

## ORAL THRUSH IN PREGNANT WOMEN: CAUSES, RISKS AND PREVENTION STRATEGIES

Alina Mihaela Calin<sup>1</sup>, Nicolae Sarbu<sup>1</sup>, Gabi Topor<sup>1\*</sup>, Iulian Catalin Bratu<sup>2\*</sup>, Victorita Stefanescu<sup>1</sup>, Simona Parvu<sup>3</sup>, Silvia Nica<sup>3</sup>, Denisa Batir Marin<sup>1</sup>, Dorian Agop Forna<sup>4</sup>, Iulia Alecsandra Salcianu<sup>3</sup>

- 1 Faculty of Medicine and Pharmacy, University "Dunarea de Jos" Galati, Romania
- 2 Ovidius University of Constanta, Constanta, Romania
- 3 Carol Davila University of Medicine and Pharmacy, Bucuresti, Romania
- 4 "Grigore T. Popa" University of Medicine and Pharmacy, Faculty of Dentistry, Iasi, Romania.

\*Corresponding authors: [topor\\_gabi\\_atu@yahoo.com](mailto:topor_gabi_atu@yahoo.com) , [dr\\_bratuilulian@yahoo.com](mailto:dr_bratuilulian@yahoo.com)

All authors have the same contribution

### Abstract

Canker sores are a common condition among pregnant women, having a significant impact on oral and overall health. This article explores the causes, risks, and prevention strategies associated with mouth sores during pregnancy. Hormonal changes, weakening of the immune system, and stress are relevant factors in their occurrence. Risks include physical and emotional discomfort, as well as possible pregnancy complications. Proper oral hygiene, balanced nutrition, and stress reduction are essential strategies for preventing oral thrush. Treatment during pregnancy requires a gentle approach, and treatment options must be safe for the mother and baby. In conclusion, proper management of mouth sores during pregnancy is essential for the oral and general health of pregnant women and the fetus. The use of transdermal systems for administering crucial oils to pregnant women is an innovative and effective method of treatment of canker sores in pregnant women, offering multiple benefits and ensuring increased safety for mother and baby.

**Keywords:** mouth sores, pregnancy, risks, hormonal changes, immune system, oral hygiene.

### Introduction

Canker sores are a common and uncomfortable oral condition that can occur during pregnancy, having a significant impact on the health and well-being of pregnant women. These painful ulcerative lesions can be a source of physical and emotional discomfort during an already demanding period. [1-3]

During pregnancy, women may experience several hormonal and immune changes that can increase susceptibility to mouth sores. Also, stress and fatigue associated with pregnancy can contribute to the worsening of this condition. [2-4,]

This article aims to examine in more detail the causes, risks, and prevention strategies associated with mouth sores during pregnancy, as well as the impact of this condition on the overall health and course of pregnancy. We will also discuss

the safe and effective treatment options available for pregnant women facing this problem. [2-6, 34-43]

The structure of the article will follow a logical approach, starting with an analysis of the causes of oral thrush during pregnancy, and continuing with a discussion about the associated risks and prevention strategies. We will explore the impact of mouth sores on overall health and provide recommendations for appropriate treatment during pregnancy. [3-5]

The use of essential oils in the treatment of canker sores in pregnant women has become increasingly popular due to their antimicrobial, anti-inflammatory, anticancer, and analgesic properties[7-10]. An innovative approach to their administration is the use of transdermal systems. These systems allow the controlled release of essential oils

directly to the affected area, ensuring increased efficiency and convenient application. [10-14]

### Causes of the appearance of mouth sores during pregnancy

The causes of mouth sores during pregnancy are hormonal changes, weakening of the immune system, and nutritional factors. [2-5]

During pregnancy, women experience significant hormonal fluctuations, especially increased levels of hormones like estrogen and progesterone. These changes can affect the oral mucosa, increasing susceptibility to mouth sores. [15,16, 44-52]

A pregnant woman's immune system is naturally suppressed to allow acceptance and development of the fetus. This immunosuppression can make the body more vulnerable to infections and conditions, including mouth sores. [15,16]

Pregnancy can be a stressful and tiring time for many women. Chronic stress and fatigue can affect the immune system and worsen inflammation, thereby increasing the risk of mouth sores. [4,5]

Nutritional deficiencies, especially a lack of certain essential vitamins and minerals such as vitamin B12, folic acid, and iron, can contribute to mouth sores. Also, certain irritating or allergenic foods

can aggravate or trigger mouth sores during pregnancy. [15,16]

These interconnected causes can influence the appearance of mouth sores during pregnancy. Understanding these factors can help pregnant women adopt preventive measures and manage this condition more effectively to maintain their oral health and well-being during pregnancy. [3-5]

During pregnancy, the appearance of canker sores may be more frequent due to hormonal changes, immune system, and general health of the pregnant woman, as well as due to phenomena that occur due to the load of microorganisms on braces, although orthodontic treatments are not contraindicated during pregnancy, certain special considerations must be taken into account. [17-22]

### Risks associated with mouth sores during pregnancy

Oral thrush can cause considerable physical discomfort for pregnant women. These painful ulcerative lesions can make eating a challenge because eating and drinking can be painful. Even speech can become difficult and uncomfortable due to the pain caused by canker sores. This physical discomfort can have a significant impact on a pregnant woman's quality of life, affecting her ability to enjoy pregnancy and carry on normally in daily activities. [23-25]



A.



B.

Fig.1 A- Oral thrush minor B- Major oral thrush [25]

In addition, the physical discomfort associated with mouth sores can contribute to the appearance of emotional discomfort. The pain and frustration caused by this condition can intensify already existing stress and anxiety associated with pregnancy. Pregnant women may feel overwhelmed by this additional condition and have difficulty managing their emotions. [23-26]

Oral thrush can significantly affect a pregnant woman's ability to feed herself properly and obtain essential nutrients for herself and her unborn baby. The pain caused by mouth sores can make eating a difficult and unpleasant experience. Eating solid or liquid foods can become painful and lead to a reduction in food intake. [23-26]

This reduction in food intake can lead to a lack of essential nutrients, such as proteins, vitamins, and minerals, which are vital for fetal health and development. A lack of these nutrients can have negative consequences for the health and growth of the unborn child, including increased risk of birth complications and long-term health effects. [26-28]

In some cases, mouth sores can be severe and lead to additional complications during pregnancy. For example, severe mouth sores can become infected and lead to the development of a severe oral infection. These infections can have serious consequences for the health of the mother and unborn baby, including increasing the risk of premature birth or birth complications. [26-28]

The stress and anxiety associated with canker sores can aggravate other

health conditions during pregnancy and influence its progression. Pregnant women need to receive care and be closely monitored by medical professionals to identify and treat complications associated with mouth sores during pregnancy. [27-29]

### **The impact of mouth sores on overall health**

*Relationship with other oral and systemic diseases:*

Oral thrush can have several complex interactions with other oral and systemic conditions. Canker sores can increase susceptibility to other oral infections, such as gingivitis or stomatitis. Gingivitis and stomatitis are two oral conditions that can occur or worsen during pregnancy due to hormonal changes and other factors associated with pregnancy. [27-29]

Gingivitis is an inflammation of the gums, which can be caused by the accumulation of bacterial plaque under the gums. During pregnancy, hormonal changes can increase susceptibility to gingivitis. Many pregnant women experience gingivitis, which can be exacerbated by hormonal changes and increased blood flow to the gums during pregnancy. Gingivitis during pregnancy can be recognized by symptoms such as red, inflamed, bleeding gums while brushing or flossing, and gum tenderness. It is important for pregnant women to pay special attention to oral hygiene and regularly visit the dentist for evaluation and treatment. [28-30]



Fig.2 Gingivitis during pregnancy. An enlargement of the gums covering both the outer and inner parts of the gums, including the vestibular, palatal, and lingual areas. [28]

Stomatitis is an inflammation of the oral mucosa, which can cause pain, swelling, and sores in the mouth. During pregnancy, some women may develop or experience an exacerbation of stomatitis. Causes of stomatitis during pregnancy can include hormonal changes, stress, fatigue, and changes in the immune system. Symptoms of stomatitis may include painful, red, or whitish lesions in the mouth, difficulty eating or speaking, and sensitivity to food or liquid. Treatment of stomatitis during pregnancy may involve the use of gargles with antiseptic solutions, and the application of topical gels or creams to relieve pain reduce inflammation, and manage stress and fatigue. [27-30]

People with mouth sores may be at increased risk of developing bacterial or fungal infections in the oral cavity. Bacterial or fungal infections in the oral cavity can be a concern during pregnancy because hormonal changes and other factors associated with pregnancy can affect the immune system and increase susceptibility to infections. Oral bacterial infections Fungal infections in pregnancy can be represented by gingivitis, dental abscess, and oral candidiasis. [28-31]

In addition to the impact on oral health, mouth sores can also affect overall health, there is some evidence to suggest that chronic inflammation associated with mouth sores may contribute to an increased

risk of cardiovascular disease and other systemic conditions. [29-32, 53-62]

#### *Consequences on quality of life:*

Canker sores can have a significant impact on quality of life. The pain and physical discomfort associated with this condition can affect your ability to eat, drink, and speak normally. This can lead to a decrease in the quality of food and nutrition and contribute to a general state of discomfort and frustration. [29-32]

In addition to physical discomfort, mouth sores can also affect a person's emotional state. The pain and stress associated with this condition can affect mental health and psychological well-being. People suffering from mouth sores may be at increased risk of anxiety, depression, and other mental health disorders. [28-31]

Canker sores can negatively impact a person's quality of life, affecting both physical and mental health. It is important to take steps to manage this condition effectively and minimize its impact on overall health and well-being. [29-32]

#### **Strategies to prevent oral thrush during pregnancy**

Brushing your teeth regularly at least twice a day and flossing to clean between dental spaces can help remove plaque and food debris, thereby reducing your risk of mouth sores. It is important to

use toothpaste containing fluoride to strengthen tooth enamel. [31-33]

Eating a balanced diet rich in essential nutrients like vitamins and minerals can help maintain oral and overall health. Avoiding irritating, acidic, or spicy foods can help reduce irritation of the oral mucosa and prevent mouth sores. [31-33]

Stress management and adequate rest are important for maintaining overall health during pregnancy and can help prevent mouth sores. Relaxation techniques like meditation, deep breathing, and yoga exercises can help reduce stress and improve well-being. [32-34]

In some cases, dietary supplements, such as vitamins and minerals, may be recommended to ensure adequate intake of essential nutrients during pregnancy. It is important to talk to a nutrition specialist before taking any supplements to ensure they are safe and suitable for the mother and unborn baby. [28-33]

Adopting these preventive strategies can help reduce the risk of mouth sores during pregnancy and help maintain oral and overall health during this particular time. [31-33]

Complex oral rehabilitation in pregnant women in the context of canker sores arising from the clinical situation is a delicate process that requires careful planning and collaboration between the dentist, family doctor, and obstetrician. Ensuring the oral health of the pregnant woman not only improves the mother's well-being but also contributes to the overall health of the fetus. It is essential to take appropriate precautions and personalize treatments to ensure a safe and effective outcome. Teeth in eruption should

also be considered or included in the radiographic approach. [34-37]

### **Treatment of mouth sores during pregnancy**

Safe treatment options during pregnancy are salt water rinses, application of topical gels or creams, and use of lidocaine lotions or sprays. [30-33]

An oral patch based on poly(ionic liquid) is an exciting innovation in the treatment of oral thrush. It could have multiple beneficial functions, including antibacterial, and anti-inflammatory properties, and the ability to maintain adequate moisture in the affected area. Poly(ionic liquid) is loaded with antibacterial substances such as silver ions or other antimicrobial compounds. These substances help fight bacterial infection and prevent its spread to ulcers. [31-33]

Poly(ionic fluid) can be modulated to release anti-inflammatory substances, such as corticosteroids or other anti-inflammatory drugs. These substances might help reduce inflammation and pain associated with oral ulcers. The structure of poly(ionic fluid) can be designed to maintain a moist environment around the oral ulcer, which would be beneficial for healing. A moist environment can speed healing and reduce pain associated with ulcers. [29-33]

The materials used in the patch must be safe for contact with soft tissues in the oral cavity and not cause irritation or adverse reactions. The patch should be adherent enough to stay in place in the oral cavity, but at the same time be easy to remove without causing additional trauma. [31-33]

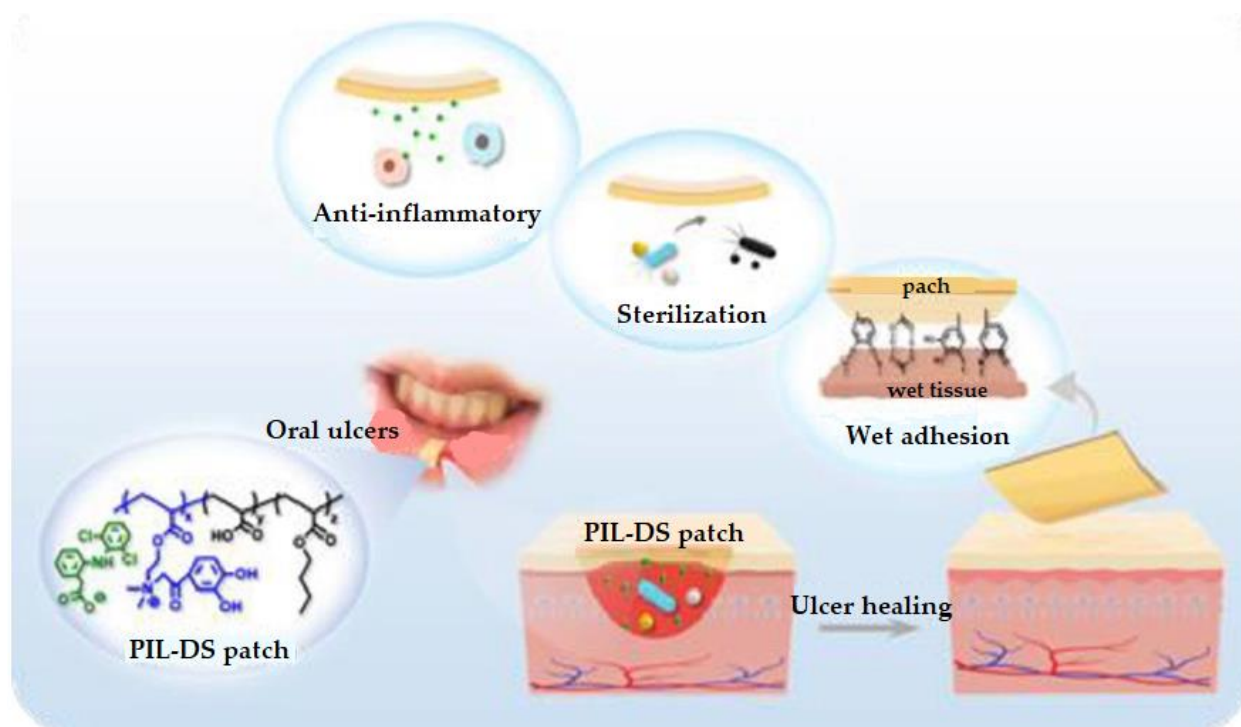


Fig.3 An oral patch using poly(ionic liquid) as a base, having antibacterial, anti-inflammatory, and wet adhesive properties, used to treat mouth sores. [38]

Rinsing your mouth with salt water can help reduce inflammation and discomfort associated with mouth sores. It is recommended to prepare a solution of lukewarm water and table salt and rinse the mouth several times a day. [38-41]

There are some topical gels and creams available in pharmacies that can be applied directly to mouth sores to reduce pain and inflammation. It is important to check with your obstetrician or dentist to choose a safe and suitable product for pregnancy. [38-42]

Lidocaine is a local anesthetic that can be used to reduce pain associated with oral thrush. There are some lotions or sprays that contain lidocaine and can be applied to thrush lesions to provide temporary relief from discomfort. [38-40]

Irritating or sour foods that can aggravate mouth sores and cause more discomfort should be avoided. It is important to maintain rigorous oral hygiene, avoiding the use of products that could irritate lesions, such as abrasive toothpaste. It is important to consume soft foods and liquids to reduce discomfort

during meals and avoid traumatizing injuries. It is recommended to consult your obstetrician or dentist for specific recommendations related to the treatment and management of mouth sores during pregnancy. [38-42]

## Conclusions

In conclusion, mouth sores are a common and sometimes uncomfortable problem for pregnant women, having a significant impact on oral and overall health. It is crucial to understand the causes of this condition and adopt appropriate preventive and management strategies to minimize discomfort and associated risks.

To prevent mouth sores during pregnancy, paying close attention to oral hygiene is essential. Avoiding irritating foods can help reduce the frequency of mouth sores. Managing stress and ensuring adequate rest are important for maintaining oral and overall health during pregnancy.

For the treatment of mouth sores during pregnancy, it is recommended to seek advice and treatment from an obstetrician or dentist. Treatment options

may include rinsing with salt water, applying topical gels or creams, and using lidocaine lotions or sprays to provide temporary relief from symptoms.

The use of transdermal systems for administering essential oils to pregnant women is an innovative and effective method of treatment of canker sores in pregnant women, offering multiple benefits and ensuring increased safety for mothers and babies.

Finally, it is essential to recognize the importance of proper management of mouth sores during pregnancy to protect the health and well-being of both mother and unborn child. By adopting appropriate preventive and treatment measures, we can minimize the impact of these conditions and ensure a more comfortable and healthy experience for pregnant women.

## References

1. Annan B, Nuamah K. Oral pathologies seen in pregnant and non-pregnant women. *Ghana Med J*. 2005 Mar;39(1):24-7. doi: 10.4314/gmj.v39i1.35977. PMID: 17299537; PMCID: PMC1790803.
2. Pecci-Lloret MP, Linares-Pérez C, Pecci-Lloret MR, Rodríguez-Lozano FJ, Oñate-Sánchez RE. Oral Manifestations in Pregnant Women: A Systematic Review. *J Clin Med*. 2024 Jan 25;13(3):707. doi: 10.3390/jcm13030707. PMID: 38337401; PMCID: PMC10856094.
3. Silk H, Douglass AB, Douglass JM, Silk L. Oral health during pregnancy. *Am Fam Physician*. 2008 Apr 15;77(8):1139-44. PMID: 18481562.
4. Coman TM, Mănărăzan AD, Cîrstea AS, Cicoș DI. The multidisciplinary approach of a patient with Sjögren's Syndrome in the dental office – case report, *Acta Stomatologica Marisiensis* 2019;2(2)235-240 <https://asmj.ro/tag/hypertension/>
5. Galea C, Cicoș DI, Feier F, Morales D. THE USE OF ESSENTIAL OILS IN THE DEVELOPMENT OF DERMATO-COSMETIC PRODUCTS. *MEDICINE AND MATERIALS* Volume 3, Issue 1, 2023: 31-36 | ISSN: 2784 – 1499 & e-ISSN: 2784 – 1537 DOI: 10.36868/MEDMATER.2023.03.01.031
6. Galea C, Cicoș DI, Earar K, Moales D, Ratiu RF, Cicoș ID, Păcurar M, Bucur SM. TAXONOMIC POSITION, CULTIVATION METHOD IN ROMANIA AS WELL AS THE RATE OF OBTAINING THE ESSENTIAL GERANIUM OIL GROWN. *Romanian Journal of Oral Rehabilitation*. Vol. 15, No.4 October-December 2023
7. Dumitriu Buzia O, Păduraru AM, Stefan CS, Dinu M, Cicoș DI, Nwabudike LC, Tatu AL. Strategies for Improving Transdermal Administration: New Approaches to Controlled Drug Release. *Pharmaceutics*. 2023; 15(4):1183. <https://doi.org/10.3390/pharmaceutics15041183>
8. Cicoș DI, Dumitriu Buzia O, Tatu AL, Dinu M, Nwabudike LC, Stefan CS, Earar K, Galea C. Challenges in Optimizing Nanoplatfroms Used for Local and Systemic Delivery in the Oral Cavity. *Pharmaceutics*. 2024; 16(5):626. <https://doi.org/10.3390/pharmaceutics16050626>
9. Feier R, Sireteanu Cucui RM, Ratiu RF, Baci D, Galea C, Sachelarie L, Nistor C, Cocos D, Hurjui LL, Cernei ER. Comparative Study of Ozonated Olive Oil and Extra Virgin Olive Oil Effects on Oral Hygiene. *Applied Sciences*. 2023; 13(5):2831. <https://doi.org/10.3390/app13052831>
10. Cicoș DI, Earar K, Dinu M, Lungu I, Bazbanela C, Galea C. PERSPECTIVES ON THE USE OF GERANIUM ESSENTIAL OIL: PELARGONIUM GRAVEOLENS AND PELARGONIUM ROSEUM, IN DENTAL MEDICINE. *Romanian Journal of Medical and Dental Education* Vol. 12, No. 2, March-April 2023
11. Jang H, Patoine A, Wu TT, Castillo DA, Xiao J. Oral microflora and pregnancy: a systematic review and meta-analysis. *Sci Rep*. 2021 Aug 19;11(1):16870. doi: 10.1038/s41598-021-96495-1. PMID: 34413437; PMCID: PMC8377136.
12. Bejan A, Baci D, Cicoș DI, Dimofte AR. CONCEPTS ON THE RESISTANCE OF ACRYLIC TEETH, PMMA. *MEDICINE AND MATERIALS* Volume 3, Issue 1, 2023: 43-47 | ISSN: 2784 – 1499 & e-ISSN: 2784 – 1537 DOI: 10.36868/MEDMATER.2023.03.01.043

13. Cocos DI, Bucur SM, Coman TM, Păcurar M. Observational study on the frequency of anchorage auxiliaries in fixed orthodontics, *Romanian Journal of Oral Rehabilitation* vol. 13, nr. 3,(iulie-septembrie) anul 2021.
14. Bucur SM, Bud A, Gligor A, Vlasa A, Cocos DI, Bud ES. Observational Study Regarding Two Bonding Systems and the Challenges of Their Use in Orthodontics: An In Vitro Evaluation. *Applied Sciences*. 2021; 11(15):7091. <https://doi.org/10.3390/app11157091>
15. Bucur SM, Cocos D, Saghin A. Bond strength of three adhesive systems used for bonding orthodontic brackets, *Romanian Journal of Oral Rehabilitation* Vol.12, pages 162-167, No. 1, January - March 2020.
16. Bucur SM, Iantovics LB, Bud A, Bud ES, Cocos DI, Vlasa A. Retrospective study regarding orthodontic retention complications in clinical practice *Appl Sci* 2021. 12 (1) 273.
17. Vlasa A, Bud ES, Păcurar M, Lazăr L, Streiche L, Bucur SM, Cocos DI, Bud A. Effects of Composite Resin on the Enamel after Debonding: An In Vitro Study—Metal Brackets vs. Ceramic Brackets. *Applied Sciences*. 2021; 11(16):7353. <https://doi.org/10.3390/app11167353>
18. 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.
19. Rosa G, Piliang M. Painful mouth ulcers. *Cutis*. 2018 May;101(5):327;341;342;345. PMID: 29894533.
20. Scully C, Shotts R. ABC of oral health. Mouth ulcers and other causes of orofacial soreness and pain. *BMJ*. 2000 Jul 15;321(7254):162-5. doi: 10.1136/bmj.321.7254.162. PMID: 10894697; PMCID: PMC1118165.
21. Fitzpatrick SG, Cohen DM, Clark AN. Ulcerated Lesions of the Oral Mucosa: Clinical and Histologic Review. *Head Neck Pathol*. 2019 Mar;13(1):91-102. doi: 10.1007/s12105-018-0981-8. Epub 2019 Mar 7. PMID: 30701449; PMCID: PMC6405793.
22. Balan P, Brandt BW, Chong YS, Crielaard W, Wong ML, Lopez V, He HG, Seneviratne CJ. Subgingival Microbiota during Healthy Pregnancy and Pregnancy Gingivitis. *JDR Clin Trans Res*. 2021 Jul;6(3):343-351. doi: 10.1177/2380084420948779. Epub 2020 Aug 10. PMID: 32777190.
23. Vigarios E, Maret D. Pregnancy gingivitis. *QJM*. 2020 Oct 1;113(10):760-761. doi: 10.1093/qjmed/hcaa027. PMID: 32068874.
24. Steinberg BJ, Hilton IV, Iida H, Samelson R. Oral health and dental care during pregnancy. *Dent Clin North Am*. 2013 Apr;57(2):195-210. doi: 10.1016/j.cden.2013.01.002. Erratum in: *Dent Clin North Am*. 2013 Jul;57(3):ix. Iida, Hiroko [corrected to Iida, Hiroko]. PMID: 23570802.
25. Decusara M, Cocos DI, Caraiane A. REHABILITATION OF AGENESIA 2.2 WITH PRAM INVOLVEMENT. CASE REPORT. *MEDICINE AND MATERIALS* Volume 3, Issue 1, 2023: 23-30| ISSN: 2784 – 1499 & e-ISSN: 2784 – 1537 DOI: 10.36868/MEDMATER.2023.03.01.023
26. Pacurar M, Cocos DI, Lazăr M, Lazăr C, Caraiane A. CONE BEAM COMPUTED TOMOGRAPHY, IMPORTANCE OF EXAMINATION FOR THE STORAGE OF THERAPEUTICAL FAILURES IN IMPLANTOLOGY. *MEDICINE AND MATERIALS*. Volume 3, Issue 1, 2023: 3-12 | ISSN: 2784 – 1499 & e-ISSN: 2784 – 1537. DOI: 10.36868/MEDMATER.2023.03.01.003
27. Bucur SM, Popa R, Cocos DI, Tunyogi AB, Istrate P. Presence of candida albicans in Hawley plate wearers: a pilot study *Romanian Journal of Oral Rehabilitation* Vol. 14, No. 1, January - March 2022. ISSN2066-7000 ISSN-L 2601-4661
28. Cocos DI, Earar K, Bucur SM, Păcurar M, Mariş M, Cocos ID, Galea C. FREQUENCY OF THIRD MOLAR PATHOLOGY: INNOVATIVE CAUSES, SYMPTOMS AND TREATMENT OPTIONS. *Romanian Journal of Oral Rehabilitation* Vol. 15, No.4 October-December 2023
29. Zhang Z, Zhang Q, Gao S, Xu H, Guo J, Yan F. Antibacterial, anti-inflammatory and wet-adhesive poly(ionic liquid)-based oral patch for the treatment of oral ulcers with bacterial infection. *Acta Biomater*. 2023 Aug;166:254-265. doi: 10.1016/j.actbio.2023.05.017. Epub 2023 May 13. PMID: 37187300.
30. Schemel-Suárez M, López-López J, Chimenos-Küstner E. Úlceras orales: diagnóstico diferencial y tratamiento [Oral ulcers: Differential diagnosis and treatment]. *Med Clin (Barc)*. 2015 Dec

- 7;145(11):499-503. Spanish. doi: 10.1016/j.medcli.2015.04.017. Epub 2015 Jun 3. PMID: 26049962.
31. Bruce AJ, Dabade TS, Burkemper NM. Diagnosing oral ulcers. *JAAPA*. 2015 Feb;28(2):1-10. doi: 10.1097/01.JAA.0000459826.63026.67. PMID: 25621959.
  32. Hale L, Wojnarowska F. Mouth ulcers: how can you help? *Practitioner*. 1997 Feb;241(1571):86-90. PMID: 9156496.
  33. Fu H, Yang J, Shen Z, Zhang Y, Kuang S, Li L, Lin Z, Shi X. Antibacterial, wet adhesive, and healing-promoting nanosheets for the treatment of oral ulcers. *Biomater Sci*. 2023 May 2;11(9):3214-3226. doi: 10.1039/d2bm02063g. PMID: 36927992.
  34. Puisoru, M., Forna, N., Fatu, A.M. Fatu, R., Fatu, C. , Analysis of mandibular variability in humans of different geographic areas, *Annals of anatomy-Anatomischer Anzeiger*, Volume 188, Issue 6, 2006, Page. 547-554
  35. Martu M.A., Solomon S.M. , Toma V. , Maftai G.A. , Iovan, A. Gamen A. , Hurjui, L. , Rezus, E. , Foia L. Forna N.C. , The importance of cytokines in periodontal disease and rheumatoid arthritis. review, *Romanian Journal Of Oral Rehabilitation*, 2019, 11 (2) , pp.230-240
  36. Mitrea M, Bozomitu LI, Tepordei RT, Gurzu IL, Walid EA, Stefanescu OM, Vicoleanu SAP, Niculescu S, Hreniuc IJ, Tecuceanu A, Dmour A, Maxim RR, Ciurcanu OE, Danila V. The sinus lift procedure applied in cases where the thickness of the bone is insufficient using double PRF as well as in the case of an intrasinus mucocoele. *Romanian Journal of Oral Rehabilitation* 2023, 15(1):66-81.
  37. Mitu F., Dumitriu I.L., Schiriac C.E, Vata L.G., Gurzu B., Effect of supervised lifestyle changes on metabolic syndrome-associated inflammation. *Acta Endocrinologica (Buc)* 2013 9(2): 249-262.
  38. Dumitriu IL, Gurzu B, Cojocaru E, Slătineanu SM, Enea M. COURSE NOTES Validation of GOD/PAP method for quantitative determination of glucose concentration in human serum. *Revista Română de Medicină de Laborator* 2011;19(1/4): 85–100.
  39. Gradinaru, I , Jipu, R, Hurjui, LL , Pendefunda, AAC , Armencia, A.O. , Mitrea, M. , Antohe, M.E., Current aspect of metal-ceramic-biomaterial restorations and technology, *Romanian journal of oral rehabilitation*, 2020, 12 (2) , pp.116-127
  40. Orefice R. Immunology and the immunological response in pregnancy. *Best Pract Res Clin Obstet Gynaecol*. 2021 Oct;76:3-12. doi: 10.1016/j.bpobgyn.2020.07.013. Epub 2020 Oct 14. PMID: 33191116.
  41. Forna, D.A. , Forna, N.C. , Earar, K., Popescu, E ., Postoperative Clinical Evolution of Edentulous Patients Treated by Guided Bone Regeneration Using Xenograft Bone Substitute and Collagen Membrane , *Materiale Plastice* ,2017, 54 (2) , pp.312-315
  42. Dinu M, Tatu AL, Cocos DI, Nwabudike LC, Chirilov AM, Stefan CS, Earar K, Dumitriu Buzia O. Natural Sources of Therapeutic Agents Used in Skin Conditions. *Life*. 2024; 14(4):492. <https://doi.org/10.3390/life14040492>
  43. Mor G, Cardenas I. The immune system in pregnancy: a unique complexity. *Am J Reprod Immunol*. 2010 Jun;63(6):425-33. doi: 10.1111/j.1600-0897.2010.00836.x. Epub 2010 Mar 29. PMID: 20367629; PMCID: PMC3025805.
  44. Solomon, S. , Ursarescu, I ., Martu, A ., Luchian, I ., Agop-Forna, D , Martu, S. , Forna, N.C., Photo-activated Toluidine Blue O as Adjunctive Periodontal Treatment, 2015, *REVISTA DE CHIMIE*, 66 (8) , pp.1166-1168
  45. Forna, N.C. and Sader, R., Oral rehabilitaion on small substance loss cases, 2009, *Romanian journal of oral rehabilitation*, 1 (4) , pp.15-20
  46. Antohe, M.E.; Madarati, M. and Forna, N.C., Clinical-technological requirements in the rehabilitation of partially extended edentulousness complications, *Romanian journal of oral rehabilitation*, 2021, 13 (4) , pp.194-200
  47. Murariu, A., Hanganu, C., Bobu, L., Vasluianu, R ., Geletu, G ., Baci, R. , Stafie, C.S. , Forna, N.C. , Comparative study of oral health systems in Europe, *Romanian journal of oral rehabilitation*, 2020, 12 (4) , pp.11-17

48. Dumitriu Buzia O, Păduraru AM, Stefan CS, Dinu M, Cocoș DI, Nwabudike LC, Tatu AL. Strategies for Improving Transdermal Administration: New Approaches to Controlled Drug Release. *Pharmaceutics*. 2023; 15(4):1183. <https://doi.org/10.3390/pharmaceutics15041183>
49. Forna, N.C. and Pepi, P., Non-invasive methods of paraclinical evaluation involved in oral rehabilitation, *Romanian journal of oral rehabilitation*, 2009, 1 (2) , pp.11-19
50. Forna N.C., Dascalu C. , Forna D ., Antohe M.E. , Incidence and prevalence of dental - periodontal conditions and edentation in Moldavia, *Medical-Surgical Journal-Revista Medico-Chirurgicala* , 2013,117 (1) , pp.205-211
51. Nemtoi, A., Nemtoi, A .,Fochi, A., Sirghe, A.E. , Preda, C. , Earar, K ., Beznea, A ., Onisor, C. , Iorgulescu, G ., Haba, D., CBCT Evaluation of the Mandibular Bone Quality in Relation to Skeletal Status After Treatment with Strontium Renelate in Diabetic Patients, *Revista de chimie*, 2019, 70 (11) , pp.4113-4118
52. Steinberg BJ, Hilton IV, Iida H, Samelson R. Oral health and dental care during pregnancy. *Dent Clin North Am*. 2013 Apr;57(2):195-210. doi: 10.1016/j.cden.2013.01.002. Erratum in: *Dent Clin North Am*. 2013 Jul;57(3):ix. Iida, Hiroko [corrected to Iida, Hiroko]. PMID: 23570802.
53. Bucur SM, Popa R, Cocoș DI, Tunyogi AB, Istrate P. Presence of candida albicans in Hawley plate wearers: a pilot study *Romanian Journal of Oral Rehabilitation* Vol. 14, No. 1, January - March 2022. ISSN2066-7000 ISSN-L 2601-4661
54. Cocoș DI, Earar K, Bucur SM, Păcurar M, Mariș M, Cocoș ID, Galea C. FREQUENCY OF THIRD MOLAR PATHOLOGY: INNOVATIVE CAUSES, SYMPTOMS AND TREATMENT OPTIONS. *Romanian Journal of Oral Rehabilitation* Vol. 15, No.4 October-December 2023
55. Botnariu G., Forna N., Popa A.,Popescu R ., Onofriescu A .,Cioloca D., Lacatusu C. , Mihai B. ,Correlation of Glycemic Control Parameters in Non-Diabetic Persons with Cardiovascular Risk Scores - Results from a Cross-Sectional Study,*Revista De Chimie* , 2017, 68 (1) , pp.108-110
56. Pomîrleanu, C., Mihailov, C., Chiriac, R., Ancuta, E. , Iordache, C. , Bran, C . Tanculescu, O. , Efficacy of baricitinib on periodontal inflammation in patients with rheumatoid arthritis, *Joint Bone Spine*, 2020, 87 (3) , pp.235-239
57. Moscalu, M., Moscalu, R., Dascalu, C.G., Tarca, V. , Cojocar, E. , Costin, I.M. , Tarca, E., Serban, I.L., Histopathological Images Analysis and Predictive Modeling Implemented in Digital Pathology-Current Affairs and Perspectives,*Diagnostics*,2023, 13 (14)
58. Sălceanu M, Vataman M, Aminov L, Giuroiu C, Topoliceanu C, Decolli Y, Ghiorghe C-A, Melian A. Diagnosis and follow-up of the periapical lesions in the non-surgical endodontic treatment: a CBCT study. *Rom J Oral Reh*. 2017; 9(2): 32-36.
59. Antohe, ME ,Dascalu, C., Savin, C., Forna, N.C., Balan, A , Study Regarding the Toxic Effects of Acrylic Resins, *Dec 2016, Materiale Plastice*, 53 (4) , pp.767-770
60. Ota K, Kwak-Kim J, Takahashi T, Mizunuma H. Pregnancy complicated with PFAPA (periodic fever, aphthous stomatitis, pharyngitis, and cervical adenitis) syndrome: a case report. *BMC Pregnancy Childbirth*. 2018 Jun 4;18(1):207. doi: 10.1186/s12884-018-1854-6. PMID: 29866074; PMCID: PMC5987649.
61. Javali MA, Saquib SA, Abdul Khader M, Khalid I, AlShahrani AY, Kanji MA, Asiri E. Oral health knowledge, attitude, and practice of pregnant women in Deccan, South India: a cross-sectional prenatal survey. *J Med Life*. 2022 Mar;15(3):420-424. doi: 10.25122/jml-2019-0095. PMID: 35449998; PMCID: PMC9015187.
62. Jahan SS, Hoque Apu E, Sultana ZZ, Islam MI, Siddika N. Oral Healthcare during Pregnancy: Its Importance and Challenges in Lower-Middle-Income Countries (LMICs). *Int J Environ Res Public Health*. 2022 Aug 27;19(17):10681. doi: 10.3390/ijerph191710681. PMID: 36078397; PMCID: PMC9518121.