







Oral manifestations in patients undergoing chemotherapy

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The proposed treatment for malignant neoplasms can be isolated or combined, involving resective surgery, radiotherapy, chemotherapy, and/or hormone replacement. Chemotherapy induces extensive immunosuppression and affects both healthy and abnormal cells. This cytotoxicity from the treatment has a significant effect that can lead to changes in the oral mucosa. The severity is related to the type of drug, duration of treatment, dosage used, level of oral hygiene during treatment, and the individual's age. Therefore, monitoring oral health before, during, and after antineoplastic therapy is essential. **Aim:** To evaluate the main oral manifestations that oncology patients presented before and after 15 days from the first administration of chemotherapy medication. **Methods:** A prospective observational study was conducted with 31 individuals treated at a Hospital Oncology and Hematology Service. The evaluations included the following steps: (1) Patient identification and completion of assessment forms; (2) Clinical examination of the oral cavity before and after the start of chemotherapy; and (3) Providing guidance to patients regarding oral care during oncological treatment. **Results:** It was observed that 70.96% of patients exhibited oral manifestations 15 days after the first infusion of antineoplastic drugs. The main changes identified included xerostomia and oral mucositis. **Conclusion:** Dental follow-up during chemotherapy is essential for preventing and managing potential oral emergencies, thereby avoiding interruptions in systemic treatment and ultimately enhancing the quality of life for these patients.

Keywords: Dentistry. Medical oncology. Antineoplastic agents. Oral manifestations.



Introduction

Cancer, in most countries, ranks among the top four causes of death before the age of 70. Changes in cancer types are observed in developing countries, with a decrease in infection-related types and an increase in carcinomas associated with improved socioeconomic conditions and the adoption of harmful habits such as poor diet, sedentary lifestyle, and stress¹.

In Brazil, the estimated number of new cancer cases between 2020 and 2022 was 625.000. The most prevalent carcinomas were skin (non-melanoma), followed by breast, prostate, colon, and rectum. In the state of Sergipe, it was estimated that 5.950 new cases would be registered annually, with the highest incidence in prostate and breast carcinomas². Therefore, malignant neoplasms constitute a significant societal issue. It is crucial to prioritize early diagnosis, control, and cancer prevention as strategies for public health^{3,4}.

Carcinogenesis is characterized by the uncontrolled and excessive proliferation of cells, resulting in loss of cellular differentiation. This cellular disorder is caused by numerous factors, including genetic, environmental, and epigenetic alterations⁵. The primary treatment for cancer is chemotherapy, which induces extensive immunosuppression and affects both healthy and abnormal cells⁶. However, healthy cells have a recovery period lasting from 5 to 15 days, while neoplastic cells are disorganized and do not recover. Therefore, chemotherapy treatment is administered in periodic cycles⁷.

The cytotoxicity of the treatment can lead to oral lesions, and the severity is related to the type and degree of malignancy, the duration of chemotherapy treatment, and the dosage used. The individual's age and the level of oral hygiene should also be considered^{3,7}. The oral mucosa is more affected due to its similarity in tissue renewal rate compared to the uncontrolled proliferation of neoplastic cells⁸.

Regarding antineoplastic therapy, some chemotherapeutic agents are more stomatotoxic than others. Drugs like 5-fluorouracil, methotrexate, and cyclophosphamide are among those most associated with oral lesions⁶. Around 40% of patients treated with chemotherapy experience oral manifestations due to direct or indirect toxicity, with mucositis, xerostomia, and viral and fungal infections being the main issues⁷. These manifestations can cause severe pain, difficulty in nutrition, and sepsis, potentially leading to temporary cessation of chemotherapy and increased hospitalization periods. This contributes to patient treatment discontinuation. Therefore, it is essential to have a dentist as part of the multidisciplinary team in oncological treatment. Therefore, a protocol is necessary that involves oral environment management, removal of infection foci, oral hygiene guidance, early diagnosis, and treatment of manifestations caused by antineoplastic medications^{6,9}.

The present study aimed to evaluate the main oral manifestations and dental needs among oncology patients at the Oncology and Hematology Service of the University Hospital of Sergipe (HU-UFS). Additionally, it aimed to validate the importance of the dentist in monitoring patients before, during, and after chemotherapy treatment.

Material and Methods

This study was approved by the Research Ethics Committee of the Federal University of Sergipe under protocol number 5.270.225 and Certificate of Ethical Appreciation Presentation number 52125521.3.0000.5546. It was a case series study, observational, prospective, longitudinal, utilizing technical resources of quantitative approach.

The sample included individuals using chemotherapy medications, aged 18 years and older, without distinction of gender, race, group, or social class, treated at the Oncology and Hematology Service of HU-UFS between January and May 2022. Volunteers included in the study were informed about each phase and subsequently signed the Informed Consent Form. Individuals lacking perceptual-cognitive conditions to respond to inquiries were excluded from the study.

The patients were evaluated at two time points: 1) before the administration of chemotherapy and 2) 15 days after the first chemotherapy infusion. The evaluation consisted of two stages: 1) patient identification and medical history and 2) clinical examination of the oral cavity. The oral cavity examination was conducted by a single evaluating dentist, who assessed eleven anatomical sites: perioral region, right and left labial commissure, upper and lower lips, right and left buccal mucosa, vestibular sulcus, dorsum of the tongue, ventral surface of the tongue, tongue margin, hard palate, soft palate, and gingiva.

The changes found in the anatomical sites were recorded on a pre-designed evaluation form. When oral mucositis was identified, it was classified according to the scale recommended by the WHO. All identified lesions were appropriately treated. Information regarding the antineoplastic therapy (chemotherapy, dose, cycle, etc.) was also recorded on the evaluation form.

It was also observed whether the patient had any need for oral environment adjustment, such as periodontal scaling, restorations, elimination of septic foci, smoothing of sharp dental edges, complaints of xerostomia, and dry lips. When dental treatment was necessary, patients were referred to the Dental Outpatient Clinic at HU-UFS. At the end of the assessment, all patients were provided with an informative leaflet containing oral care guidelines for oncology patients.

The results obtained in this research were subjected to descriptive analysis and presented in tables, showing both absolute values and percentages.

Results

Table 1 presented the demographic data of the research participants. Out of 31 participants, 20 (64.5%) were female and 11 (35.5%) were male, with a mean age of 55.6 years. The majority of participants identified as mixed race (83.9%), were native to the interior of the state (67.7%), had completed high school education (58.0%), and were married (54.8%).

Table 1. Sociodemographic Characteristics of Individuals Undergoing Chemotherapy Treatment.

	Mean + SD	
	N	%
Age		
Sex		
Female	20	64.5
Male	11	35.5
Race		
White	4	12.8
Mixed race (Brown)	26	83.9
Black	1	3.3
Place of Birth		
Capital	10	32.3
Interior	21	67.7
Educational Level		
Illiterate	2	6.5
Elementary School	9	29.0
High School	18	58.0
Higher Education	2	6.5
Marital Status		
Single	10	32.3
Married	17	54.8
Widowed	1	3.2
Divorced	3	9.7
Total	31	100.0

Dental needs present before the start of chemotherapy treatment can be seen in Table 2. Among the dental demands observed were: 7 patients needing restorative procedures, 8 needing tooth extractions, and 16 needing periodontal treatment. A significant number of patients with tooth loss were identified, with those using old and/or ill-fitting dentures or without dentures being referred for prosthetic rehabilitation.

Table 2. Distribution of dental needs before the start of chemotherapy treatment.

	Number of teeth with caries lesions	Number of residual roots	Number of sextants with dental calculus	Number of missing teeth
1	0	0	6	9
2	2	0	0	30
3	0	0	0	5

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4	0	0	0	32
5	1	0	0	6
6	0	0	0	27
7	0	1	6	9
8	0	0	1	12
9	2	0	0	25
10	2	4	5	5
11	0	0	0	7
12	0	0	1	27
13	0	1	0	0
14	0	1	2	5
15	1	1	2	4
16	0	0	0	0
17	0	0	2	3
18	0	0	0	32
19	1	0	0	3
20	0	1	2	4
21	0	0	2	7
22	1	0	2	4
23	0	1	0	27
24	0	0	0	22
25	0	0	0	32
26	0	0	1	14
27	0	0	0	32
28	0	0	1	25
29	0	0	1	24
30	0	2	2	5
31	0	0	2	3

Regarding the location of malignant neoplasms (Table 3), the most frequent sites were: breast (9), lymphatic tissue (4), and lung (3). Among the medication protocols for antineoplastic therapy, the most commonly used drug was paclitaxel 11 (35.48%), followed by carboplatin 6 (19.35%).

Regarding oral manifestations, after the first medication administration among the 31 patients (Table 3), 22 reported some type of discomfort in the oral cavity. The majority of patients presented with xerostomia (9 cases - 29.03%), followed by oral mucositis (MO) (6 cases - 19.35%) and candidiasis (5 - 16.13%). Additionally, other oral changes were also observed, such as dysgeusia,odynophagia, and lesions caused by herpes simplex virus.

Table 3. Distribution of individuals undergoing chemotherapy treatment and oral manifestations.

	Localization	Chemotherapy	Oral manifestations at initial evaluation	Oral manifestations after chemotherapy began
1	Cervix	Cisplatin	No manifestations	Xerostomia and Dysgeusia
2	Left breast	Paclitaxel + Doxorubicin + Cyclophosphamide	No manifestations	Dry lips
3	Hematopoietic tissue	Doxorubicin + Tretinoin	No manifestations	Grade III Mucositis, Odynophagia, and Pseudomembranous Oral Candidiasis
4	Pancreas	Gemcitabine + capecitabine	No manifestations	No manifestations
5	Right breast	Paclitaxel + trastuzumab	No manifestations	Dysgeusia and Xerostomia
6	Left breast	Paclitaxel + carboplatin	No manifestations	No manifestations
7	Cervix	Cisplatin	No manifestations	No manifestations
8	Right breast	Paclitaxel	No manifestations	No manifestations
9	Left breast	Paclitaxel	Erythematous oral candidiasis	Erythematous oral candidiasis
10	Prostate	Docetaxel + zoledronic acid	Traumatic ulcer on lower lip	Dry lips and xerostomia
11	Lymphatic tissue	ABVD (Doxorubicin + bleomycin + vinblastine + dacarbazine))	No manifestations	No manifestations
12	Right breast	Paclitaxel	No manifestations	Xerostomia; Dysgeusia; petechiae on the right buccal mucosa
13	Ascending colon and cecum	Capecitabine	No manifestations	Grade III mucositis
14	Hematopoietic tissue	Doxorubicin + cytarabine	Angular cheilitis and dry lips	Petechiae on oral mucosa, Odynophagia, Grade III mucositis
15	Lung	Carboplatin + paclitaxel	No manifestations	Dry lips, Generalized pseudomembranous oral candidiasis, Oral burning sensation, Xerostomia
16	Head and neck	Carboplatin+ paclitaxel	No manifestations	Xerostomia and tooth sensitivity
17	Middle rectum	FLOX (Oxaliplatin + Calcium folinate + Fluorouracil)	No manifestations	Pseudomembranous oral candidiasis, Grade II mucositis, and dry, crusty lips
18	Lung	Paclitaxel + carboplatin	No manifestations	Grade I mucositis
19	Prostate	Docetaxel + prednisone + zoledronic acid	No manifestations	No manifestations
20	Right breast	Doxorubicin + Cyclophosphamide + filgrastim	No manifestations	Dry lips with ulcerations and Grade III mucositis
21	Ovaries	Carboplatin + paclitaxel	No manifestations	Xerostomia

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22	Bile ducts	Gemcitabine + Cisplatin	Actinic cheilitis on the lower lip	Lesion caused by herpes simplex virus and actinic cheilitis on lower lip
23	Stomach	FLOX (Oxaliplatin + Calcium folinate + Fluorouracil)	No manifestations	Dry lips and xerostomia
24	Right breast	Doxorubicin + Cyclophosphamide	No manifestations	Traumatic ulcer and sialorrhea
25	Lymphatic tissue	R-CHOP (rituximab + Cyclophosphamide + Doxorubicin + vincristine + prednisone))	Actinic cheilitis on the lower lip and petechiae on the dorsal surface of the tongue	Actinic cheilitis on lower lip and herpes simplex virus on hard palate
26	Lymphatic tissue	ABVD (Doxorubicin + bleomycin + vinblastine + dacarbazine)	No manifestations	Dysgeusia and xerostomia
27	Colon	FLOX (Oxaliplatin + Calcium folinate + Fluorouracil)	No manifestations	No manifestations
28	Stomach	FLOX (Oxaliplatin + Calcium folinate + Fluorouracil)	Dry lips and hemangioma on buccal mucosa	Hemangioma on buccal mucosa
29	Lung	Carboplatin + paclitaxel	Dry lips and erythematous oral candidiasis	Erythematous oral candidiasis
30	Right and left breast	Doxorubicin + cyclophosphamide	No manifestations	Xerostomia
31	Lymphatic tissue	ABVD (Doxorubicin + bleomycin + vinblastine + dacarbazine)	No manifestations	No manifestations

Discussion

The best time to plan and implement dental treatment is before the patient starts oncologic therapy, whether chemotherapy or radiation therapy. The cornerstone of dental care for patients with malignant neoplasms focuses on promoting oral health, which includes preventive measures such as oral hygiene instructions, as well as therapeutic care for conditions like mucositis, xerostomia, oral infections, among others. Additionally, it's crucial to eliminate potential sources of oral trauma, such as removing orthodontic appliances, adjusting poorly fitting dentures, and extracting fractured teeth^{10,11}. This approach allows for not only prevention but also immediate treatment of oral manifestations that may arise during oncologic therapy. This helps prevent systemic complications, promotes treatment progress, and improves the prognosis for oncology patients¹¹⁻¹³.

In the study by Dholam et al.¹³ (2021), the oral health of patients undergoing neoadjuvant chemotherapy for head and neck cancer was analyzed. Participants were evaluated during the pre-, trans-, and post-chemotherapy periods. At the end of the study, 130 patients completed all three evaluations. Among them, 23 participants underwent restorative treatment, and 119 extractions were performed during the pre-chemotherapy period. These findings align with the results of the current research,

highlighting that the primary dental treatments performed included periodontal treatment, dental extractions, and restorative treatment.

In the study conducted by Hespanhol et al.⁶ (2010), it was observed that oral changes were the most frequent adverse reactions resulting from antineoplastic treatment. The most common incidents were xerostomia, oral mucositis, and bacterial, viral, or fungal infections. These adverse reactions stem from the cytotoxic effects of chemotherapy drugs, which can lead to direct stomatotoxicity reactions such as mucositis, hyposalivation, dysgeusia, and neurotoxicity, or indirect stomatotoxicity reactions such as oral bleeding and opportunistic infections.

In the study by Fernandes and Fraga¹⁴ (2019), oral manifestations during oncologic treatment were evaluated in 20 patients diagnosed with head and neck cancer. Treatment included chemotherapy combined with radiotherapy (70% of patients) and radiotherapy alone (30%). The most prevalent oral changes were xerostomia (100% of patients), oral mucositis (80%), oral candidiasis (80%), osteoradionecrosis (20%), and radiation caries (10%). These findings are similar to those reported by García-Chías et al.¹⁵ (2019) and Mercadante et al.¹⁶ (2015).

In the present study, xerostomia was also the most observed oral manifestation; however, it affected fewer individuals compared to the previously mentioned studies. This could be related to the type of oncologic treatment administered, as in this study, only chemotherapy was used, and patients undergoing head and neck radiotherapy were excluded. Additionally, the duration of chemotherapy treatment exposure may have influenced this result, as only manifestations occurring after 15 days from the first drug administration were considered in this study.

Silva et al.¹² (2021) investigated the association between xerostomia and taste alteration in patients undergoing chemotherapy, following 55 patients through the first two cycles of chemotherapy infusion. It was observed that taste alteration was significantly more prevalent in patients who reported xerostomia compared to those who did not. The study concluded that taste changes were more severe for patients experiencing xerostomia, and the combination of both symptoms potentially impacted the nutritional status and quality of life of the patients.

In our study, 66.6% of patients who reported xerostomia also reported dysgeusia, which is consistent with findings from previous studies reporting a decrease in subjective taste function during the initial cycles of chemotherapy and recovery months after treatment completion^{17,18}.

Another oral manifestation highlighted in our study was oral mucositis, which affected 19.35% of patients, a percentage similar to findings in the literature. According to some studies, this complication occurs in up to 100% of patients receiving radiation therapy in the head and neck region and between 20 and 40% in those receiving conventional chemotherapy alone^{3,15}. Dentists should be attentive to managing this complication, as the main issues include pain, loss of nutritional intake, and secondary infections¹⁹. These factors can lead to suspension of antineoplastic therapy, prolonged hospitalizations, and reduced quality of life for these individuals^{20,21}.

In the present study, the most commonly used drugs were paclitaxel and carboplatin. Among the patients who experienced some degree of oral mucositis (MO) were those using drugs such as capecitabine, doxorubicin, fluorouracil, and paclitaxel. These findings are consistent with the literature, which notes that chemotherapeutic agents posing a higher risk for the development of MO include bleomycin, capecitabine, cyclophosphamide, cytarabine, cisplatin, dactinomycin, docetaxel, doxorubicin, fluorouracil, methotrexate, and paclitaxel^{6,22-24}.

It is worth noting that, although no cases of Medication-Related Osteonecrosis of the Jaw (MRONJ) were observed in the present study, certain drugs used in the oncological therapy of some patients in this study, such as zoledronic acid and prednisone, are associated with MRONJ, according to the American Association of Oral and Maxillofacial Surgeons²⁵.

Although rare, MRONJ is a serious adverse effect due to the extensive morbidity it can cause and the poorer prognosis that oncology patients face when affected by it^{26,27}. Therefore, the dentist needs to closely monitor these patients, intensify oral hygiene care, eliminate risk factors, and promote oral health maintenance to prevent the occurrence of MRONJ²⁷.

In conclusion, the main dental treatment needs observed before starting chemotherapy were periodontal treatment, tooth extractions, and restorative procedures. After 15 days from the first administration of antineoplastic drugs, oral manifestations may already occur. Out of the 31 individuals observed, 70.96% experienced some type of discomfort in the oral cavity, with xerostomia and oral mucositis being the most frequent. Additionally, other oral alterations were also observed, such as oral candidiasis, dry lips, and lesions caused by the herpes simplex virus. Dental monitoring during chemotherapy is essential for preventing and managing potential oral emergencies, thereby preventing interruptions in systemic treatment and ultimately improving the quality of life for these patients.

Data availability

Datasets related to this article will be available upon request to the corresponding author.

Conflicts of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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Author Contribution

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Writing - original draft; Writing - review & editing. **Antônio Carlos Marqueti**: Validation; Resources; Writing - review & editing. **Geydson Silveira da Cruz**: Validation; Resources; Writing - review & editing. **Álvaro Bezerra Cardoso**: Conceptualization; Methodology; Writing - original draft; Writing - review & editing; Supervision; Project administration. All authors actively participated in the manuscript's findings, revised, and approved the final version of the manuscript.

References

1. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin*. 2018 Nov;68(6):394-424. doi: 10.3322/caac.21492. Erratum in: *CA Cancer J Clin*. 2020 Jul;70(4):313. doi: 10.3322/caac.21609.
2. INCA. Brazilian National Cancer Institute. [Estimate 2020: cancer incidence in Brazil.] Rio de Janeiro: INCA; 2019 [cited 2023 Apr 13]. 120p. Available from: <https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//estimativa-2020-incidencia-de-cancer-no-brasil.pdf>. Portuguese.
3. Araujo TLC, Mesquita LKM, Vitorino RM, Macedo AKMN, Amaral RC, Silva TF. [Oral manifestations in patients selected for chemotherapy treatment]. *Rev Cubana Estomatol*. 2015 [cited 2023 Apr 13];52(4):16-23. Available from: <https://www.redalyc.org/articulo.oa?id=378661473004>. Portuguese.
4. Facina T. [Estimate 2014 – Cancer incidence in Brazil]. *Rev Bras Cancerol*. 2014;60(1):63-44. Portuguese. doi: 10.32635/2176-9745.RBC.2014v60n1.964.
5. Islam F, Qiao B, Smith RA, Gopalan V, Lam AK. Cancer stem cell: fundamental experimental pathological concepts and updates. *Exp Mol Pathol*. 2015 Apr;98(2):184-91. doi: 10.1016/j.yexmp.2015.02.002.
6. Hespanhol FL, Tinoco EM, Teixeira HG, Falabella ME, Assis NM. [Buccal manifestations in patients submitted to chemotherapy]. *Cien Saude Colet*. 2010 Jun;15 Suppl 1:1085-94. Portuguese. doi: 10.1590/s1413-81232010000700016.
7. Martins ACM, Caçador NP, Gaeti WP. [Oral complications of antineoplastic chemotherapy]. *Acta Sci*. 2002 [cited 2023 Apr 13];24(3):663-70. Available from: <http://periodicos.uem.br/ojs/index.php/ActaSciHealthSci/article/viewFile/2481/1661>. Portuguese.
8. Volpato LE, Silva TC, Oliveira TM, Sakai VT, Machado MA. Radiation therapy and chemotherapy-induced oral mucositis. *Braz J Otorhinolaryngol*. 2007 Jul-Aug;73(4):562-8. doi: 10.1016/s1808-8694(15)30110-5.
9. Freire AAS, Honorato PSM, Macedo SB, Araújo CS. [Buccal manifestations in patients submitted to chemotherapeutic treatment in the Cancer Hospital of Acre]. *J Amazon Health Sci*. 2016 [cited 2023 Apr 13];2(1):1-21. Available from: <https://periodicos.ufac.br/index.php/ahs/article/view/315>. Portuguese.
10. Mark AM. Oral care during cancer treatment. *J Am Dent Assoc*. 2019 Jan;150(1):82. doi: 10.1016/j.adaj.2018.10.019.
11. Kusiak A, Jereczek-Fossa BA, Cichońska D, Alterio D. Oncological-therapy related oral mucositis as an interdisciplinary problem-literature review. *Int J Environ Res Public Health*. 2020 Apr;17(7):2464. doi: 10.3390/ijerph17072464.
12. Silva SC, Queiróz CDS, Silva RCD. [Main oral manifestations in patients submitted to chemotherapy: dental approach and treatment]. *Rev Multidiscip Nordeste Mineiro*. 2021 May [cited 2023 Apr 13];1(1):1-16. Available from: <https://revista.unipacto.com.br/index.php/multidisciplinar/article/view/818>. Portuguese.

13. Dholam KP, Sharma MR, Gurav SV, Singh GP, Prabhash K. Oral and dental health status in patients undergoing neoadjuvant chemotherapy for locally advanced head and neck cancer. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2021 Nov;132(5):539-48. doi: 10.1016/j.oooo.2021.07.018.
14. Fernandes IS, Fraga CPT. [The importance of dentist surgery in adverse effects in the oral cavity of oncological treatment of head and neck]. *Rev Cient UMC*. 2019 Feb [cited 2023 Apr 13];4(1):1-16. Available from: <https://seer.umc.br/index.php/revistaumc/article/view/290>. Portuguese.
15. García-Chías B, Figuero E, Castelo-Fernández B, Cebrián-Carretero JL, Cerero-Lapiedra R. Prevalence of oral side effects of chemotherapy and its relationship with periodontal risk: a cross sectional study. *Support Care Cancer*. 2019 Sep;27(9):3479-90. doi: 10.1007/s00520-019-4650-6.
16. Mercadante S, Aielli F, Adile C, Ferrera P, Valle A, Fusco F, et al. Prevalence of oral mucositis, dry mouth, and dysphagia in advanced cancer patients. *Support Care Cancer*. 2015 Nov;23(11):3249-55. doi: 10.1007/s00520-015-2720-y.
17. van Oort S, Kramer E, de Groot JW, Visser O. Taste alterations and cancer treatment. *Curr Opin Support Palliat Care*. 2018 Jun;12(2):162-7. doi: 10.1097/SPC.0000000000000346.
18. IJpma I, Renken RJ, Gietema JA, Slart RHJA, Mensink MGJ, Lefrandt JD, et al. Changes in taste and smell function, dietary intake, food preference, and body composition in testicular cancer patients treated with cisplatin-based chemotherapy. *Clin Nutr*. 2017 Dec;36(6):1642-8. doi: 10.1016/j.clnu.2016.10.013.
19. Elad S, Cheng KKF, Lalla RV, Yarom N, Hong C, Logan RM, et al. MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. *Cancer*. 2020 Oct;126(19):4423-31. doi: 10.1002/cncr.33100. Erratum in: *Cancer*. 2021 Oct;127(19):3700. doi: 10.1002/cncr.33549.
20. Daugėlaitė G, Užkuraiytė K, Jagelavičienė E, Filipauskas A. Prevention and treatment of chemotherapy and radiotherapy induced oral mucositis. *Medicina (Kaunas)*. 2019 Jan 22;55(2):25. doi: 10.3390/medicina55020025.
21. Lalla RV, Bowen J, Barasch A, Elting L, Epstein J, Keefe DM, et al. MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. *Cancer*. 2014 May;120(10):1453-61. doi: 10.1002/cncr.28592. Erratum in: *Cancer*. 2015 Apr;121(8):1339.
22. Villa A, Sonis ST. Mucositis: pathobiology and management. *Curr Opin Oncol*. 2015 May;27(3):159-64. doi: 10.1097/CCO.0000000000000180.
23. Souza GB, Demartini KTM, Santos L, Nucci F, Neves CTD, Costa JWG, et al. [Mucositis and masterful pharmaceutical formulations for use in patients undergoing oncology palliative care: literature review]. *Hematol Transfus Cell Ther*. 2021 Oct;43(Suppl1):S464-5. doi: 10.1016/j.htct.2021.10.801. Portuguese.
24. Curra M, Soares Junior LAV, Martins MD, Santos PSDS. Chemotherapy protocols and incidence of oral mucositis. An integrative review. *Einstein (Sao Paulo)*. 2018;16(1):eRW4007. doi: 10.1590/s1679-45082018rw4007.
25. Ruggiero SL, Dodson TB, Aghaloo T, Carlson ER, Ward BB, Kademani D. American Association of Oral and Maxillofacial Surgeons' position paper on medication-related osteonecrosis of the jaws-2022 update. *J Oral Maxillofac Surg*. 2022 May;80(5):920-43. doi: 10.1016/j.joms.2022.02.008.
26. Tadokoro Y, Hasegawa T, Takeda D, Murakami A, Yatagai N, Arimoro S, et al. Risk factors associated with prognosis of patients with medication-related osteonecrosis of the jaw. *Head Neck*. 2024 Feb;46(2):282-90. doi: 10.1002/hed.27574. Epub 2023 Nov 14.
27. Ferreira SO, Silva PC, Dayube URC. [Osteonecrosis of the jaw associated with bisphosphonates: importance of the dentist]. [Abstract]. *Rev Saude UNG-Ser*. 2018 [cited 2023 Apr 13];12(1Esp):18. Available from: <http://revistas.ung.br/index.php/saude/article/view/3482/2622>. Portuguese.