

# Oral Manifestations in Cancer Patients following Chemotherapy: A cross-sectional study in Libya

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**Abstract - Background:** Various treatment modalities for cancer, including radiotherapy, surgical intervention, and chemotherapy, are associated with certain complications, including those affecting the oral cavity. The existing literature indicates that oral lesions may develop as a consequence of chemotherapy. **Objectives:** The study aimed to identify and analyze the specific oral lesions that can arise as a complication of chemotherapy treatment and to improve understanding of how to deal with them to ensure patient comfort and increase the quality of life.

**Materials and Methods:** A cross-sectional study was conducted in the oncology department at the Benghazi Medical Center in Benghazi, Libya. The study involved 70 hospitalized patients who were undergoing chemotherapy and met specific inclusion and exclusion criteria. A questionnaire was prepared and we collected information from cancer patients undergoing chemotherapy, including personal data, oral symptoms and the extent of their impact. A comprehensive history and detailed clinical examination were performed to identify the oral manifestations associated with the treatment

**Results:** The study comprised 70 patients aged 25 to 56 years, with a mean age of 53.70. Among the participants, 68.6% (n=48) were females, while 31.4% (n=22) were males. The most frequently reported oral manifestations included changes in taste (58.6%), dysphagia (34.3%), persistent bad breath (30%), xerostomia (25%), and oral ulceration (18.6%). A range of oral complications were documented in this study.

**Conclusion:** The study highlights chemotherapy's negative impact on oral health, emphasizing the need for improved patient education on oral hygiene and a holistic approach to integrating oral care into cancer treatment to enhance healing and outcomes.

**Keywords:** Oral manifestation; chemotherapy; cancer patients; oral ulcer; mucositis; side effects; patient education.

## I. INTRODUCTION (HEADING 1)

Cancer is characterized by uncontrolled proliferation and growth of cells that can inhibit anti-growth signals, leading to invasion and the spread of cancerous cells to other parts of the body. Various treatment methods, including chemotherapy, radiotherapy, hormonal therapy, immunotherapy, and targeted

drug therapy, are employed to manage the disease [1-2]. Chemotherapy (CT) represents a modern therapeutic approach employed by approximately 40-80% of cancer patients. This treatment functions by targeting and eliminating rapidly dividing cells, without differentiation between normal cells and malignant cells. Chemotherapy (CT) is typically cytotoxic to rapidly dividing cells, affecting not only cancerous cells but also healthy cells in the bone marrow and the mucosa of the gastrointestinal tract, including the lining of the oral cavity [3]. The treatment modalities of malignant diseases often results in unavoidable lesions in the oral structures, including the mucous membrane, due to the sensitivity of the oral mucosa to the toxic effects of chemotherapy. Oral mucositis (OM) represents a significant and challenging complication arising from both chemotherapy and radiotherapy in cancer patients [4]. Chemotherapy can cause changes in the lining of the oral mucosa and salivary glands that produce saliva and the protective components of saliva. As a result, the flow of saliva to the outside decreases, which can disturb the healthy balance of bacteria and increase the risk of tooth decay and periodontal diseases [5]. Chemotherapy (CT) can result in both direct and indirect complications affecting the oral cavity. The direct toxic effects on oral structures may include conditions such as mucositis, dysgeusia (altered taste sensation), neurotoxicity, xerostomia (dry mouth), and dysfunction of the salivary glands. Conversely, indirect toxic effects arise from factors such as immunosuppression and myelosuppression, which can render patient more susceptible to bacterial, fungal, and viral infections. Furthermore, mucosal bleeding may occur due to thrombocytopenia, significantly impacting the overall oral health of patient undergoing cancer treatment. Several factors can affect the occurrence and severity of oral complications. These include the patient's age, the specific type and anatomical location of cancer, nutritional status, dental and periodontal health status, as well as oral hygiene practices both prior to and following treatment [6]. Furthermore, the dosage and variety of chemotherapeutic agents can significantly exacerbate oral complications. Due to the limited treatment options for mucositis, prevention becomes crucial. It's important to focus on educating cancer patients about proper oral hygiene. Pre-treatment strategies should aim at reducing the risk of systemic infections, ensuring that the nutritional status of the patient is preserved, and maintaining their quality

of life throughout the treatment process. [4]. Dental pre-treatment measures, particularly periodontal treatment, have demonstrated a significant reduction in the incidence of fever, septicemia, and the prevention of oral mucosa inflammation. This outcome is achieved through a comprehensive oral health care program, which includes dental treatments and the provision of oral hygiene instructions, such as the brushing of teeth and gums after each meal and prior to sleep [7]. Numerous studies have documented the occurrence of CT-induced oral complications in pediatric patients, with a significant focus on specific types of cancer, particularly leukemia, or particular chemotherapy regimens. However, there exists a gap in the literature regarding the prevalence of CT-induced oral complications within the adult population [3, 8]. The objective of our study was to identify the oral side effects experienced by cancer patients undergoing chemotherapy at Benghazi Medical Centre. Additionally, we aimed to determine whether these oral complications were associated with the patients' oral health status

## II. MATERIAL AND METHODS

Our study enrolled a total of 70 patients in a descriptive cross-sectional design to evaluate the prevalence of oral manifestations in cancer patients treated at the oncology department of Benghazi Medical Centre in November 2024. Participants were above the age of 18 and willing to cooperate in the clinical evaluation. During our study, information was collected regarding the patients' details, including gender, age, and type of cancer, method and duration chemotherapy, as well as any oral manifestations present. Various oral manifestations were assessed, including mucosal inflammation, ulcerations, gingivitis, bleeding gums, dry mouth, increased salivation, changes in taste, discoloration of the tongue, toothache, caries, tooth loss, and loss of dental fillings. Clinical examinations were conducted using an adequate light source, a mouth mirror, and sterile cotton. The data collected during this study were systematically exported to an Excel database for organization and statistical analysis. The analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 28.0 (Chicago, IL, USA).

## III. RESULTS

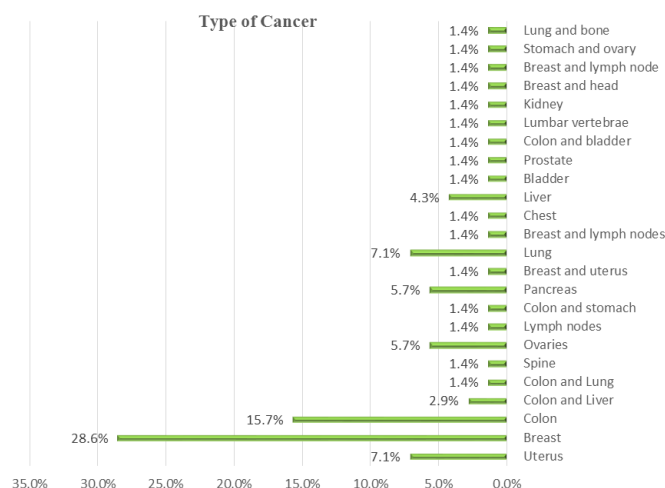
The current study comprised 70 patients in 25 to 56, with a mean age of 53.70; 68.6% (n=48) of patients were females and 31.4% (n=22) of patients were males. The Table 1 reveals that most participants (58.6%) fall within the 41-56 age range.

**Table 1:** Gender and age Distribution of Participants

Gender	No.	Percentage %
Female	48	68.6%
Male	22	31.4%
Total	70	100%

Age	No.	Percentage
25-40	8	11.4%
41-56	41	58.6%
> 56	21	30.0%
Total	70	100%

Figure 1 shows various cancer types, with breast cancer being the most common (28.6%). This highlights the need for targeted oral care strategies for specific cancer types that may have unique oral health challenges.



**Figure 1:** Types of Cancer Diagnosed in Participants

The number of chemotherapy doses received is shown in table 2. Most participants (42.9%) received 1-4 doses of chemotherapy and this indicates that many patients are in the early stages of treatment, which is critical for understanding the onset of oral complications.

**Table 2:** Number of Chemotherapy Doses Received

How many doses of chemotherapy did you receive	No.	Percentage %
4-1	30	42.9%
8-5	17	24.3%
12-9	12	17.1%
16-13	3	4.3%
20-17	2	2.9%
> 20	6	8.6%
Total	70	100.0%

In our study, intravenous was the most common administration rout for the chemotherapeutic drugs, accounting for 81.4%, followed by intramuscular injection (14.3%). Subcutaneous injection (4.3%) was the least frequently administration rout (table 2). Around 38.6% of participants (38.6%) received additional cancer treatments and this could complicate the assessment of oral health impacts, as multiple treatments may contribute to oral complications. The predominant form of additional cancer treatment identified was surgical intervention, accounting for 51.9% of cases, followed by radiotherapy (25.9%) (table 3).

**Table 3:** Types of Additional Cancer Treatments

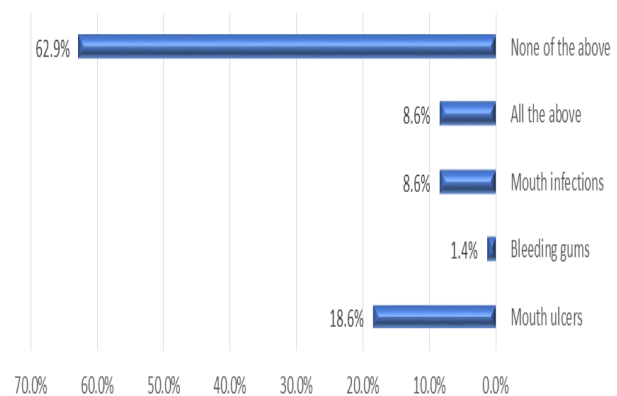
If no, then the treatment is yes.	No.	Percentage
Procedure	14	51.9%
Bone marrow transplantation	1	3.7%
Immunotherapy	2	7.4%
Hormonal therapy	2	7.4%
Targeted drug therapy	1	3.7%
Radiation therapy	7	25.9%
<b>Total</b>	<b>27</b>	<b>100.0%</b>

Around 28.6% of patients receiving chemotherapy exhibited one or more oral manifestations. Among these, the most frequently observed manifestation in our study was oral ulceration (18.6%), followed by mouth infection (8.6%) and the least recorded was the bleeding gum (1.4%). Also, a large number of participants (62.9%) reported no oral symptoms. This variability underscores the need for individualized oral health monitoring (Table 4) (figure 2).

**Table 4:** Oral Symptoms Experienced During Chemotherapy

What oral symptoms do you experience during chemotherapy?	No.	Percentage %
Mouth ulcers	13	18.6%
Bleeding gums	1	1.4%
Mouth infections	6	8.6%
All the above	6	8.6%
None of the above	44	62.9%
<b>Total</b>	<b>70</b>	<b>100.0%</b>

What oral symptoms do you experience during chemotherapy?

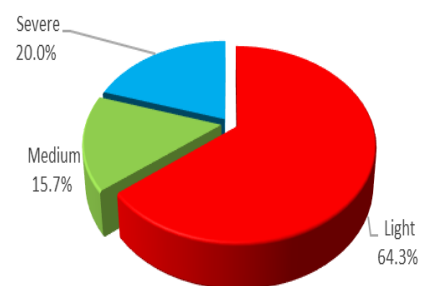


**Figure 2:** Oral symptoms during chemotherapy

**Table 5:** Severity of Oral Symptoms

In the presence of oral symptoms, how severe?	No.	Percentage %
Light	45	64.3%
Medium	11	15.7%
Severe	14	20.0%
<b>Total</b>	<b>70</b>	<b>100.0%</b>

in the presence of oral symptoms, how severe



**Figure 3:** Severity of Oral Symptoms

Table 5 indicates that most participants (64.3%) reported light severity of symptoms, suggesting that while oral complications are common, they may not always be severe.

**Table 6:** Frequency of Tooth Brushing Among Participants

Do you brush your teeth? How many times a day?	No.	Percentage %
Once a day	40	57.1%
Twice a day	23	32.9%
Three times a day	4	5.7%
I rarely brush my teeth	1	1.4%
I never brush my teeth	2	2.9%
<b>Total</b>	<b>70</b>	<b>100.0%</b>

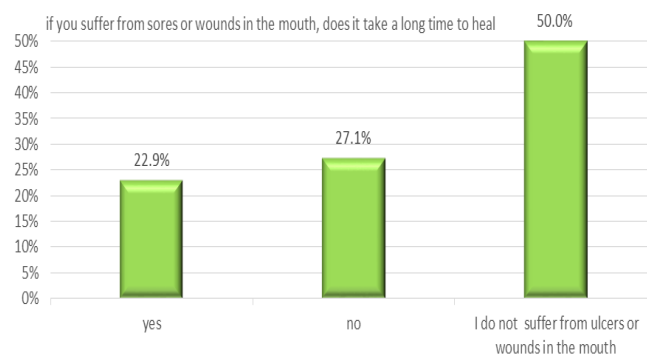
The majority of participants (57.1%) brush their teeth once a day, which may not be sufficient for maintaining oral health during chemotherapy. This highlights the need for education on oral hygiene practices (Table 6).

**Table 7:** Changes in Oral Health during Chemotherapy

		Yes	No
have you noticed any change in the colour or texture of the gums or tongue	N	22	48
	%	31.4%	68.6%
if there are oral symptoms, do you have difficulty speaking	N	22	48
	%	31.4%	68.6%
Do you suffer from persistent bad breath?	N	21	49
	%	30.0%	70.0%
are you experiencing any swelling of the mouth or gums	N	15	55
	%	21.4%	78.6%
Do you feel any pain or discomfort in the mouth during chemotherapy	N	21	49
	%	30.0%	70.0%
Do you have any difficulty swallowing	N	24	46
	%	34.3%	65.7%
have you had any dental problems (such as tooth decay or eating the surface of the teeth) since the start of chemotherapy	N	21	49
	%	30.0%	70.0%
are you experiencing any changes in the sense of taste (such as loss of taste or metallic taste)	N	41	29
	%	58.6%	41.4%

Other oral manifestations like - change in the taste (58.6%), dysphagia (34.3%), changes in gum or tongue texture (31.4%) and persistent bad breathe (30%) were also reported (table 7). Nearly half of the participants (n=33, 47.1%) reported salivation issues, with a majority experiencing a lack of salivation (n=25, 75.8%). This is a common side effect of

chemotherapy that can exacerbate oral health problems. This condition can lead to discomfort and increase the risk of oral health issues, highlighting the need for effective management strategies for patients undergoing chemotherapy. Our data shows that (22.9%) of participants who suffer from mouth sores experience prolonged healing times (Figure 4). This suggests that oral lesions can significantly impact patients' quality of life, necessitating further investigation into effective treatments and preventive measures to enhance healing and comfort.



**Figure 4:** Healing Time for Oral Sores

**Table 8:** Strategies for Managing Oral Symptoms

If you suffer from oral symptoms, what measures have you followed to relieve symptoms?	No.	Percentage %
Use of mouthwash	9	12.9%
Taking analgesic drugs	3	4.3%
Use of oral moisturizers	8	11.4%
The use of cloves or its products	2	2.9%
I didn't use any procedure	48	68.6%
<b>Total</b>	<b>70</b>	<b>100%</b>

The majority of participants (68.6%) reported not using any measures to relieve their oral symptoms, which is concerning. This indicates a gap in patient education regarding oral care during chemotherapy. The low usage of mouthwash, analgesics, and other remedies suggests that more awareness and guidance are needed to help patients manage their oral health effectively (Table8).



#### IV. DISCUSSION:

Over the years, chemotherapy (CT) has developed as a vital therapeutic approach for cancer treatment. However, a significant limitation of chemotherapy is its lack of selectivity; it affects both malignant cells and rapidly dividing normal cells, including those in the bone marrow and oral cavity [9]. Consequently, patients may experience various oral complications, which can be either acute or chronic, arising during or following cancer treatment. Commonly observed oral manifestations induced by chemotherapy include mucositis, xerostomia, dysgeusia, salivary gland dysfunction, infections, and pain [10].

In our study, twenty four different types of cancer were observed. Breast carcinoma (28.6%), colon cancer (15.7%), lung cancer (7.1%) and pancreas & ovaries cancer (each 5.7%) were the most frequently reported cancers. However, many other studies have identified a variety of carcinomas as the most frequently encountered, specifically highlighting breast cancer [11-12], leukaemia [13], and lymphomas [6]. Approximately 28.6% of patients undergoing chemotherapy presented with at least one oral manifestation. These findings are lower than those reported in other studies [6, 12, 13]. Additionally, the current study did not find a significant association between gender and the prevalence of oral manifestations, which is consistent with observations from other research [12].

The three most common manifestations were change in the taste (58.6%), dysphagia (34.3%), persistent bad breathe (30%) and ulceration (18.6%) were also reported. Nearly 25% of the participants experienced a lack of salivation. Xerostomia is a common side effect of chemotherapy that can exacerbate oral health problems. This condition can lead to discomfort and increase the risk of oral health issues, highlighting the need for effective management strategies for patients undergoing chemotherapy. A similar prevalence of xerostomia has been recorded in other research [12, 14].

Dysgeusia, characterized by a reduced or altered sense of taste, is a prevalent oral complication observed in about 50–75% of cancer patients undergoing chemotherapy (CT), radiotherapy, or both. This condition often arises as the chemotherapeutic agents can infiltrate the oral cavity, leading to an unpleasant metallic taste that typically develops a few weeks after the initiation of treatment and resolving within a few weeks [15]. In our study, dysgeusia was the most frequently reported symptom, affecting 58.6% of participants. Moreover, previous research has indicated an even higher prevalence of this condition in other studies [6, 16, 17].

Oral mucositis (OM) is an iatrogenic complication resulting from cancer chemotherapy, characterized by inflammation and ulceration of the mucosal lining in the digestive tract. It tends to primarily affect the movable non-keratinized mucosa, including the labial and buccal mucosa, floor of the mouth, ventral surfaces of the tongue, and soft palate, which are more susceptible due to their rapid turnover rate [9, 18]. The prevalence of mucositis can vary significantly, although the oral cavity is highly vulnerable to the harmful effects of chemotherapy. Severe cases of mucositis are notably high

among bone marrow transplant patients (90%) and pediatric oncology patients (65%), who often undergo more intense chemotherapy protocols. In contrast, patients receiving chemotherapy for solid tumors typically experience milder symptoms, with a prevalence of about 21% [17]. In this study, mucosal ulceration had been reported in 18.6% of cases. These findings aligned with other studies that have documented similar prevalence rates [6, 17]. However, some studies found a higher prevalence of oral mucositis [13, 17, 19].

A relatively low prevalence of mucositis has been observed in several studies [12]. This observation may be attributed to favorable oral health conditions present prior to the induction of chemotherapy. Such conditions may contribute to a reduced risk of developing oral manifestations during the chemotherapy [9].

The findings regarding the healing time for oral sores in participants undergoing chemotherapy reveal significant insights into the oral health challenges faced by cancer patients. The data indicate that a notable percentage of participants experience prolonged healing times for oral sores, which can adversely affect their quality of life. Oral mucositis and other lesions can lead to discomfort, pain, and difficulties in eating and speaking, ultimately impacting nutritional intake and overall well-being, the prolonged healing time of oral sores may be attributed to numerous factors, comprising the immunosuppressive effects of chemotherapy, which can impair the body's natural healing processes [20]. Additionally, the reduced salivary flow commonly experienced by chemotherapy patients can further exacerbate oral health issues, as saliva plays a crucial role in oral tissue repair and maintenance, the lack of adequate oral care practices reported by many participants also suggests that education on proper oral hygiene and symptom management is lacking, which is vital for promoting healing and preventing complications. The study highlights the need for a multidisciplinary approach to care for cancer patients, collaboration between oncologists, dentists, and nutritionists can ensure that comprehensive care strategies are implemented, addressing both cancer treatment and oral health management. This approach can help mitigate the adverse effects of chemotherapy on oral health, leading to improved patient outcome [20- 21].

In our study, there are some limitations that should be acknowledged. Initially, the sample size may not be representative of the broader population of cancer patients undergoing chemotherapy, which limits the generalizability of the findings. Moreover, the dependence on self-reported data might introduce bias, as participants may overreport or underreport their symptoms and experiences. Furthermore, the study did not account for variations in chemotherapy regimens, which can differ significantly between patients and may influence the severity of oral complications. Lastly, the cross-sectional nature of this study did not allow for the assessment of changes over time, making it difficult to conclude the long-term impact of chemotherapy on oral health.

In Conclusion, the study underscores the significant impact of chemotherapy on oral health, particularly concerning the healing time for oral sores. The findings indicate that many

participants experience prolonged healing, which can lead to serious complications and decreased quality of life. Enhancing patient education regarding oral hygiene practices and symptom management is crucial to facilitate healing and improve overall oral health outcomes. Integrates oral care into cancer treatment plans by adopting a holistic approach that, healthcare providers can better support patients in managing the side effects of chemotherapy.

Based on the findings of our study, several recommendations can be made: firstly; educating patients about the significance of strict adherence to oral care guidelines while undergoing chemotherapy protocols is recommended. Effective oral hygiene practices can minimize oral side effects, improve the patient's life and also decrease the urgency of stopping CT due such complications. Moreover; establish routine oral health assessments for cancer patients undergoing chemotherapy to monitor for the development of oral sores and other complications. Early detection can facilitate timely intervention and improve healing outcomes. Encouraging collaboration between oncologists, dentists, and nutritionists through a Multidisciplinary Care Approach is essential for developing comprehensive care plans. This strategy addresses both cancer treatment and oral health needs.

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