Effectiveness of Sodium Bicarbonate Mouth Wash on mucositis among Cancer Patients Undergoing Chemotherapy

Amal Mohamed Ahmed[1], Hossam Hassan Abd Elnaeem[2,3],Khaled Abdeeen Talha Sulemian[4] &Thana Mohamed Diab[5].

[1] Professor of Medical Surgical Nursing Department, Faculty of Nursing, Aswan University, Aswan, Egypt.
[2] Nursing Specialist at Technical Institute of Nursing, Faculty of Nursing, Aswan University, Aswan, Egypt.
[3] Master student at Medical Surgical Nursing Department, Faculty of Nursing, Aswan University, Aswan, Egypt.
[4] Lecturer of Oncology Surgery, Faculty of Medicine, Aswan University., Aswan, Egypt.
[5] Assistant Professor of Medical Surgical Nursing Department, Faculty of Nursing, Aswan University., Aswan, Egypt.
Email.hamzahoornew2022&gmail.com.

Abstract

Background: Oral mucositis is one of the most debilitating problems of chemotherapy during the treatment period. It is important to prevent and treat mucositis because this complication is associated with pain, inability to maintain hydration and nutrition. **Aim of the study:** This study aimed to evaluate the effectiveness of sodium bicarbonate mouth wash on mucositis among cancer patients undergoing chemotherapy. **Research Design:** A quasi-experimental design was utilized in this study. **Setting**: The study was conducted at oncology medical department at Aswan University Hospital. **Sample:** A convenient sample of 100 adult patients of both sex who undergoing chemotherapy treatment and received sodium bicarbonate mouth care. **Tools:** In this study three tools were used for data collection: **I)** Interview questionnaire sheet included Patients' socio- demographic characteristics and Patients' medical history. **II)** Oral Mucositis severity Scale. **Results:** The results revealed that, more than two fifth (42%) of the studied patients have fourth degree of oral mucositis and more than one third of them (35%) have third degree pre intervention while, this percentages improved after use of sodium bicarbonate mouth wash. Furthermore, regarding oral mucositis symptoms, more than two fifth (42%) of the studied patients have severe level of oral mucositis symptoms pre intervention while, this percentages improved to less than one tenth (8%) post intervention. **Conclusion:** The study concluded that sodium bicarbonate mouthwashes are effective in treating and reducing the severity of oral mucositis and its symptoms in cancer patients undergoing chemotherapy. **Recommendations:** using sodium bicarbonate mouthwash as a therapeutic care measure in clinical settings.

Keyword: Cancer, Chemotherapy, Mucositis and Sodium Bicarbonate.

Introduction

Cancer is one of the most common and problems diseases of this century. In 2022, there were an estimated 20 million new cancer cases and 9.7 million deaths. The estimated number of people who were alive within 5 years following a cancer diagnosis was 53.5 million. About 1 in 5 people develop cancer in their lifetime, approximately 1 in 9 men and 1 in 12 women die from the disease. **(Bray et al., 2024).**

The most popular way to treat different kinds of cancer with chemotherapy. But chemotherapy can cause a lot of issues and unwanted effects. Chemotherapy mucositis can also cause a super-infection, which raises the risk of bacteremia and sepsis. People with oral mucositis are more likely to have bad treatment results, a lower quality of life, and more medical costs than people who don't get this ailment **(Rambod, Pasyar & Ramzi, 2022).**

Ulcers that form when the oral mucosa is damaged are very likely to get bacteria and cause systemic illness. It makes it hard to talk, to chew, swallow and take medicine by mouth. Oral mucositis also makes the patient's hospital stay longer, raises the expense of therapy, increases the need for drugs to control pain, and requires parenteral nourishment, all of which make the patient's quality of life worse. (**Kongwattanakul et al., 2022).**

Mucositis is the painful swelling and ulceration of the mucous membranes. It happens most often as a side effect of chemotherapy and radiation therapy for cancer. Mucositis may make it harder for the patient to handle chemotherapy or radiation therapy, and it also affects their nutritional condition. It might have a big effect on the patient's quality of life and cancer therapy. (**Barasch, Epstein & Doty, 2024).**

Recent research has indicated that 40% to 75% of those who get chemotherapy still get oral mucositis. However, for patients with head and neck tumors who are getting high-dose chemotherapy or chemoradiotherapy, the risk of severe mucositis can be as high as 80%. Also, several chemotherapy drugs, including as methotrexate, 5-fluorouracil, and cisplatin, are still significantly linked to damage to the mucous membranes**. (Lee, Lee, & Kim, 2021).**

Specifically, Sodium Bicarbonate (SB), a component of basic oral care, is one the most used agents regarding the prevention and treatment of OM. It is also used as a cleansing agent due to its ability to dissolve mucus and loosen debris. The benefits of SB use is due to its alkalizing effect (thereby raising oral pH), which prevents the growth of aciduric bacteria, making saliva more fluid and preventing the accumulation of detritus. (**Hong et al., 2020).**

Nurses play a very important role in all parts of managing oral mucositis, such as

assessing the condition, educating patients how to take care of their mouths, giving them medications, and helping them deal with the pain of their symptoms. Nurses have a lot of duties when it comes to treating oral mucositis. They need to properly examine and monitor the mouth and symptoms, manage the condition by making sure that patients have access to the right treatment, and teach patients how to take care of their mouths. Nurses should also help create and carry out standardized clinical practice guidelines.(**Iovoli et al, 2023).**

Significance of the study

Recent research has indicated that 40% to 75% of those who get chemotherapy still get oral mucositis. 20–40% of people getting chemotherapy get oral mucositis, and 76% of people getting high-dose chemotherapy before a hematopoietic stem-cell transplant do. More than 90% of those who have treatment for mouth and oropharynx cancer also get severe oral mucositis. **(Nau, 2021).**

As a result, oral mucositis can develop to secondary infections, intense discomfort, and trouble eating, which can cause malnutrition and dehydration. Mucositis can also lead to higher healthcare and hospitalization expenditures. **(O'Neill, Scully, & Prime, 2020).** So, the current study conducted to evaluate the effectiveness of sodium bicarbonate mouth wash on mucositis in cancer patients undergoing chemotherapy.

Aim of the study

This study aim to assess the efficacy of sodium bicarbonate mouthwash in alleviating mucositis among cancer patients receiving chemotherapy.

Research hypothesis

Sodium bicarbonate improvescell membrane stability effective in reducing of oral mucositis and promoting oral health in patients undergoing chemotherapy compared to patients who .do not receive it

Subjects & methods

Research design

A quasi-experimental research design was utilized to conduct the study.

Research setting

The research was carried out at cancer department of Aswan University Hospital.

Sampling

A convenience sample of 100 adult patients of both sexes having chemotherapy treatment was screened for prospective inclusion in the trial and administered sodium bicarbonate mouth care.

Tools of data collection

To accomplish the study's objective, the following tools were utilized:

Tool one: - Structured Interview Sheet

Structured interview questionnaire was developed by investigators based on

scientific review of literature **(Carrozzo et al, 2021; Pulito et al, 2022)** which consist of three parts:

Part I: Socio-demographic characteristics of chemotherapy-patients: Such as age, gender, residence, marital status and occupation.

Part II: Medical history which include cancer type, duration of the disease, length of chemotherapy, mucositis degree, time of beginning mucositis, pain in the mouth and color of the mouth.

Tool two: - Oral Mucositis severity assessment tool

This tool was developed by **(Khanjani, et al., 2019)** to measure the severity of oral mucositis using the World Health Organization criteria for grading of oral mucositis. This scale included five levels (0–4) for measuring mucositis.

Scoring system

- Level zero (no ulcers).
- Level one: soreness and redness.
- Level two (ulcer and erythema).
- Level three: the patient has an ulcer and a lot of redness, and they can't take solid meals.
- Level four: Mucositis is so bad that it can't be fixed quickly, and the person can't eat through their mouth.

Method of data collection

Pilot study

A pilot study was conducted prior to the commencement of data collecting involving 10% (10) of the patients admitted to the medical oncology department. to test the applicability, clarity and efficiency of the tools.

Validity & Reliability of the instruments' content

- All tools were reviewed for content validity by a panel of three expertise in the field of medical-surgical nursing and two in medical oncology to measure the content for accuracy and internal validity and necessary modifications were be done accordingly. The reliability for the study tools were calculated by Cronbach's alpha test; it were (.893 & .931).

Ethical Consideration

- An official letter was issued by the research ethics committee of the Faculty of Medicine, Aswan University.
- Approval to perform the study was secured from the manager of Aswan University Hospital.
- Prior to the commencement of both the pilot project and the real trial, informed permission was secured from patients interested to participate, following a thorough explanation of the study's nature and objectives. The study participant had the opportunity to decline participation or withdraw from the research at any moment without justification. Participant confidentiality was prioritized during data collection.
- Patients were told that all their data is highly private.

Filed work

- Assessment phase:It was included reviewing of related literature and theoretical knowledge of various aspects of the study using books, articles, periodicals and magazines to develop tools for data collection.
- Patients who met the inclusion criteria were selected. After outlining the purpose of the study, the researcher obtained the patients' written informed consent agreement to participate. The patient's interview questionnaire served as the starting point for data collection.
- After getting official permission to do the study, the researcher met with the patients during the morning shift (8 a.m. to 2 p.m.)for three months to collect data. The purpose of the study was explained, the tools were given out, and the study subjects were asked to fill them out. The tools were then collected and checked for competence.
- All of the patients learned how to take care of their mouths on a regular basis (brushing their teeth, eating well, and keeping their mouths clean).
- Mouth wash done four times every day time (at 7:00 a.m., 1:00 p.m., 7:00 p.m., and 10:00 p.m). patients who answer will rinse their mouths for 30 seconds.
- Patients washed their mouths, which made sure that the mouthwash got to all the tissues in the mouth, including the tongue, palate, throat, and inside the cheeks.
- After 5 days of giving the responders mouthwash with normal saline, the researchers used the World Health Organization's standards to grade the severity of their oral mucositis.

Statistical analysis

After gathering the data, it was organized and put into tables. Then, it was statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 24. We used descriptive statistics to show the data as numbers and percentages, means, and standard deviations. We used the chi-square test to compare qualitative variables. We used the Wilcoxon signed rank test to compare quantitative data. Spearman correlation was used to see if there was a link between the research variables. Data was also shown as a bar chart. If the p-value was less than or equal to 0.05, the difference was judged statistically significant. If the p-value was < 0.001, the difference was thought to be very statistically significant.

RESULTS

Table (1): Frequency distribution of the studied patients regarding their socio-demographic characteristics demonstrates that 36% of the examined patients were aged 45 years or older, 64% were female, and 60% resided in rural areas. Regarding marital status, 64% of the patients evaluated were married, and 44% were housewives in

terms of work.

Figure (1):Percentage distribution of oral mucositis severity level among the studied patients pre & post intervention indicates that over two-fifths (42%) of the examined patients exhibit fourth-degree oral mucositis, while more than one-third (35%) present with third-degree mucositis before to intervention; these percentages subsequently improved to (8%) and (12%), respectively, following intervention.

Table (2): Comparison between total level of the studied patients regarding oral mucositis severity at pre & post intervention reveals that, there is a highly significant difference between the studied patients regarding oral mucositis severity level between pre and post intervention at (P=0.000). Which severity of oral mucositis improved post intervention.

Table (3):Frequency distribution of the studied patients regarding their restriction of eating because of mouth sores because of mouth sores pre and post intervention indicates a highly statistically significant difference in eating restrictions due to mouth sores among the examined patients before and after the intervention; severe eating restrictions decreased from 22% pre-intervention to 2% post-intervention.

Table (4): Frequency distribution of the studied patients regarding their restriction of drinking because of mouth sores pre and post intervention demonstrates a highly statistically significant difference in the limitation of drinking due to mouth sores among the examined patients before and after the intervention; severe restriction of drinking decreased from 16% pre-intervention to 0% post-intervention.

Figure (2):Percentage distribution of patient reported oral mucositis symptoms level among the studied patients pre & post intervention illustrates that almost two-fifths (40%) of the examined patients exhibited severe oral mucositis symptoms before to intervention, but this percentage decreased to less than one-tenth (9%) following intervention.

Table (1) frequency distribution of the studied patients regarding their socio-demographic characteristics (n=100).

Item	No	%
Age (years):		
< 25years	**12**	**12**
25 to < 35 years	**20**	**20**
35 to <45 years	**32**	**32**
45 years or more	**36**	**36**
Gender:		
Male	**36**	**36**
Female	**64**	**64**
Residence:		
Rural	**60**	**60**
Urban	**40**	**40**
Marital status:		
Single	**16**	**16**
Married	**64**	**64**
Divorced	**12**	**12**
Widow	**8**	**8**
Occupation:		
Unemployed	**16**	**16**
Employed	**28**	**28**
House wife	**44**	**44**
Educator	**12**	**12**

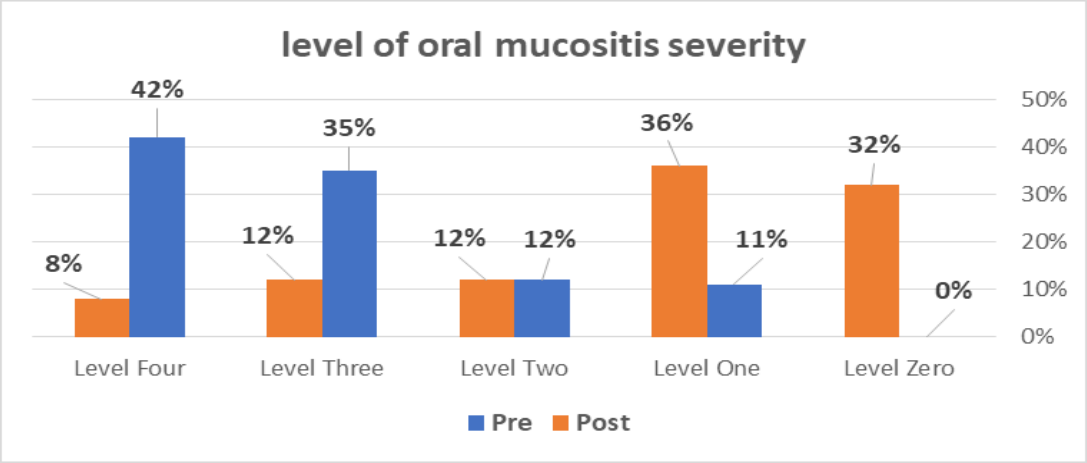

Figure (1) Percentage distribution of oral mucositis severity level among the studied patients pre & post intervention (n=100).

Table (2): Comparison between total level of the studied patients regarding oral mucositis severity at pre & post intervention (n=100)

Oral Mucositis severity level	Pre		Post		X^2	p-value
	No.	%	No.	%		
Level zero (lack of ulcers)	0	0	32	32	75.962	0.000**
Level one (pain and erythema)	11	11	36	36		
Level two (erythema and ulcer)	12	12	12	12		
Stage three (ulceration and significant erythema, with the patient unable to consume solid meals)	35	35	12	12		
Level four (mucositis is so severe that it cannot be readily healed, and oral feeding is unfeasible).	42	42	8	8		

(**) highly statistically significant at p<0.01. X2= chi square test.

Table (3): frequency distribution of the studied patients regarding their restriction of eating because of mouth sores because of mouth sores pre and post intervention (n=100).

Item	estriction of eating because of mouth sores					
	Pre		Post		X^2	p-value
	No.	%	No.	%		
No	20	20	31	31	25.052	.003**
Mild	32	32	40	40		
Moderate	20	20	27	27		
Sever	28	28	2	2		

(**) highly statistically significant at p<0.01. X2= chi square test.

Table (4): frequency distribution of the studied patients regarding their restriction of drinking because of mouth sores pre and post intervention (n=100).

Item	Restriction of drinking because of mouth sores					
	Pre		Post		X^2	p-value
	No.	%	No.	%		
No	32	32	29	29	16.35	.005**
Mild	32	32	57	57		
Moderate	20	20	14	14		
Sever	16	16	0	0		

(**) highly statistically significant at p<0.01. X2= chi square test.

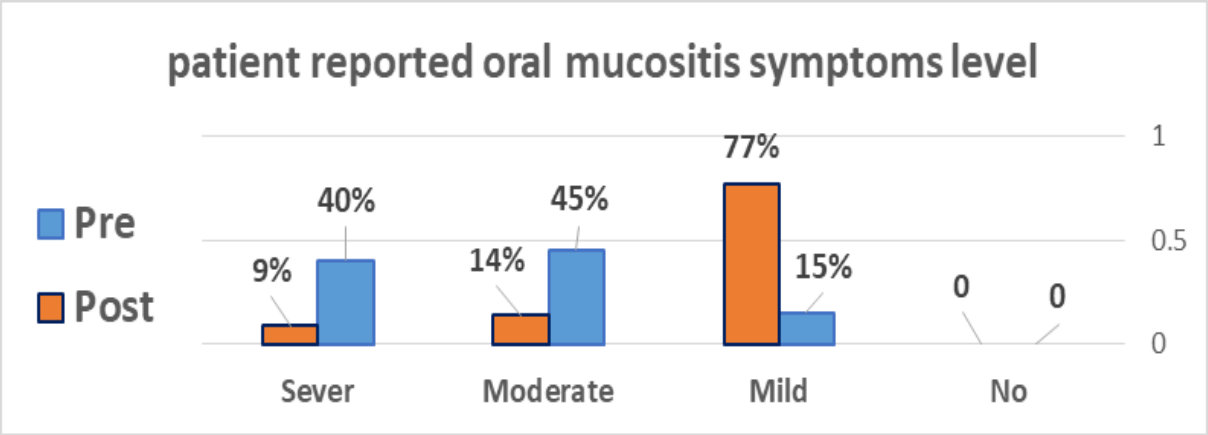

Figure (2) Percentage distribution of patient reported oral mucositis symptoms level among the studied patients pre & post intervention (n=100).

Discussion

Mucositis is one of the most serious adverse effects of chemotherapy, potentially leading to treatment cessation in 11% of patients. According to previous studies, chemotherapy-induced mucosal oxidative damage generally manifests during the first and second weeks of treatment and resolves by the third or fourth week. Mucositis may lead to diminished quality of life, increased financial strain, or even hospitalization for the patient afflicted **(Roayaei, Andalib & Akhavan, (2022).**So, the study aim to assess the efficacy of sodium bicarbonate mouthwash in alleviating mucositis among cancer patients receiving chemotherapy.

The socio-demographic features of the patients in this study indicated that almost one-third of the participants were aged 45 years or older. This outcome may be attributed to the high-risk age group for cancer exposure, characterized by diminished immunity and inadequate nutritional state. This finding aligns with **Pulito et al. (2020),** who did a research named "Oral Mucositis: The Hidden Side of Cancer Therapy" and discovered that over half of the cancer patients examined were aged 45 years or older. This conclusion is corroborated by **Mohamed, El–Kady, Said, Abd-Allah, & Abdelslam, (2020),** who did a research named "Chemotherapy Induced Oral Mucositis Based on Patients Needs Assessment" and discovered that a significant proportion of the cancer patients examined were above 45 years of age. Concerning gender and domicile, almost three-fifths are female, and three-fifths dwell in rural areas. This conclusion may be attributed to the fact that some forms of cancer, such as breast cancer, are more prevalent in

females than in males. This conclusion contradicted **Mohamed et al. (2020),** who reported that fewer than three-quarters of the investigated patients were male and over two-thirds resided in metropolitan areas.

Regarding marital status and occupation, over three-fifths of the examined patients are married, and fewer than half are housewives. This outcome may be attributable to the significant proportion of the investigated patients who are adult females residing in rural areas. This conclusion aligned with **Mohammad, Ahmed, & Magbool, (2020**), who did a research named "Effect of Honey Mouthwash on the Health Outcomes of Patients with Stomatitis" and discovered that over half of the participants were married and housewives. In contrast, this data contradicts **Jicman et al. (2022),** who did a research named "Oral Mucositis Induced by Chemoradiotherapy in Head and Neck Cancer," which revealed that over half of the patients examined were employed.

The current study indicated that over 40% of the patients exhibited fourth-degree oral mucositis, while more than 33% presented with third-degree mucositis prior to intervention. Post-intervention, these percentages decreased to less than 10% and slightly above 10%, respectively. This outcome may be attributed to the detrimental impact of chemotherapy on the entire bodily system, resulting in mucositis as a prevalent side effect of the treatment.

This finding was corroborated by **Naibaho, Dharmajaya & Harahap, (2020),** who discovered that over fifty percent of the cancer patients taking chemotherapy experienced fourth-degree oral mucositis during the assessment phase of the trial. Additionally, this assertion is corroborated by **Di Fede et al. (2023**), who conducted a research named "Prevention and Treatment of Oral Mucositis: The Efficacy of Sodium Bicarbonate versus Other Agents," which shown an improvement in oral mucositis following the use of sodium bicarbonate intervention.

The current investigation demonstrated a highly statistically significant difference in eating restrictions due to mouth sores among the patients before and after the intervention. This outcome may be attributed to the influence of sodium bicarbonate in decreasing acidity, relieving discomfort, and enhancing flavor. This conclusion aligns with **Mohammadi et al. (2022**), who observed a statistically significant improvement in eating among the examined group with oral mucositis following the use of sodium bicarbonate post-intervention.

The current study demonstrated a

highly statistically significant difference in the restriction of drinking due to mouth sores among the analyzed patients before and after the intervention. This outcome may be attributed to the beneficial effects of sodium bicarbonate in alleviating irritation and inflammation, as well as hydrating the throat, hence diminishing pain associated with swallowing and drinking. This outcome aligns with **Elad et al. (2020**), who conducted a study titled "Clinical Practice Guidelines for the Management of Mucositis Secondary to Cancer Therapy" and discovered a statistically significant enhancement in fluid intake among patients with oral mucositis following the implementation of clinical practice guidelines that included sodium bicarbonate.

Regarding the severity of oral mucositis symptoms reported by patients in the study before and after the intervention, the current research indicated that two-fifths of the participants experienced severe oral mucositis symptoms prior to the intervention, whereas this percentage decreased to less than one-tenth following the intervention. A significant proportion of the patients undergoing chemotherapy exhibited severe oral mucositis, likely attributable to the adverse effects of chemotherapy, which compromise the immune system, thereby elevating the risk of bacterial and fungal infections in the oral cavity, altering the oral environment, such as inducing xerostomia, and affecting rapidly proliferating cells, including mucosal cells in the mouth.

This outcome contradicted the findings of **Özalp Gerçeker et al. (2024),** who conducted a study titled "The Effect of Oral Care Protocols on Mucositis in Pediatric Cancer Patients" and discovered that over half of the participants exhibited moderate oral mucositis symptoms during the assessment phase of their research.

Conclusion& Recommendations

The study concluded that there exists a highly statistically significant difference among the patients about the severity of oral mucositis and the patients' reported symptoms score of oral mucositis before and after the use of sodium bicarbonate mouthwashes, indicating an improvement in mucositis

.**Recommendations:**

Using sodium bicarbonate mouthwash as a treatment for cancer patients at the onset of chemotherapy in a clinical setting. Nurses on the oncology unit should have regular training on the most up-to-date oral hygiene strategies that promote good oral health. More research with a bigger probability sample to make the results more generic.

References

Barasch, A., Epstein, J. B., & Doty, R. L. (2024). Head and neck complications of cancer therapies: taste and smell. *Oral Diseases*.**22** July 2024 https://doi.org/10.1111/odi.15074

Bray, F., Laversanne, M., Sung, H., Ferlay, J., Siegel, R. L., Soerjomataram, I., & Jemal, A. (2024). Global cancer statistics 2022: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA: *a cancer journal for clinicians*, 74(3), 229-263.

Carrozzo, M., Eriksen, J. G., Bensadoun, R. J., Boers-Doets, C. B., Lalla, R. V., & Peterson, D. E. (2021). Oral mucosal injury caused by targeted cancer therapies. *JNCI Monographs*, (53)

Di Fede, O., Canepa, F., Maniscalco, L., Tozzo, P., Matranga, D., & Giuliana, G. (2023). Prevention and the treatment of oral mucositis: the efficacy of sodium bicarbonate vs other agents: a systematic review. *BMC oral health*, 23(1), 4.

Elad, S.; Rn, K.K.F.C.; Lalla, R.V.; Yarom, N.; Hong, C.; Logan, R.M.; Bowen, J.; Gibson, R.; Dds, D.P.S.; Zadik, Y. (2020): clinical practice guidelines for the management of mucositis secondary to cancer therapy. *Cancer 2020*, 126, 4423–4431.

Hong CHL, Gueiros LA, Fulton JS, Cheng KKF, Kandwal A& Galiti D. (2020): Mucositis Study Group of the Multinational Association of Supportive Care in Cancer/International Society for Oral Oncology (MASCC/ISOO). Systematic review of basic oral care for the management of oral mucositis in cancer patients and clinical practice guidelines. *Support Care Cancer*. (10):3949-3967.

Iovoli, A. J., Turecki, L., Qiu, M. L., Khan, M., Smith, K., Yu, H., ... & Singh, A. K. (2023). Severe oral mucositis after intensity-modulated radiation therapy for head and neck cancer. *JAMA Network Open*, 6(10), e2337265-e2337265.

Jicman, D., Sârbu, M. I., Fotea, S., Nechifor, A., Bălan, G., Anghele, M., ... & Tatu, A. L. (2022). Oral Mucositis Induced by Chemoradiotherapy in Head and Neck Cancer—A Short Review about the Therapeutic Management and the Benefits of Bee Honey. *Medicina*, 58(6), 751.

Khanjani Pour-Fard-Pachekenari, A., Rahmani, A., Ghahramanian, A., Jafarabadi, M. A., Onyeka, T. C., & Davoodi, A. (2019). The effect of an oral care protocol and honey mouthwash on mucositis in acutemyeloid leukemia patients undergoing chemotherapy: A single blind clinical trial. *Clinical Oral Investigations*, 23(4), 1811–1821.

Kongwattanakul S, Petchann N, Petroch P, Thanthong S, Tungfung S,

Chamchod S, Pitiporn S & Nantajit D (2022). Prophylactic management of radiation-induced mucositis using herbal mouthwash in patients with head and neck cancer: an assessor-blinded randomized controlled trial. *J Complement Integr Med*. 19(3):771-780.

Lee, J., Lee, H., & Kim, W. (2021). Chemotherapy-induced oral mucositis: Pathogenesis and management strategies. *Journal of Cancer*, 12(3), 781-792. https://doi.org/10.1155/2021/1857983.

Mohamed, Y., El–Kady, M., Said, H., Abd-Allah, D., & Abdelslam, S. (2020). Chemotherapy Induced Oral Mucositis Based on PatientsNeeds Assessment. *Egyptian Journal of Health Care*, 11(4), 1382-1391.

Mohammad, R., Ahmed, N. M., & Magbool, F. R. (2020). Effect of Honey mouth wash on the health outcome of patient with stomatitis. Int. J. Nov. *Res. Healthc. Nurs*, 7, 210-219.

Mohammadi F, Oshvandi K, Kamallan SR, Khazaei S, Ranjbar H, Ahmadi-Motamayel F. (2022): Effectiveness of sodium bicarbonate and zinc chloride mouthwashes in the treatment of oral mucositis and quality of life in patients with cancer under chemotherapy. *Nurs Open.* 2022;9(3):1602–11.

Naibaho, E. N., Dharmajaya, R., & Harahap, I. A. (2020). Effectiveness of Oral Care Using Normal Saline and Baking Soda Towards Pain and Comfort in Mucositis Patients Undergoing Chemotherapy. *Indian Journal of Public Health Research & Development*, 11(10), 222-228.

Nau, C. (2021). Epidemiology of oral mucositis in cancer patients: Incidence, risk factors, and associated impacts. *Oral Oncology*, 115, 104761. https://doi.org/10.1016/j.oraloncology.2021.104761.

O'Neill, D., Scully, C., & Prime, S. (2020). Oral mucositis: Pathogenesis and management. *Oral Diseases*, 26(1), 150-157. https://doi.org/10.1111/odi.13289

Özalp Gerçeker, G. Ü. L. Ç. İ. N., Yıldırım, B., Önal, A., Bektaş, M., Leblebici, A., Ören, H. A. L. E., & Olgun, H. A. T. İ. C. E. (2024). The Effect of Oral Care Protocols on Mucositis in Pediatric Cancer Patients: A Randomized Controlled Trial. *Journal of Contemporary Medicine*, 14(4).

Pulito, C., Cristaudo, A., Porta, C. L., Zapperi, S., Blandino, G., Morrone, A., & Strano, S. (2020). Oral mucositis: the hidden side of cancer therapy. *Journal of experimental & clinical cancer research,* 39, 1-15.

Pulito, C., Cristaudo, A., Porta, C. L., Zapperi, S., Blandino, G., Morrone, A., & Strano, S. (2020). Oral mucositis: the hidden side of cancer therapy. *Journal of experimental & clinical cancer research*, 39, 1-15.

Rambod, M., Pasyar, N., & Ramzi, M. (2022). The effect of zinc sulfate on prevention, incidence, and severity of mucositis in leukemia patients undergoing chemotherapy. European *Journal of Oncology Nursing,* 33, 14-21.

Roayaei M, Andalib Z, Akhavan A. (2022): The effect of oral zinc sulfate on prevention of chemotherapy-induced oral mucositis in breast cancer patients treated with Adriamycin and cyclophosphamide; a double-blind randomized clinical trial. *J Nephropharmacol.* 2022;12:e10533. https://doi. org/10.34172/npj.2022.10533.