Effectiveness of Self-Care Practices Educational Program in Preventing and Managing Oral Mucositis in Children Undergoing Chemotherapy

Zagazig Nursing Journal
Vol. 21; Issue. 2
July 2025
Received: 8/6/2025
Revised: 28/6/2025
Accepted: 16/7/2025

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ABSTRACT

Background: Oral mucositis is a common and painful complication in children undergoing chemotherapy, characterized by inflammation and ulceration of the oral mucosa. This condition can lead to difficulties in eating, swallowing, and speaking, significantly affecting the quality of life and potentially interrupting cancer treatment. **Aim of the study:** This study aimed to evaluate the effectiveness of a self-care practices educational program in preventing and managing oral mucositis in children undergoing chemotherapy. **Subjects and methods: Study design:** A quasi-experimental design was used to conduct this study. **Setting:** The study was conducted at Zagazig University Children's Hospital in both inpatient and outpatient clinics of the hematology-oncology unit, as well as the Internal Medicine Hospital (Oncology Unit), Egypt. **Subjects:** A purposive sampling technique was used to choose a sample of 50 children undergoing chemotherapy. **Tools of data collection:** Three tools were used for data collection (I) a structured interview questionnaire, (II) an Oral Assessment Guide (OAG), and (III) a children's self-care habits about oral mucositis tool. **Results:** The current study revealed that the findings indicate a statistically significant improvement in knowledge and self-care practice regarding mucositis after the implementation of the program as well as children`s oral assessment as the outcome of the program ($P < 0.05$). **Conclusion:** The self-care educational program that emphasizes oral self-care practices effectively prevents and manages oral mucositis in children undergoing chemotherapy. **Recommendations:** health care providers should integrate a self-care educational program regarding oral mucositis into the standard care protocol for pediatric chemotherapy patients.
Keywords: Children undergoing chemotherapy, Oral mucositis, Self-care practices.

Introduction

Pediatric oncological disorders are estimated to be 450,000 new cases reported annually between 2015 and 2023. The most diagnosed cancers in children include leukemia, lymphoma, central nervous system tumors, sarcomas, and solid tumors such as Wilms' tumor and neuroblastoma **(Heydari et al., 2023).** Treatment usually involves a multimodal approach that combines radiotherapy, chemotherapy, and surgery. Chemotherapy is often used alongside other treatments to improve their effectiveness or, at times, as a standalone treatment given in high doses to enhance its effects **(Curra et al., 2021).**

Chemotherapeutic agents, particularly anthracyclines and methotrexate,

can cause adverse effects like nausea, vomiting, immunosuppression, and mucositis, which can lead to the discontinuation of chemotherapy regimens and significantly impact treatment outcomes. Oral mucositis occurs in 52% to 100% of patients undergoing chemotherapy **(Attinà et al., 2021; Redman et al., 2021).** Oral mucositis, an inflammatory condition triggered by chemotherapy, causes discomfort and pain in the oral cavity, leading to ulceration, gastrointestinal tract erosion, dysphagia, and reduced oral intake in children, severe cases may lead to treatment cessation **(Chan et al., 2020; Hurrell et al., 2019).**

The management of oral mucositis focuses on comfort measures, including mouth rinses like chlorhexidine and iodine, regular oral hygiene, and dental consultations. Given the inconsistent evidence for current interventions, nurses should prioritize evidence-based strategies that empower children and their families, promoting independence and improving quality of life **(Kostak et al., 2020).** The Assessment, Practicing Oral Health, Health Education, and Observation (APHO) nursing intervention has demonstrated efficacy in the prevention and management of oral mucositis in children. This approach emphasizes health education for children and their families, guided by the World Health Organization (1979). Oral Assessment Tool, to provide comprehensive and effective care **(Colella et al., 2023; Lohakare et al., 2023).**

Significance of the study

Egypt faces a high rate of childhood cancer cases and mucositis, compounded by inadequate resources and care, which increases symptoms and infection risk. Effective treatment and self-care for mucositis are crucial for children undergoing chemotherapy, as it can lead to complications. Implementing self-care practices can help prevent oral mucositis, improve treatment adherence, reduce complications, and enhance quality of life. Early integration of these practices, with support from caregivers and clinicians, can significantly benefit a child's recovery and comfort **(Nurhidayah et al., 2023).**

Aim of the study

The current study aimed to evaluate the effectiveness of self-care practices educational program in preventing and managing oral mucositis in children undergoing chemotherapy

Study hypotheses

H1; The level of children's knowledge and practice will be improved significantly after implementing self-care practices educational program.

H2; Children who will receive self-care practices educational program will show improved symptoms and prevention of oral mucositis after the program implementation.

Subjects and methods

Study design

A quasi-experimental design was used to achieve this study.

Study setting

The study was conducted at the Zagazig University Children's Hospital in both the inpatient and outpatient clinics of the hematology-oncology unit, as well as the Internal Medicine Hospital Oncology Unit, Egypt.

Subjects

Children who attend the pre mentioned settings to receive chemotherapy doses.

The inclusion criteria

- Children aged 6-18 years old are newly diagnosed with oncological diseases and undergoing oncological chemotherapy.

The exclusion criteria

- Children who received radiotherapy in the head and neck region.

- Children on anti-platelet or anticoagulant therapy with existing oral health issues like infections, trauma, or ulcerations need special attention in their treatment plans, especially before chemotherapy.

Sample size

Sample size (n) = N/1+N*d2 **(Sharma et al., 2020)**

N = Total population = 50

d = Margin of error or precision = 0.05

n = 55/1+55* (0.05)2 = 50 child

Sampling technique: A purposive sample of children with inclusion criteria were involved in the current study.

Tools of data collection

Tool (I): a structured interview questionnaire that adapted from **Khalaf et al. (2020)**. It included three parts:

Part 1: Characteristics of the studied children: which included age, sex, residence, and educational level.

Part 2: Children's clinical data: diagnosis, chemotherapy type, duration of chemotherapeutic sessions, and side effects of chemotherapy.

Part 3: Children`s knowledge regarding cancer and related concepts, oral mucositis, and its appropriate care.

Tool (II): Oral Assessment Guide (OAG): adopted from **Eilers et al. (1998).** It is a reliable tool for monitoring oral cavity conditions and mucositis in children, helping assess the effects of treatments. It includes standardized descriptions for eight items: voice, swallow, lips, tongue, saliva, mucous membranes, gingiva, and teeth or dentures ***as shown in table (1)***. The score of mucositis is assigned between 1 and 3 by the appearance of the affected area as follows:

Scoring system:

Total Score	Interpretation
1–8	Healthy oral cavity
9–16	Moderate stomatitis
17–24	Severe stomatitis

Tool (III): Twelve items that address children's self-care habits about oral mucositis, a side effect of chemotherapy. Additionally, it was awarded two points for correctly completed work and one point for incorrectly completed work, as it is adapted from **Ribeiro et al., (2020)**

Content validity and reliability

The validity of the tools was assessed by a jury of five pediatric nursing experts, focusing on clarity, relevance, comprehensiveness, simplicity, and applicability. Tool I demonstrated reliability with a Cronbach's alpha of r = 0.87. Tool II, the oral assessment guide for mucositis (OAG), showed higher internal consistency with r = 0.912. Tool III also proved reliable with a Cronbach's alpha of r=0.901.

Fieldwork

The fieldwork for the assessment and intervention program took place from February to April 2024, followed by three months (May to July 2024), then posttest through August 2024. Researchers were present three days a week during chemotherapy sessions in the morning to collect data using the established tools.

Assessment phase:

Researchers explained the study's purpose, obtained consent, and assessed the children`s knowledge needs using baseline questions (**Tool I**). Before the program intervention for assessing mucositis in children, researchers carry out several procedures, including:

1. Evaluating the child's voice and swallowing ability.
2. Testing the gag reflex with a blade on the tongue.
3. Observing and feeling the lip and tongue tissue, including the center of the tongue and floor of the mouth.
4. Examining the appearance of the mucous membrane and gently pressing on the gingiva.
5. Assessing the condition of the teeth.

Researchers measured oral mucositis at three points: the first week (7 days), the second week (14 days), and the third week (21 days) following the start of chemotherapy and calculated the average score from these assessments by using **Tool II.** The evaluation of oral mucositis and related symptoms in children took an average of 5 to 10 minutes using a light source. Researchers also assessed each child's ability to perform routine oral care on their own (**Tool III**).

Program content:

The educational program covered management strategies for chemotherapy-induced oral mucositis (OM), emphasizing essential skills such as tooth brushing, flossing, and non-medicated rinses. Participants learned to use ice chips before chemotherapy and were trained in breathing exercises and relaxation techniques to reduce stress and tension. Children's knowledge regarding cancer and related concepts contained (9 questions), and oral mucositis and oral care contained (14) questions, with a total of (23) questions. While the children's practices include (12) Questions.

Planning phase:

The self-care practice program was developed by researchers following a thorough literature review and needs assessment. An Arabic booklet was created to help pediatric patients undergoing chemotherapy manage oral mucositis. This resource aimed to equip children with knowledge and strategies for self-care. The booklet was distributed to enhance their ability to effectively confront this health issue.

Implementation phase:

The oral mucositis care program targeted children aged 6-18 receiving induction or consolidated treatments for solid tumors or hematological malignancies. Implemented over three months, the program consisted of four sessions (2 sessions for theory, 2 sessions for practice, and an assessment of the child`s oral mucositis). divided into six groups of 8 children each, while 2 groups had 9 children. The researchers conducted theory and practical sessions, each lasting 35-40 minutes, three days a week, using simple language to accommodate children's needs. Teaching methods included group discussions, lectures, role-playing, demonstrations, and re-demonstrations, with educational aids like posters and PowerPoint. Children learned oral mucositis prevention and management, using Arabic handouts. ***The contents of educational classes were presented in table (2).***

Evaluation phase: The children's knowledge and skills were evaluated post-implementation of the self-care practice program, and their oral condition was assessed using the Oral Assessment Guide scale, using the same instruments (**Tools: I, II, & III**), three months after the program was implemented, an evaluation was conducted. As an incentive, each child received a smooth toothbrush and was encouraged to brush their teeth at least twice a day with the new soft toothbrush.

Pilot study

A pilot study was conducted with 5 children to assess the feasibility of the research, the applicability of the tool, and the completion time. Based on the results, modifications were made to the study tools and participants.

Administration and ethical considerations

Approval from the Research Ethical Committee, Faculty of Nursing, Zagazig University, was obtained (ZU.Nur.REC#:229). Parental consent was secured prior to the commencement of the study for participants with children under the age of 16, consent was acquired from all participants aged 16 and older prior to their involvement in the study. Parents and children were informed about the study's purpose, advantages, risks, and methodology,

and participants were assured of voluntary participation. Confidentiality and anonymity were guaranteed, and permission was obtained from hospital managers and oncology supervisors.

Statistical analysis

The SPSS software, Version 29, was utilized for data classification, examination, and tabulation. Numerical data were represented using mean and standard deviation, while qualitative data were expressed in frequencies and percentages. A comparative analysis of qualitative variables was conducted using the parametric Chi-square test, and the Pearson correlation coefficient was applied for variable comparison. Statistical significance was determined with a p-value of less than 0.05, extreme significance at less than 0.001, and non-significance greater than 0.05.

Results

Table (3) indicates that 54% of the participants were aged between 13 and 18 years, with about equal representation of genders, as 54% of the participants were female. Furthermore, two-thirds of the children (68%) were enrolled in secondary school. Notably, over 70% of the children were diagnosed with solid malignant tumors.

Table (4): All of the studied children undergoing chemotherapy (100%) suffered from oral mucositis, followed by nausea and vomiting (78%), anemia (72%), and thrombocytopenia (62%). Anorexia and leukopenia were observed in 58% of the cases for both.

Table (5): The findings indicate a statistically significant enhancement in knowledge pertaining to cancer, mucositis, and preventive measures before and after the implementation of the program.

Table (6): demonstrates a statistically significant improvements in Children`s oral assessment 3 months after the program implementation, including improvements in the child's voice, lips, and teeth with the same P value of 0.000 as well as the child's tongue, Gingiva, then the effect on swallow and oral mucosa, with P value 0.001, 0.008, then 0.010, 0.039 respectively, both before and after the implementation of the program. Despite there being no statistically significant correlation between children`s oral assessment guide and the child's saliva secretion with a P-Value of 0.094.

Table (7): represents that, there were a statistically significant improvement (P < ,05) in all Children`s Practice after the interventions, regarding mucositis except one point " don't eat acidic, salty, dry, spicy, or hot foods" showed that less significant improvements**.**

Figure (1): The study revealed that only 46% of the children demonstrated satisfactory knowledge before the program was implemented. However, after the program, this percentage increased to 68%. In terms of unsatisfactory knowledge, about two-thirds (54%) of the children had unsatisfactory knowledge before the program, while after the program, a minority (32%) continued to have unsatisfactory knowledge.

Figure (2): Before the implementation of the program, only 36% of the studied children conducted proper oral care for mucositis. In contrast, following the program’s implementation, a substantial majority, comprising 86% of the children, demonstrated adherence to correct oral care practices for mucositis.

Figure (3): The results revealed that before the program was implemented, none of the children had healthy mouths. However, after the program, 14% of the children were reported to have a healthy mouth. Additionally, approximately two-thirds of the study sample (58%) had severe mucositis prior to the program, but this percentage significantly declined to just 4% after the program was put into place.

Discussion

The present study found that half of the patients aged 13-18, with equal gender representation in primary school, and over two-thirds of them were diagnosed with solid tumors. These findings align with those of **Attinà et al. (2021),** who reported an equal incidence of oral mucositis between genders and a higher prevalence among children aged over 10 years with solid tumors undergoing chemotherapy. Similarly, **Chan et al. (2020),** support our findings as they found a higher oral mucositis incidence in children aged 10-18, with females experiencing higher rates due to chemotherapy frequency.

Concerning chemotherapy-related complications**,** the present findings clarified that all children experienced oral mucositis, gastrointestinal symptoms, anorexia, and leukopenia, with over two-thirds reporting these issues. These findings align with a study by **García-Chías et al. (2019**) and **Torres et al. (2019),** which assessed the oral adverse effects of chemotherapy, identifying dry mouth, taste alterations, and dry lips, are prevalent among children, with fatigue, nausea, and loss of appetite being the most persistent symptoms. In contrast, **Rawat et al. (2021**) reported that oral mucositis accounted for only 28% of all chemotherapy-related side effects.

Current results show that over two-thirds of children had insufficient knowledge about cancer, mucositis, and preventive measures. This might be attributed to limited resources and healthcare systems prioritizing disease treatment over preventive education. This finding aligns with **Nurhidayah et al. (2023),** who reported that children and their caregivers lacked essential knowledge about the basic self-care practices required to prevent oral mucositis. Furthermore, the current study agrees with **Bezerra et al. (2021),** who demonstrated that a health education program was 1.4 times more effective in preventing the incidence of oral mucositis compared to the control group. The study shows that a family-centered approach to healthcare, which involves children in healthcare practices, significantly enhances their understanding of mucositis and its prevention. As a result, there was a 68% increase in satisfaction. This indicates that the teaching methods used in the study effectively empowered children and improved their knowledge of mucositis. Our findings side with those of **Boshagh et al. (2022),** in A study conducted at an Iranian children's hospital found a significant increase in knowledge within the intervention group both before and after the intervention. Additionally, our results are consistent with **Farsani (2023),** as it was obvious that intervention significantly reduced mucositis incidence in children, with no significant difference in oral mucosa inflammation, and significantly improved children's quality of life between the intervention and control groups immediately and three months after the intervention.

The present study revealed that a significant improvement in oral assessment scores for children undergoing chemotherapy, indicating reduced complications related to the lips, tongue, gingiva, and overall oral mucosal health. This result is due to implementing a good oral care guide for children undergoing chemotherapy. The findings align with those of **Yavuz and Bal Yilmaz (2015),** who reported that a significant difference in oral mucositis before and after education, showing a strong link between education and pain intensity. Furthermore, daily mouth care was associated with a significant reduction in pain severity. Additionally, the current results were on consistent with **Kostak et al. (2020)** who found that implementing a regular oral care routine from the first day of chemotherapy was associated with improved swallowing, reduced pain, and lower grades

of oral mucositis, as measured by the WHO Oral Mucositis Assessment Scale.

The introduction of a program enhanced children's self-care habits, decreasing poor self-care incidents to under 10% of the initial figures, with an emphasis on daily self-evaluations, hygiene, comfort measures, and nutrition. Participants exhibited a statistically significant advancement in every area, with the exception of refraining from acidic, salty, dry, spicy, or hot foods. The educational program's booklet significantly improved children's self-care knowledge and practices. This may be attributed to its simple explanations, pictures, and easy-access links, and its accessibility in print and cellphone form, promoting convenience and environmental sustainability. Our study is unique as it focuses on the children themselves, unlike previous studies that predominantly targeted caregivers. The current findings are consistent with those of **Kostak et al. (2020),** who reported that patients are not regularly reinforced on how to perform proper oral care or recognize the symptoms of oral mucositis. They emphasized the need for healthcare professionals to educate parents and children about the benefits of oral health, which is often neglected.

Most studies explore self-care behaviors in adults or adults acting as caregivers for children with chronic diseases. However, our current study sheds light on self-care practices performed by children themselves to achieve adequate disease control, improve quality of life, promote social inclusion, and foster development. To accomplish this, barriers must be addressed, including knowledge, resources, time, and support systems, as identified in our study **(Hurrell et al., 2019).** Our results, aligned with **Dall'Oglio et al. (2021),** who cleared in their study on pediatric self-care practices using PRISMA highlighted that a lack of knowledge about self-care is the main issue across six studies, emphasizing the need for our research and the shift from a caregiver to a patient-centered approach. Additionally, **Modi et al. (2012)** concluded that the nature of treatment and the management of complications e.g. chemotherapy, are major barriers to achieving overall quality self-care. Finally, **Lansing and Berg (2014),** in their study on adolescents and their parents highlighted the lack of resources, role models, technical support services, and attitudes as significant factors in achieving quality health outcomes during adolescence, which aligns with the majority of our study sample.

In relation to the outcomes of the intervention, the present results indicated that about 20% of children had healthy oral conditions after the program was introduced, compared to none before it. Additionally, nearly two-thirds of the participants suffered from severe mucositis before the program, but this number fell dramatically to only 4% following the intervention, highlighting the program's effectiveness for the children. These results were aligned with **Banat et al., (2024),** who found that children showed positive mean scores in knowledge and practices, leading to preventing oral mucositis among children, demonstrating notable benefits at various stages of their treatment journey and a reduction in complications.

Conclusion

Based on the results of the current study it's concluded that" the self-care educational program that emphasizes oral health practices is effective in preventing and managing oral mucositis in children undergoing chemotherapy".

Recommendations

- Health care providers should integrate a self-care educational program regarding oral mucositis into

the standard care protocol for pediatric chemotherapy patients.

- Continue to demonstrate periodical training sessions for the children undergoing chemotherapy to improve and update their oral care knowledge.
- To maintain sustainability of the current study program should include social media platforms for training children with oral mucositis as its appropriate to them and will get benefit.

Authors' contributions

N.R.M; suggested the research concept, drafted the proposal, performed data collection and analysis, and drafted the manuscript. H.S.A and H.H.A; and R.AR; contributed to the study by revising and assisting in the development of the research methodology, data collection, data analysis and interpretation, discussion, comparison of results with recent literature in the study field. All parts in the manuscript have been revised and approved by all authors.

Acknowledgements

The researchers express their gratitude and best wishes for to the patients and their parents who participated in this study, as well as to the directors of the study setting.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

Funding source

The author received no financial support for the research, authorship, and/or publication of this article.

Table (1): Eight Elements of Oral Assessment Guide

Assessment Item	1 score (Normal)	2 score (Moderate Change)	3 score (Severe Problem)
Voice	Voice is normal	Voice is deeper or raspy	Difficulty or painful talking
Swallow	Swallow is normal	Some pain on swallowing	Unable to swallow
Lips	Smooth, pink, and moist lips	Dry or cracked lips	Ulcerated or bleeding lips
Tongue	Pink, moist tongue with papilla present	Coated tongue or loss of papilla, shiny appearance, with/without redness	Blistered or cracked tongue
Saliva	Watery saliva	Thick or ropy saliva	Absent saliva
Mucous Membranes	Pink and moist mucous membranes	Reddened or coated without ulcerations	Ulceration with or without bleeding
Gingiva (Gums)	Pink, stippled, and firm gingiva	Edematous gums with or without redness	Spontaneous bleeding or bleeding with pressure
Teeth/Dentures	Clean teeth, no debris	Plaque or debris in localized areas	Plaque or debris generalized along the gum line/denture

Table (2): Outline for a 3-month oral mucositis care program

Session	Duration	Content	Method	Materials Used
Session 1	35–40 minutes (Theory)	- Introduction to cancer, chemotherapy, and side effects - Definition, causes, and onset of oral mucositis	-Lecture - Small group discussion - Brainstorming	- PowerPoint presentations - Colored posters
Session 2	35–40 minutes (Theory)	- Clinical signs of mucositis - Assessment and prevention - Management, pain relief, complications	- Lecture - Role play - Brainstorming	- Arabic educational booklet - Handouts
Session 3	50–60 minutes (Practice)	- Demonstration of oral care skills: toothbrushing, flossing, mouth rinsing - Breathing and relaxation techniques	- Demonstration and re-demonstration - Group practice	- Toothbrushes - Saline solution - Educational posters
Session 4	50–60 minutes (Practice)	- Reinforcement of self-care skills - Individual practice and feedback	- Practical re-demonstration - Role-playing scenarios	- Feedback checklists - Posters - Booklet

Table (3): Frequency distribution of the children according to their demographic characteristics (n=50)

Characteristics of Studied Children	No.	%
Children's age		
6-12 years	23	46.0
13-18 years	27	54.0
Mean ± SD	**15.2 ± 3.04**	
Gender		
Female	27	54.0
Male	23	46.0
Types of tumors		
Solid tumor	35	70.0
Hematological Malignancy	15	30.0
The rank of the child		
The first	12	24.0
The middle	21	42.0
The last	17	34.0
Child Educational Level		
Primary	16	32.0
Secondary	34	68.0

Table (4): Frequency distribution of chemotherapy complications for the studied children (n=50)

Complications of Studied Children	No.	%
Routes Chemotherapy		
IM	13	26.0
IV	21	42.0
CVA	16	32.0
Presence of Side Effects		
Oral Mucositis		
No	0	0.0
Yes	50	100.0
Leukopenia		
No	21	42.0
Yes	29	58.0
Anemia:		
No	14	28.0
Yes	36	72.0
Anorexia:		
No	21	42.0
Yes	29	58.0
Thrombocytopenia		
No	19	38.0
Yes	31	62.0
Nausea and Vomiting		
No	11	22.0
Yes	39	78.0
Depression and anxiety		
No	22	44.0
Yes	28	56.0

Table (5): Frequency distribution of children`s knowledge about cancer and mucositis and its care before and after the program (n=50)

Variables	Children's Knowledge Before the Program Implementation				Children's Knowledge 3 Months After the Program Implementation				McNemar Test	P-Value
	Satisfying		Unsatisfying		Satisfying		Unsatisfying			
	No	%	No	%	No	%	No	%		
Knowledge about Cancer										
Definition of Cancer	18	36.0	32	64.0	38	76.0	12	24.0	0.829	0.000**
Common Types of Tumors	14	28.0	36	72.0	32	64.0	18	36.0	7.028	0.009*
Definition of chemo	17	34.0	33	66.0	36	72.0	14	28.0	1.369	0.000**
Indications chemotherapy	24	48.0	26	52.0	36	72.0	14	28.0	0.206	0.023*
Knowledge about Mucositis										
Definition of Oral Mucositis	10	20.0	40	80.0	33	66.0	17	34.0	6.439	0.000**
How it appeared	11	22.0	39	78.0	22	44.0	28	56.0	8.186	0.007*
The time that will appear and will be cured	20	40.0	30	60.0	38	76.0	12	24.0	10.526	0.000**
Signs of mucositis	14	28.0	36	72.0	27	54.0	23	46.0	16.564	0.000**
When Cure occurs	12	24	38	46	27	54.0	23	46.0	9.018	0.000**
Preventive Measures										
Methods of Prevention	10	20.0	40	80.0	31	62.0	19	38.0	7.661	0.000**
Dietary Preventive measures	6	12.0	44	88.0	28	56.0	22	44.0	5.357	0.012*
Appropriate frequency of oral care	13	26.0	37	74.0	29	58.0	21	42.0	12.721	0.000**
Treatment modalities	16	32.0	34	68.0	29	58.0	21	42.0	12.345	0.000**
Pain medications to control it	13	26.0	37	74.0	41	82.0	9	18.0	1.265	0.000**
Complications of Chemo	18	36.0	32	64.0	29	58.0	21	42.0	20.366	0.001*
Emotional Support	21	42.0	29	58.0	34	68.0	16	32.0	5.221	0.004*

Table (6): Frequency distribution of children`s oral assessment guide before and after the program implementation (n=50)

Child`s Oral Assessment Guide	Children's Oral Assessment before the Program Implementation		Children's Oral Assessment 3 Months after the Program Implementation		X^2 Test	P-Value
	No	%	No	%		
Voice						
Normal	8	16.0	24	48.0	41.38	0.000**
Deeper or raspy	26	52.0	16	32.0		
Difficulty talking or crying or painful	16	32.0	10	20.0		
Swallow						
Normal swallow	20	40.0	29	58.0	13.190	0.010*
Some pain on swallowing	25	50.0	20	40.0		
Unable to swallow	5	10.0	1	2.0		
Lips						
Smooth, pink and moist	7	14.0	25	50.0	20.455	0.000**
Dry or cracked	21	42.0	16	32.0		
Ulcerated or bleeding	22	44.0	9	18.0		
Saliva						
Watery	3	6.0	26	52.0	4.734	0.094
Thick or ropy, excess salivation due to teething	31	62.0	24	48.0		
Absent	16	32.0	0	0.0		
Tongue						
Pink, moist and papillae present	8	16.0	24	48.0	18.701	0.001**
Coated or loss of papillae with a shiny appearance with or without redness. Fungal infection.	28	56.0	23	46.0		
Blistered or cracked	14	28.0	3	6.0		
Oral Mucosa						
Pink and moist	11	22.0	32	64.0	10.077	0.039*
Reddened or coated without ulceration. Fungal infection.	24	48.0	17	34.0		
Ulceration with or without bleeding	15	30.0	1	2.0		
Gingiva						
Pink and firm	6	12.0	26	52.0	13.732	0.008**
Edematous with or without redness, smooth. Edema due to teething	33	66.0	22	44.0		
Spontaneous bleeding or bleeding with pressure	11	22.0	2	4.0		
Teeth						
Clean and no debris	22	44.0	29	58.0	49.395	0.000**

Plaque or debris in localized areas (between teeth)	19	38.0	16	32.0		
Plaque or debris generalized along gum line	9	18.0	5	10.0		

Table (7): Frequency distribution of children`s practices regarding mucositis care before and after the implementation program (n=50)

Variables	Children's Practice before the Program Implementation				Children's Practice 3 Months after the Program Implementation				McNemar Test	P-Value
	Correctly Done		Incorrectly Done		Correctly Done		Incorrectly Done			
	No	%	No	%	No	%	No	%		
Mucosal daily Assessment	11	22.0	39	78.0	28	56.0	22	44.0	3.815	0.051*
Clean the tooth with a soft brush	12	24.0	38	76.0	35	70.0	15	30.0	6.767	0.009*
Use Fluoride toothpaste	7	14.0	43	86.0	23	46.0	27	54.0	9.555	0.002*
Spit out mouth rinse	30	60.0	20	40.0	40	80.0	10	20.0	18.750	0.000**
Effective analgesia before mouthcare	18	36.0	32	64.0	27	54.0	23	46.0	23.958	0.000**
Applying ice chips to the mouth for 5 minutes before the infusion	15	30.0	35	70.0	32	64.0	18	36.0	12.054	0.001*
Antifungal prophylaxis agents (oral or intravenous as prescribed and tolerated)	10	20.0	40	80.0	29	58.0	21	42.0	9.052	0.003*
Rinse the mouth after vomiting with water	35	70.0	15	30.0	41	82.0	9	18.0	25.610	0.000**
Apply a moisturizing cream to the lips	20	40.0	30	60.0	45	90.0	5	10.0	3.704	0.054*
Don`t eat acidic, salty, dry, spicy, or hot foods	20	40.0	30	60.0	28	56.0	22	44.0	1.096	0.295
Flossing to remove plaque to be performed at least once a day	18	36.0	32	64.0	31	62.0	19	38.0	17.238	0.000**
Good hydration moisturizes the oral cavity	18	36.0	32	64.0	26	52.0	24	48.0	7.488	0.006*

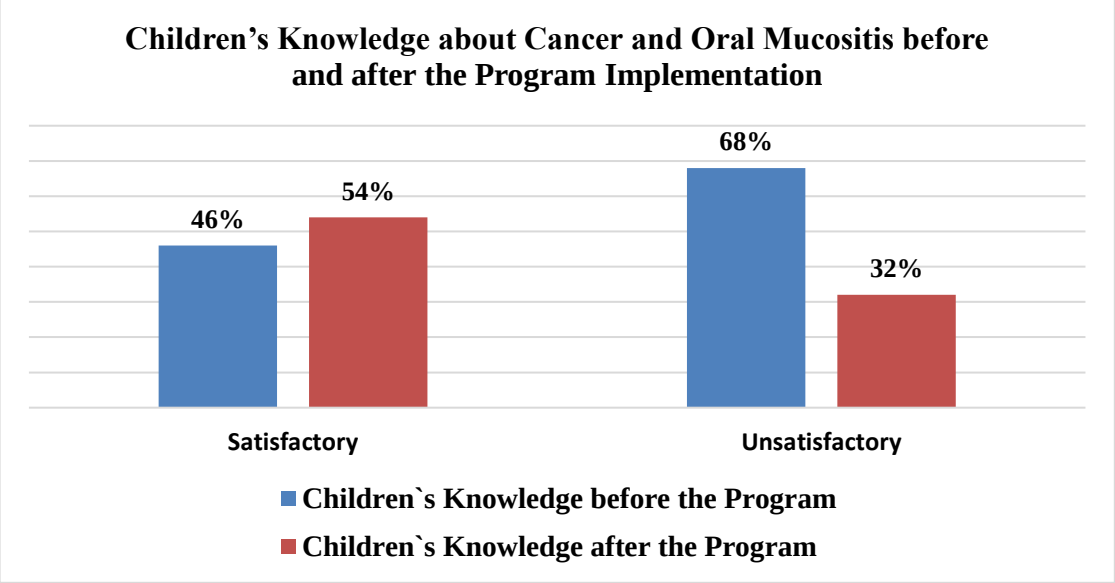

Figure 1: Distribution of total children's knowledge about cancer and oral mucositis before and after the program implementation (n=50)

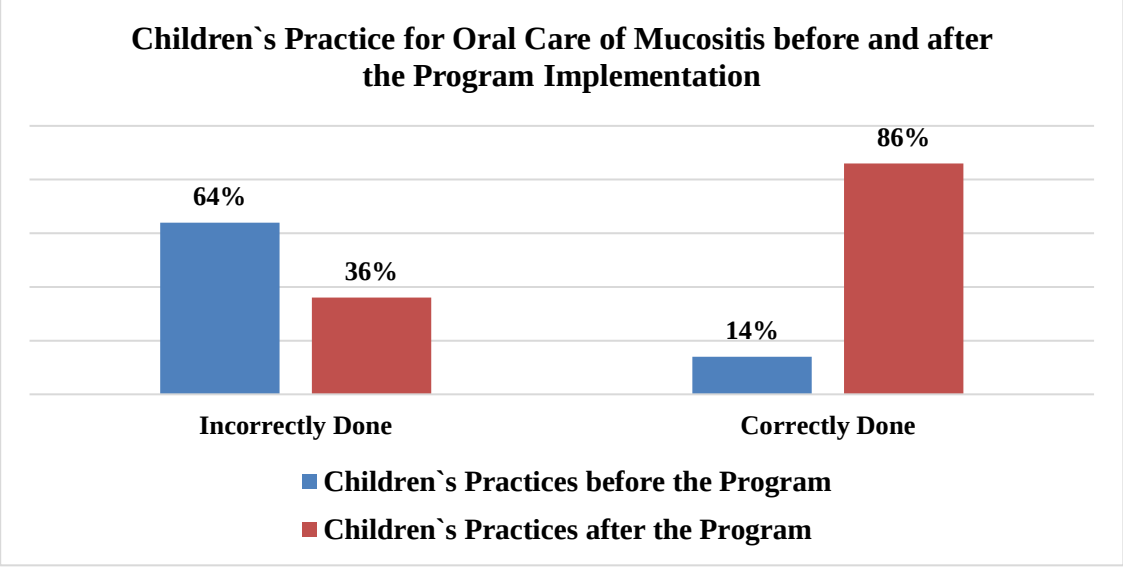

Figure 2: Distribution of total children`s practice for oral care of mucositis before and after the program implementation (n=50)

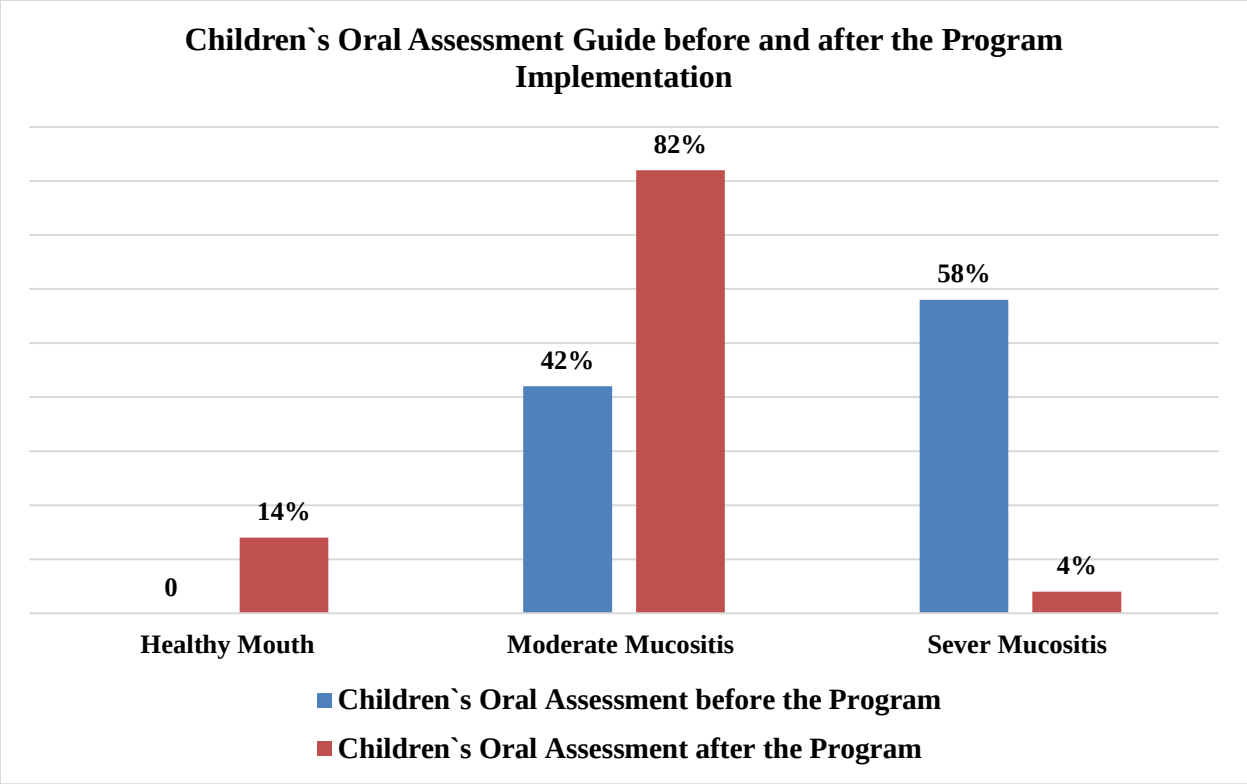

Figure 3: Distribution of Total Children`s Oral Assessment Guide before and after the Program Implementation (n=50)

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