2]. Pre-eclampsia in pregnant women has increased plasma levels of some cytokines. These increases would be due to a generalized inflammatory state, meaning that these changes in the

pathogenesis of preeclampsia remain obscure.

### Periodontal Disease

Periodontal disease is a generic name that encompasses a series of pathological changes that occur in the periodontium (**Figure 1**). The periodontium is the set of tissues that cover and surround the tooth, which is called the tissues that surround the tooth, which stand out between the gingiva, the alveolar bone, the cementum, and the periodontal ligament (fibers that join the gingiva to the alveolar bone and the cement). There are numerous periodontal diseases, which can be grouped into two large groups: periodontitis and gingivitis. In periodontitis, in addition to soft tissue and hard tissue (bone, periodontal ligament, and cementum) are altered. In gingivitis, only the soft tissues of the gums are altered [1,3].

**Figure 1.** In the image, we are representing a schematic of a periodontitis process explored through a probe to determine the loss of bone attachment.



**Source:** Own authorship.

When microorganisms are allowed to adhere to the tooth, along with the gums, the main change that occurs is inflammation of the gums. In this circumstance, the space between the gingiva and the tooth (gingival

sulcus or space around the tooth) increases, and the gingival sulcus (2 to 3mm) becomes known as the pathological pocket. When the microbial flora of gingivitis is eliminated, the gingivitis regresses and the

gingiva returns to being normal [4,5].

In the case of gingivitis, if it is not treated, the pathological process tends to reach the hard tissues and, gradually or abruptly, they are changed, constituting periodontitis. The resorption of the alveolar bone and the disappearance of the fibers that join the bone to the tooth (periodontal ligament) is the main alteration in periodontitis. This bone resorption is called attachment loss [6].

Periodontal diseases can be mainly grouped into two groups: Gingivitis and Periodontitis.

### Periodontite

PD is a chronic infection, with high levels of prevalence, produced by gram-negative bacteria, is considered the second leading cause of dental pathology in the world population. Being defined as a "multifactorial chronic inflammatory disease associated with biofilm and characterized by the progressive impact of the dental insertion apparatus". As already mentioned, the main alteration in periodontitis is the resorption of the alveolar bone and the disappearance of the fibers that join the bone to the tooth (periodontal ligament). However, there are various types of Periodontitis in which insertion loss occurs, as shown below [6].

- ✓ **Chronic Localized Periodontitis:** Usually slow evolution, associated with dental plaque and in localized sites.
- ✓ **Chronic Generalized Periodontitis:** Slow evolution associated with dental plaque and located generally in the oral cavity.
- ✓ **Localized Aggressive Periodontitis:** Rapid evolution and without necessarily a significant accumulation of bacterial plaque.
- ✓ **Aggressive Generalized Periodontitis:** Evolution a little faster and without necessarily a significant accumulation of bacterial plaque. Insertion loss detected at two or more non-adjacent Interproximal sites; or Attachment loss of 3 mm or more on the buccal or lingual/palatal in at least 2 teeth, not due to the gingival recession of traumatic origin; dental caries extending to the cervical area of the tooth; the presence of attachment loss on the distal face of a second molar and associated with poor positioning or third molar extraction; endoperiodontal lesion draining through the marginal periodontium or occurrence of vertical root fracture.

### Periodontitis Stage

- ✓ **Stage I:** Early Periodontitis. No tooth loss due

to periodontitis.

- ✓ **Stage II:** Moderate Periodontitis. No tooth loss due to periodontitis.
- ✓ **Stage III:** Severe periodontitis with potential for additional tooth loss. Loss of  $\leq 4$  teeth due to periodontitis.
- ✓ **Stage IV:** Advanced periodontitis with extensive tooth loss and potential for tooth loss. Loss of  $\geq 5$  teeth due to periodontitis [7].

### Grade of Periodontitis

- ✓ **Grade A:** Dense biofilm deposits with low levels of destruction. % bone loss  $< 0.25$ .
- ✓ **Grade B:** Destruction proportional to biofilm deposits. % bone loss 0.25 to 1.0.
- ✓ **Grade C:** Destruction outweighs the expectations given to biofilm deposits; clinical patterns specific to periods of rapid progression and/or early-onset disease (expected lack of response to standard bacterial control therapies). % Bone loss  $> 1.0$ .

Gingivitis is one of the periodontal diseases characterized by inflammation of the gums, causing edema, enanthema, bleeding, exudate, modification of normal contours and occasionally causing discomfort. The microbiome is predominantly constituted by gram-positive, aerobic, saccharolytic, and immobile bacteria. Diagnosis is based on inspection [7,8].

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Dental plaque-associated gingivitis is caused by the accumulation of dental plaque or biofilm on the surface of the teeth, leading to inflammation in the gums, followed by bleeding, swelling, and discomfort. Mineralized bacterial plaque is a concretion of bacteria, which are induced by almost all gingivitis, which are food waste, saliva and mucus with calcium and phosphate salts, and food waste. Poor oral hygiene allows plaque build-up between the gums and teeth; gingivitis only happens in areas of the mouth where you have gums and teeth, without the presence of both, not gingivitis. Irritation from plaque deepens the normal gingival sulcus between the gingiva and the tooth, creating pathological gingival pockets [1,4].

Biofilm-induced gingivitis can be classified according to its location, extent, and/or generalized and

according to its extent as mild, moderate, or severe. Percentages: Light: less than 10% of sites. Moderate: 10%-30% of sites. Severe: greater than 30% of sites. Grade: Grade 1: 20% of sites. Grade 2: 40% of sites. Grade 3: 60% of sites [4].

Gingivitis not associated with dental plaque is inflammation of the gums, leaving them swollen, red, and bleeding, where triggers other than the biofilm are triggers. It was the creation of a more comprehensive classification, adding diseases and conditions (Table 1).

**Gingivitis Not Induced By Bacterial Plaque**

**Table 1.** Gum diseases are not induced by dental biofilm [9].

<b>GENETIC DISORDERS / DEVELOPMENT SPECIFIC INFECTIONS</b>	<b>HEREDITARY GINGIVAL FIBROMATOSIS</b>
	<ul style="list-style-type: none"> <li>• Bacterial: Neisseria gonorrhoeae, Treponema pallidum, Mycobacterium tuberculosis, streptococcal gingivitis</li> <li>• Viral: Coxsackie, herpes simplex, Varicella zoster, Molluscum contagiosum, papillomavirus</li> <li>• Fungi: Candidiasis</li> </ul>
<b>IMMUNE AND INFLAMMATORY CONDITIONS</b>	<ul style="list-style-type: none"> <li>• Hypersensitivity reactions</li> <li>• Autoimmune diseases</li> <li>• Granulomatous inflammatory conditions</li> </ul>
<b>REACTIONAL PROCESSES</b>	<ul style="list-style-type: none"> <li>• Epulides</li> </ul>
<b>NEOPLASMS</b>	<ul style="list-style-type: none"> <li>• Pre-maligna: leukoplakia</li> <li>• Malignant: squamous cell carcinoma, leukemia, lymphoma</li> </ul>
<b>ENDOCRINE, METABOLIC AND NUTRITIONAL DISEASES</b>	<ul style="list-style-type: none"> <li>• Vitamin C deficiency</li> </ul>
<b>TRAUMATIC INJURIES</b>	<ul style="list-style-type: none"> <li>• Physical • Chemical • Thermal</li> </ul>
<b>GINGIVAL PIGMENTATION</b>	-

One of the epidemiology points of preterm birth is the fact that some pregnant women experience the infectious stimulus, but this alone is not capable of activating the inflammatory cascade and triggering preterm birth. The first evidence to support this concept was found in animal studies. Endotoxins restrict fetal growth. Another study created localized infections with Porphyromonas gingivalis injected subcutaneously that reduced fetal weight by more than 25%. Complications such as preterm delivery, intrauterine increase in PGE2 and TNF-α and increase in PGE2 in the amniotic fluid and abortion were also monitored and observed [10].

**Gestational Changes And Their Possible Impact On The Periodontal**

Pregnancy is a process comprised of complex physical and psychological changes that profoundly affect healthy women. In the past, pregnancy was considered an impediment to dental treatment due to physiological changes that alter the patient's medical condition [11]. Physiological changes that occur during pregnancy include weight gain, hypotension when positioned in a supine position, frequency of urination, restriction of respiratory function, potential for hypoglycemia, and decreased heart rate. Syncope and nausea are also common during pregnancy.

The first trimester is the most critical for the embryo, as several organs are developing during this period, making it more vulnerable to teratogenic aggression and abortion. During this period, spontaneous abortions are more likely to occur, therefore, whenever possible, dental procedures should be avoided, especially invasive procedures [12].

Also, during pregnancy, increased levels of sex steroid hormones are maintained in the luteal phase, which results in the implementation of the embryo until birth. The pregnant woman, near term or at term, produces large amounts of estradiol (20 mg/day), estriol (80 mg/day), and progesterone (300 mg/day). Gingival inflammation initiated by plaque and exacerbated by some hormonal changes in the second/third trimester of pregnancy is called gingivitis of pregnancy [12].

Besides, PD is a common term given to those chronic inflammatory conditions of bacterial etiology that generate gingival inflammation, thus, gingivitis, which may or may not lead, over time, to developing inflammation of the supporting tissues of the teeth, that is, to periodontitis, such development does not happen directly, but through episodic outbreaks [1].

Based on the evidence of blood dissemination of cytokines and bacteria from periodontal infection, it is believed that there may be an association between this

condition and the increased risk of some systemic changes, especially cardiovascular actions and diabetes mellitus [3]. The levels of cytokines can be increased in the blood of patients that get periodontal disease. After periodontal treatment, there are elevations in serum levels of IL-6 and TNF-alpha. If cytokines remain exclusively inside the periodontal pocket without reaching the bloodstream, there is no justification for concern regarding periodontal diseases and systemic alterations. This evolution can be demonstrated in two ways: by the circulating action of bacteria inducing the production of cytokines systemically, or by the dissemination of cytokines during the scraping of infected tissue [1].

## Conclusion

The gestational period that periodontal disease is in is a possible high-risk factor for the fetus for low birth weight. Dental treatment is essential for optimal oral health and extends even during a woman's gestational period. Some oral changes can be noticed even in the first trimester of pregnancy, which may progress to the third trimester, a period coinciding with a higher hormonal increase in the pregnant woman. The dental surgeon must be part of the pregnant women's prenatal care team. In the first consultations, pregnant women should have their obstetrician referred to the team's reference oral health professional so that an evaluation and dental follow-up could be carried out. The dentist, during this period, would carry out preventive, educational, and interventional actions carried out after the evaluation of each case and together with the obstetrician, evaluating the degree of risk of each pregnant woman, such as the gestational period, systemic conditions of the same, among others. It cannot be allowed to relate that this approach has an impact on public coffers, as it aims to reduce a possible complication during and postpartum with a reduction in neonatal hospitalizations.

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## Data sharing statement

No additional data are available.

## Conflict of interest

The authors declare no conflict of interest.

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## References

1. Gadzhula NG, Cherepakha OL, Lezhnova OV. Efficiency of treatment of inflammatory periodontal diseases in pregnant women. *Wiad Lek.* 2021;74(5):1065-1068. PMID: 34090265.
2. Cruz, Simone Seixas da et al. Doença periodontal materna como fator associado ao baixo peso ao nascer. *Revista de Saúde Pública* [online]. 2005, v. 39, n. 5 [Acessado 16 Dezembro 2021], pp. 782-787. Disponível em: <<https://doi.org/10.1590/S0034-89102005000500013>>. Epub 03 Feb 2006. ISSN 1518-8787. <https://doi.org/10.1590/S0034-89102005000500013>.
3. Geisinger ML, Geurs NC, Bain JL, Kaur M, Vassilopoulos PJ, Cliver SP, Hauth JC, Reddy MS. Oral health education and therapy reduces gingivitis during pregnancy. *J Clin Periodontol.* 2014 Feb;41(2):141-8. doi: 10.1111/jcpe.12188. Epub 2013 Nov 19. PMID: 24164645.
4. Ostrovskaya LI. Modern approaches to prevention of periodontal diseases in pregnancy: a review. *Wiad Lek.* 2019;72(1):89-94. PMID: 30796869.
5. Petit C, Benezech J, Davideau JL, Hamann V, Tuzin N, Huck O. Consideration of Oral Health and Periodontal Diseases During Pregnancy: Knowledge and Behaviour Among French Pregnant Women. *Oral Health Prev Dent.* 2021;19(1):33-42. doi: 10.3290/j.ohpd.b875513. PMID: 33491376.
6. Iheozor-Ejiofor Z, Middleton P, Esposito M, Glenny AM. Treating periodontal disease for preventing adverse birth outcomes in pregnant women. *Cochrane Database Syst Rev.* 2017 Jun 12;6(6):CD005297. doi: 10.1002/14651858.CD005297.pub3. PMID: 28605006; PMCID: PMC6481493.
7. Grinin VM, Makeeva IM, Gosteva NS, Erkanyan IM, Solovyova OA. Struktura vospalitel'nykh zabolevaniï parodonta i dinamika parodontal'nogo statusa beremennykh na protiazhenii gestatsionnogo perioda [The structure of inflammatory periodontal diseases and the dynamics of the periodontal status in pregnant women during the gestational period].

- Stomatologija (Mosk). 2020;99(1):12-17. Russian. doi: 10.17116/stomat20209901112. PMID: 32125296.
- 8.** Hartnett E, Haber J, Krainovich-Miller B, Bella A, Vasilyeva A, Lange Kessler J. Oral Health in Pregnancy. *J Obstet Gynecol Neonatal Nurs*. 2016 Jul-Aug;45(4):565-73. doi: 10.1016/j.jogn.2016.04.005. Epub 2016 Jun 6. PMID: 27281467.
- 9.** Steffens JP, Marcantonio RAC. Classificação das Doenças e Condições Periodontais e Peri-implantares 2018: guia Prático e Pontos-Chave. *Revista de Odontologia da UNESP [online]*. 2018, v. 47, n. 4 [Acessado 17 Dezembro 2021], pp. 189-197. Disponível em: <<https://doi.org/10.1590/1807-2577.04704>>. Epub Jul-Aug 2018. ISSN 1807-2577. <https://doi.org/10.1590/1807-2577.04704>.
- 10.** Escobar-Arregoces F, Latorre-Uriza C, Velosa-Porras J, Roa-Molina N, Ruiz AJ, Silva J, Arias E, Echeverri J. Inflammatory response in pregnant women with high risk of preterm delivery and its relationship with periodontal disease: a pilot study. *Acta Odontol Latinoam*. 2018 Jun;31(1):53-57. English. PMID: 30056467.
- 11.** Opacic J, Maldonado A, Ramseier CA, Laugisch O. Einfluss der Parodontitis auf Schwangerschaft und Geburt [Influence of periodontitis on pregnancy and childbirth]. *Swiss Dent J*. 2019 Jul 22;129(7-8):581-589. German. PMID: 31271020.
- 12.** Bobetsis YA, Graziani F, Gürsoy M, Madianos PN. Periodontal disease and adverse pregnancy outcomes. *Periodontol 2000*. 2020 Jun;83(1):154-174. doi: 10.1111/prd.12294. PMID: 32385871.