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## **The impact of systemic diseases - Diabetes, Cardiovascular diseases, Epilepsy, Thyroid diseases, on the condition of the oral cavity and the course of a dental visit.**

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**KEYWORDS:** Systemic disease, diabetes, cardiovascular diseases, epilepsy, thyroid diseases.

**Abstract:**

**Introduction and purpose**

Systemic diseases are affecting an increasing number of people worldwide. Both adults, the elderly, and children are affected. Social awareness regarding diseases and their symptoms remains very low. In the rush of life, we forget how important it is to take care of our health to fully enjoy each day.

Many systemic diseases exhibit characteristic symptoms in the oral cavity. Patients are often unaware of this, which emphasizes the importance of alertness on the part of the dental practitioner, thorough history-taking not only in dentistry but also in general medicine, and comprehensive patient examination.

Patient awareness of their condition not only matters for the individual but also significantly impacts the course of the dental visit, office preparation, and procedures performed. Many diseases, especially those uncontrolled, may preclude certain treatments or necessitate alterations in dental management.

Among the most common lifestyle diseases whose symptoms may be observed in the oral cavity and which will influence the course of the visit and procedures performed are diabetes, epilepsy, thyroid diseases, and cardiovascular diseases.

The aim of this review is to characterize the influence of systemic diseases on the condition of the oral cavity, as well as to indicate the most important symptoms that may suggest a particular disease and affect the course of a dental visit.

**Materials and methods.** The article presents the current state of knowledge regarding the impact of systemic diseases on the condition of the oral cavity in various scientific publications. Publications describing these diseases and the course of dental visits were reviewed using the PubMed platform and included in textbooks listed in current scientific databases.

**Conclusions.** Awareness of the oral cavity's condition, as well as the symptoms that systemic diseases can exhibit, has a tremendous impact on our health. Early detection of pathologies and implementation of treatment contribute to halting or slowing down the progression of the

disease, as well as improving our well-being. Increasing patient awareness of the significance of lifestyle, regular check-ups, prevention, and lifestyle choices can influence an individual's future and eventually raise awareness across society.

## **INTRODUCTION**

Systemic diseases affect an increasing number of people worldwide. They affect adults, the elderly, and children alike. Many of them are lifestyle diseases, while others, despite being less common, also pose a threat to our lives, especially when undiagnosed and untreated. Some of us are aware of our ailments, but a significant number of people trivialize symptoms, skip periodic check-ups, or fail to connect their complaints with systemic diseases. Social awareness regarding diseases and their symptoms remains very low. In the rush of life, we forget how important it is to take care of our health to fully enjoy each day.

Many systemic diseases manifest characteristic symptoms in the oral cavity. Patients are often unaware of this, highlighting the importance of vigilance on the part of the dental practitioner, comprehensive history-taking not only in dentistry but also in general medicine, and thorough patient examination.

Increasingly, we focus only on the reason for the patient's visit, neglecting the examination of the entire dentition, periodontium, oral mucosa, temporomandibular joints, salivary gland ducts, or trigeminal nerve exits, which may indicate pathology that the patient is unaware of but which may be an important symptom of disease. Therefore, it must be remembered that a dentist may be the first person to diagnose a particular condition in a patient.

Oncological vigilance is also necessary because precancerous conditions are very often characteristic changes that, when detected and treated at an early stage, can prevent the development of actual cancer. Every dental examination is an opportunity to assess the patient's condition from an oncological perspective. Additionally, patients should be reminded

of the importance of periodic preventive examinations, and societal awareness of cancerous conditions should be increased.

The patient's awareness of their condition is not only significant for the individual but also has a substantial impact on the course of the visit, office preparation, and procedures performed. Many diseases, especially those uncontrolled, may preclude certain treatments or necessitate alterations in dental management.

It is crucial to effectively communicate information about the state of the patient's oral cavity, particularly any detected pathologies, in order not to frighten the patient but to encourage further diagnostics. It is the dentist's task to assist the patient in further diagnostics by referring them to appropriate specialized medical centers, providing psychological support, and participating in prevention efforts, including tobacco cessation, alcohol consumption reduction, adherence to a low-vitamin diet, and adherence to oral hygiene principles.

Among the most common lifestyle diseases whose symptoms may be observed in the oral cavity and which will influence the course of the visit and procedures performed are diabetes, epilepsy, thyroid diseases, and cardiovascular diseases.

## **DIABETES**

Diabetes is a metabolic disorder characterized by disturbances in protein, fat, and carbohydrate metabolism. There are two types of diabetes:

Type 1 diabetes - characterized by insulin deficiency.

Type 2 diabetes - associated with impaired insulin action and secretion.

Typical symptoms of diabetes include excessive urination, increased thirst, weakness, drowsiness, and weight loss.

In addition to general symptoms, numerous changes in the oral cavity are observed. The main cause is microangiopathies, which are changes occurring in small blood vessels, resulting in impaired blood flow, reduced saliva secretion, increased plaque deposition, high susceptibility to infections, disruptions in the function of the immune system (granulocytes and lymphocytes), and impaired wound healing.

Symptoms of diabetes manifesting in the oral cavity include primarily gingivitis and periodontitis, generalized loss of tongue papillae, angular cheilitis, taste disturbances, dysfunction of salivary glands (leading to increased susceptibility to tooth decay, especially around the tooth neck, root cementum, and contact surfaces), burning mouth syndrome, delayed wound healing, and mucosal diseases. Additionally, there is an unpleasant odor from the mouth, difficulty in swallowing and speaking, taste disturbance, and a metallic or salty taste in the mouth. Patients also report difficulties in using prosthetic appliances and irritation of the oral mucosa under prosthetic work. Imbalance in the microbiological environment also contributes to the development of pathogenic microorganisms such as *Candida albicans* (increased frequency of fungal infections) and *Streptococcus mutans*.

Changes in the oral cavity in the course of diabetes most commonly occur in the form of periodontal disease. They can occur concurrently with the underlying condition or appear after a prolonged duration of diabetes. These changes can be accompanied by multiple periodontal abscesses with destruction of alveolar bone.

There is a bidirectional relationship between diabetes and periodontitis: diabetes can worsen the condition of the periodontium, and poor periodontal health can hinder diabetes control

Another common symptom of diabetes in the oral cavity is changes on the tongue. We distinguish:

- Fissured tongue (scrotal tongue) - the smooth dorsal surface of the tongue is furrowed, crossed by one or several grooves arranged most often parallel to the long axis of the tongue.
- Atrophic glossitis - total or partial atrophy of lingual papillae.
- Median rhomboid glossitis - atrophy of papillae in the midline of the posterior dorsal part of the tongue, the tongue is burning, smoothed, ham-colored.
- Geographic tongue - a mild migratory inflammation of the tongue, characterized by focal atrophy of lingual papillae, taking on an irregular, "geographic" shape.

In the case of receiving information from a patient about diabetes or observing characteristic symptoms of this condition, a detailed interview in this direction is essential.

The most important aspect is whether diabetes is controlled and stabilized and whether the patient regularly takes insulin. The basic indicator is the level of glycated hemoglobin (a modified form of normal hemoglobin, formed as a result of the attachment of glucose molecules), which should be below 7%. The result of this test influences the monitoring of the effectiveness of the treatment being used, thereby avoiding dangerous complications that may occur in the case of improperly treated diabetes. It also enables the dentist to carry out treatment correctly and choose procedures that can be performed on a particular patient, as a higher HbA1C value is a contraindication to, among others, extraction or subgingival procedures.

A patient with diabetes requires special care in the dental office. The appointment time should be adjusted to the patient because individuals may experience different levels of well-being throughout the day. Patients should be informed that they should attend each appointment after a meal and insulin intake. Such patients may experience both hypoglycemia and hyperglycemia, making the dentist's vigilance during the visit crucial. If a patient develops symptoms of hypoglycemia in the dental office, orally administered glucose should be given to conscious patients with symptoms, such as glucose tablets, sugar cubes, a drink containing 2-4 teaspoons of sugar, or glucose gel squeezed into the mouth. If the patient is unconscious, intramuscular administration of 1 mg of glucagon is required, and immediate medical assistance should be sought. Throughout the time when the patient is unconscious, maintaining airway patency is essential.

Each dental office should be additionally equipped with a glucometer to be able to assess the patient's current blood glucose level at any time. While not a diagnostic indicator or a means of qualifying a patient for a specific procedure, it allows for the implementation of appropriate first aid measures in the event of deterioration in the patient's condition.

Prevention of oral diseases in patients with diabetes is also crucial: it justifies the need for maintaining proper oral hygiene, instructing and monitoring correct methods of tooth cleaning, eliminating factors that facilitate the accumulation of dental plaque, performing professional preventive and therapeutic procedures (scaling, root planing), and adhering to regular follow-up examinations.

Another question that arises in the case of a patient with diabetes is the necessity of implementing antibiotic prophylaxis during surgical procedures. Routine use of antibiotic prophylaxis in patients with diabetes is not recommended; the decision to implement antibiotic prophylaxis should be balanced and dependent on disease control and its systemic course. The recommended antibiotic for prophylaxis in adults is amoxicillin without clavulanic acid administered in a single dose of 2000 mg, and for patients allergic to penicillin antibiotics, cefazolin in a single dose of 1000 mg or clindamycin in a single dose of 600 mg, given 30-60 minutes before the procedure. In children, amoxicillin without clavulanic acid is administered in a single dose of 50 mg/kg body weight, and for children allergic to penicillin antibiotics, cefazolin in a single dose of 50 mg/kg body weight or clindamycin in a single dose of 20 mg/kg body weight. (1-14, 19-23, 27, 28, 30-32)

## **EPILEPSY**

Epilepsy is one of the most common neurological disorders. It is characterized by spontaneous, recurrent seizures. In the diagnosis of epilepsy, imaging studies and electroencephalography are crucial.

Epilepsy can have a genetic basis. The risk of its occurrence increases several times in the case of a family history of the disease. Epilepsy may coexist with some genetic disorders, such as Down syndrome. Its causes may include developmental disorders, brain tumors, stroke, head injury, previously experienced infections of the central nervous system. Epilepsy may develop as a result of conditions such as meningitis, viral encephalitis, central nervous system tuberculosis, malaria, toxoplasmosis, Alzheimer's disease, multiple sclerosis.

Symptoms of epilepsy include seizures, which can vary in nature. Focal seizures involve excessive discharges occurring in a specific area of the brain and within one hemisphere. Generalized seizures, on the other hand, result from the disruption of electrical activity in both hemispheres of the brain. They may manifest as tonic seizures - sudden contractions of various muscle groups, atonic seizures - sudden loss of muscle tone, typically affecting the muscles of the upper and lower limbs, or generalized absence seizures - sudden loss of consciousness.



Patients with poorly controlled epilepsy experiencing frequent generalized seizures show worse oral health compared to patients who are better controlled or whose seizures do not involve the chewing organ. The number of damaged and missing teeth, the degree of wear, and the condition of the periodontium are significantly worse in patients with epilepsy. Individuals with epilepsy also have significantly fewer restored and replaced teeth than the general population. Generalized tonic-clonic seizures often cause minor injuries to the oral cavity, such as biting the tongue, lips, or cheeks. Frequent attacks also affect the temporomandibular joints and chewing muscles. Numerous pathologies can be observed, including pain, jaw deflection disorders, and acoustic symptoms such as clicks and crepitus.

In addition, patients may exhibit gingival overgrowth associated with the use of phenytoin, a primary medication used in epilepsy.

An epileptic patient in the dental office requires special care. It is important to thoroughly explain to the patient how the treatment will proceed (minimizing stress) and to avoid prolonged exposure to the dental lamp. A seizure can be triggered by factors accompanying the dental visit such as stress, pain, light, or sound stimuli, as well as the administration of local anesthesia.

It is also crucial to distinguish between a seizure and status epilepticus. Status epilepticus is a life-threatening condition that lasts for more than 10 minutes or involves a series of seizures with no regaining of consciousness between them.

A seizure can occur suddenly, which is why it is so important to prepare the office for each visit of an epileptic patient. There should be as little equipment as possible around the patient (only what is necessary for the procedure). In the oral cavity, we should also limit the number of objects so that they can be quickly removed in case of a seizure, as they pose a risk of aspiration into the patient's airway.

Another important issue is the guidelines for handling during a seizure. First, move all instruments away from the patient. Then, secure the patient from injuries and place the dental chair in a reclined position as close to the floor as possible. Place the patient on their side (to reduce the risk of aspiration of saliva, teeth, or materials in the patient's mouth). Do not restrain the patient or put fingers in their mouth. If the seizure lasts longer than 5 minutes, call

112. It is necessary to administer oxygen at a rate of 6–8 l/min if the office is equipped with appropriate equipment. If the seizure lasts longer than 1 minute or in case of recurring seizures, administer a dose of 10 mg diazepam intramuscularly or intravenously, or 2 mg lorazepam, or 5 mg midazolam.

It is also important to manage the patient after the seizure. Do not proceed with further dental treatment during the same visit. Try to communicate with the patient to assess their level of consciousness in the postictal phase. Do not restrain the patient in any way. Do not allow the patient to leave the office until full consciousness is restored. Contact the patient's family/caregivers if they are alone. Perform a brief oral examination for any injuries sustained. Depending on the postictal state, discharge the patient home, to their family doctor, or to the emergency room, depending on the assessment, with a responsible person.(1-9, 15, 16, 19-23, 25, 29-32)

## **Hyperthyroidism and hypothyroidism**

**Hypothyroidism** is a condition in which the thyroid gland produces too few hormones for the body's needs. The most common causes of hypothyroidism in Poland include Hashimoto's disease, which is a chronic autoimmune (lymphocytic) thyroiditis, a state after surgical removal of the thyroid, and a state after treatment with radioactive iodine.

The main symptoms suggesting hypothyroidism include a constant feeling of coldness, fatigue/drowsiness, depression, memory impairment, weight gain, less frequent bowel movements/constipation, slowed heart rate, low blood pressure, dry, flaky, pale skin, dry hair, menstrual irregularities, and infertility.

In addition to general symptoms, numerous oral symptoms of hypothyroidism are observed. These include macroglossia resulting from swelling due to the deposition of fibronectin and hydrophilic glycosaminoglycans, delayed tooth eruption, poor periodontal health, delayed wound healing, slowed metabolic turnover, bone growth and maturation, unfavorable effects on the maturation of fungiform papillae on the tongue, resulting in taste impoverishment, and inhibition of somatosensory sensitivity of the trigeminal nerve in individuals with an increased number of taste buds, which can initiate burning mouth syndrome.

**Hyperthyroidism**, on the other hand, is a disorder in which the thyroid gland produces too many hormones relative to the body's needs. The most common causes of hyperthyroidism in Poland include Graves' disease (an autoimmune disorder in which the body's own antibodies stimulate the thyroid to produce hormones) and thyroid nodules (toxic nodular goiter, autonomous thyroid nodule). Among the rarer causes of hyperthyroidism, we can mention subacute thyroiditis (a disease associated with a previously acquired viral infection) and postpartum thyroiditis.

General symptoms of hyperthyroidism include feeling hot, increased sweating, nervousness, anxiety, irritability, hand tremors, weight loss despite increased appetite, more frequent bowel movements/diarrhea, accelerated heart rate, palpitations, muscle weakness, hair loss, eye symptoms (exophthalmos, double vision, eyelid or conjunctival swelling and redness), and menstrual irregularities and infertility.

In the oral cavity, hyperthyroidism manifests as increased susceptibility to tooth decay, periodontal disease, osteoporosis of the jaw or mandible (due to altered bone metabolism - hyperthyroidism causes increased metabolism of bone tissue, increased number of osteoclasts, resorption outweighs bone formation), accelerated eruption of permanent teeth, and Burning Mouth Syndrome (BMS).

One of the most common issues among individuals with thyroid disorders is periodontal disease, mainly affecting those with hyperthyroidism. Altered defensive functions of the body in individuals with hyperthyroidism lead to faster growth of bacteria in the oral cavity, resulting in dental plaque buildup. This irritates the soft tissues, leading to the development of gingival inflammation.

Hyperactivity and increased levels of anxiety in the course of hyperthyroidism can exacerbate stress associated with dental visits (a potential trigger for thyroid storm). Therefore, it is recommended to shorten the duration of appointments and pay special attention to comfort and safety conditions. Routine dental procedures in patients with well-controlled hypothyroidism usually do not pose problems. Due to cardiovascular burdens in this group of patients, caution is recommended when using local anesthetics with vasoconstrictors. In the course of thyroid disorders, healing processes may be slowed down, and there is an increased risk of wound infection (the use of antiseptics is recommended). Additionally, avoiding the administration of atropine is advised.

For patients with thyroid diseases, it is also important to use preventive measures: regular removal of dental plaque (protection against gum inflammation), therapy for primary diseases (thyroid dysfunction and osteoporosis), oral hygiene with fluoride-rich products, and supplementation with vitamin D and K.

It is recommended that dental treatment be carried out in a state of euthyroidism (normal levels of thyroid hormones and TSH). (1-9, 17, 19-23, 26, 27, 30-32)

### **Cardiovascular diseases**

Cardiovascular diseases constitute another group of civilization-related disorders. Individuals burdened with cardiovascular issues form a significant portion of patients visiting dental offices. The most important aspect is to gather a thorough medical history to ascertain whether the patient regularly sees a cardiologist, what medications they are taking, and whether they have undergone any surgeries or procedures in the past.

Cardiovascular diseases can present with characteristic symptoms in the oral cavity. These may include unpleasant breath odor, gingival bleeding, mucosal congestion in the oral cavity, or increased susceptibility to dental caries.

Although according to the latest guidelines, dental procedures are classified as low-risk for patients, they should not be underestimated. The most important conditions affecting the course of dental treatment include a history of infective endocarditis, congenital cyanotic heart disease, valvular heart disease, and heart defects treated with artificial materials. The most pressing question is whether pre-procedural antibiotic therapy is necessary. It is required in cases involving procedures within the gum with mucosal perforation, in the periapical area of the tooth, and in cases where large wounds are left after the procedure. Prophylactic antibiotic use is not required for removing stitches from the oral cavity, injecting anesthetic into non-infected tissue, or in cases of trauma involving the lips or oral mucosa, taking X-rays within the oral cavity, or fitting orthodontic appliances.

The recommended antibiotic for prophylaxis in adult patients is amoxicillin without clavulanic acid given in a single dose of 2000 mg, and for patients allergic to penicillin

antibiotics, cefazolin in a single dose of 1000 mg or clindamycin in a single dose of 600 mg, 30-60 minutes before the procedure. For children, amoxicillin without clavulanic acid is given in a single dose of 50 mg/kg b.w., and for children allergic to penicillin antibiotics, cefazolin in a single dose of 50 mg/kg b.w. or clindamycin in a single dose of 20 mg/kg b.w.

Another important issue is the impact of oral hygiene on the course of general diseases. Currently, it is believed that it is not dental procedures, but rather the lack of oral hygiene and repetitive bacteremia associated with activities such as chewing food and brushing teeth that may contribute to the development of infective endocarditis. Bacteria constituting the oral flora exacerbate conditions such as peripheral atherosclerosis, coronary artery disease, and acute coronary syndrome. It is considered that periodontal disease therapy, leading to an improvement in oral health, is an integral part of preventive cardiology. It is also important to prevent oral diseases in patients with cardiovascular diseases: justifying the need for proper oral hygiene, instructing and controlling methods of proper tooth cleaning, eliminating factors facilitating plaque accumulation, performing professional preventive and therapeutic procedures (scaling, root planing), and adhering to systematic follow-up examinations. (1-10, 18-24, 27, 30-32)

## **CONCLUSIONS**

Awareness of the oral cavity's condition, as well as the symptoms that systemic diseases can exhibit, has a tremendous impact on our health. Early detection of pathologies and implementation of treatment contribute to halting or slowing down the progression of the disease, as well as improving our well-being. Increasing patient awareness of the significance of lifestyle, regular check-ups, prevention, and lifestyle choices can influence an individual's future and eventually raise awareness across society.

Let us not forget to remain vigilant during examinations, gather thorough patient histories, and adopt an individualized approach to each patient. By doing so, we can diagnose specific conditions and effectively manage dental treatment for patients with particular disorders.

## **AUTHOR'S CONTRIBUTION**

Conceptualization, K.Krygicz, and M.Kocoń; methodology, M. Czapska; software, T.Duplaga; check, T.Duplaga, L.Krawczyk and M.Czapska; formal analysis, L.Krawczyk; investigation, M.Czapska; resources, T.Duplaga; data curation, L.Krawczyk; writing - rough preparation, K.Krygicz; writing - review and editing, M.Kocoń; visualization, L.Krawczyk; supervision, M.Czapska; T.Duplaga; L.Krawczyk; project administration, M.Kocoń; , Kamila Babkiewicz-Jahn and Justyna Matuszewska; resources

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## REFERENCES:

1. Olczak-Kowalczyk D. Contemporary Developmental Dentistry. 1st ed. Otwock; 2017. ISBN: 978-83-87717-26-1.
2. Jańczuk Z. Conservative Dentistry with Endodontics. 4th ed. Warsaw; 2014. ISBN: 978-83-200-4863-6.
3. Górská R. Periodontology: A Textbook for Students and for the LDEK Exam. 1st ed. Wrocław; 2022. ISBN: 978-83-66960-50-3.
4. Mueller HP. Periodontology. 2nd ed. Wrocław; 2017. ISBN: 978-83-65625-98-4.
5. Scully C. Oral Diseases: Diagnosis and Treatment. 1st ed. Wrocław; 2006. ISBN: 8389581493.
6. Roberson TM. Conservative Dentistry. 1st ed. ISBN: 978-83-7563-098-5.
7. Bartkowski S. Maxillofacial Surgery. 3rd ed. Kraków; 1996. ISBN: 83-86101-42-3.
8. Kryst L. Maxillofacial Surgery. 5th ed. Warsaw; 2021. ISBN: 978-83-200-4295-5.
9. Chiapasco M. Dental Surgery. 3rd ed. Wrocław; 2020. ISBN: 978-83-65373-37-3.
10. Recommendations of the Working Group of the Polish Dental Society and the National Antibiotic Protection Program on the Use of Antibiotics in Dentistry.
11. Gandara BK, Morton TH Jr. Symptoms of Diabetes in the Oral Cavity Beyond the Periodontium: Basic Information for Medical Personnel.
12. Karłowska I. Outline of Contemporary Orthodontics. Warsaw: PZWŁ; 2016. ISBN: 978-83-200-5221-3.
13. Graves DT, Ding Z, Yang Y. The impact of diabetes on periodontal diseases. *Periodontol* 2000. 2020 Feb;82(1):214-224. doi: 10.1111/prd.12318. PMID: 31850631.

14. Graves DT, Corrêa JD, Silva TA. The Oral Microbiota Is Modified by Systemic Diseases. *J Dent Res*. 2019 Jan;98(1):148-156. doi: 10.1177/0022034518805739. PMID: 30359170; PMCID: PMC6761737.
15. Fiske J, Boyle C. Epilepsy and oral care. *Dent Update*. 2002 May;29(4):180-187. doi: 10.12968/denu.2002.29.4.180. PMID: 12050884.
16. Yeung PM, Wong VC, McGrath CP, Yiu CK, Lee GH. Oral health status of children with epilepsy in Hong Kong. *J Int Clin Dent*. 2019 Dec;12(1):67-74. doi: 10.1111/jicd.12479. PMID: 31755666.
17. Kwon M, Jeong YJ, Kwak J, Jung KY, Baek SK. Association between oral health and thyroid disorders: A population-based cross-sectional study. *Oral Dis*. 2021 Sep;27(6):1371-1378. doi: 10.1111/odi.13895. PMID: 33930233.
18. Kuczaj A, Fudal M, Kasperski J, Nowalany-Kozielska E. Cardiologically Burdened Patient in the Dentist's Office – An Interdisciplinary Problem.
19. Szczeklik AT. *Internal Medicine 2023*. Kraków: Medycyna Praktyczna; 2023. ISBN: 9788374306997.
20. Szczeklik AT. *Internal Medicine - Small Handbook 2023*. Kraków: Medycyna Praktyczna; 2023. ISBN: 9788374307000.
21. Ralston SH, Penman ID, Strachan MWJ. *Davidson's Principles and Practice of Medicine*. Volume 1. 2023. ISBN: 9788366310841.
22. Ralston SH, Penman ID, Strachan MWJ. *Davidson's Principles and Practice of Medicine*. Volume 2. 2023. ISBN: 9788366310858.
23. Ralston SH, Penman ID, Strachan MWJ. *Davidson's Principles and Practice of Medicine*. Volume 3. 2023. ISBN: 9788366310865.
24. Witkowski A, Lipiec P, Mitkowski P, Gil R. *Cardiology: Polish Society of Cardiology Textbook*. 2nd ed. ISBN: 9788367638876.
25. *Merritt's Neurology*. 14th ed. Volume 1-2. ISBN: 9788367447102.
26. Ambroziak U. *Thyroid Diseases: Diagnosis and Treatment*. Warsaw: PZWL; ISBN: 9788301225698.
27. Mamcarz A, Prejbisz A, Dobrowolski P. *Metabolic Syndrome: New Insights in Cardiology, Diabetology, Hypertension, Hepatology*. ISBN: 9788301228385.
28. Czupryniak L, Zozulińska-Ziółkiewicz D. *Diabetology Repetitorium*. 1st ed. 2017. ISBN: 9788365672933.
29. Staszewski J. *Outpatient Neurology*. Warsaw: PZWL; 2024. ISBN: 9788301234409.



30. Urich J, Liokatis P, Pannenbäcker L. Oral manifestations of systemic diseases. *MMW Fortschr Med.* 2022 Sep;164(19):32-37. doi: 10.1007/s15006-022-1820-0. PMID: 36123487.
31. Long RG, Hlousek L, Doyle JL. Oral manifestations of systemic diseases. *J Am Dent Assoc.* 1998 Dec;129(12):1761-1782. PMID: 9844357.
32. Islam NM, Bhattacharyya I, Cohen DM. Common oral manifestations of systemic disease. *Otolaryngol Clin North Am.* 2011 Feb;44(1):161-182. doi: 10.1016/j.otc.2010.09.006. PMID: 21093628.