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The Effect of Implementing Self-Care Strategies on Taste Alterations among Chemotherapy Patients

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Abstract: *Chemotherapy agents cause a wide range of adverse effects. One of these adverse effects is taste alterations. Teaching patients about treatment of their adverse effects reduces fear, increases self-confidence, improves compliance and enhances their participation in self-care.*
Objective: *To determine the effect of implementing self-care strategies on taste alterations among chemotherapy patients.*
Setting: *The study was carried out in the Oncology Therapy Unit, Alexandria Main University Hospital.*
Subjects: *A convenience sample of 60 adult patients who had cancer and received at least two cycles of chemotherapy or at least three weeks of weekly chemotherapy and were experiencing taste alterations.*
Tools: *Two tools were used for data collection:1**)** Chemotherapy Patient Self Reported Taste Alterations Interview Schedule and 2) Chemotherapy Patient Taste Alterations Self Care Strategies Check List.*
Results: *The results of the current study showed that there was a statistical significant improvement of studied chemotherapy patients taste alterations between pre and post implementation of self care strategies, as (p < 0.001).* ***Conclusion:*** *It was concluded that, applying the self care strategies had a statistical significant improvement on taste alterations among chemotherapy patients.*
Recommendations: *The developed booklet about self care strategies to improve taste alterations should be available and distributed to each cancer patient at chemotherapy unit and develop health teaching program to nurses working in chemotherapy unit.*
Keywords*: Cancer, Chemotherapy, Taste changes, Self care strategies.*

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I. Introduction

Chemotherapy agents cause a wide range of adverse effects. One such cluster of manifestations that has gained greater attention is taste alterations, which are described by severity, distress, and effects on usual activities [(1,2)]. Prevalence data on chemotherapy-related altered taste sensations range very broadly from 38% to 84% [(3)]. This adverse side effect is a major concern for the doctors and patients because disrupted taste can reduce appetite, cause malnutrition, delay recovery, and affect quality of life[(4).]

Research in this area has most often focused on chemotherapy induced nausea and vomiting, while taste and/or smell changes (TSCs) have received less attention in general, with only a few recent studies published. Hence, there is scant evidence underlying care provision for patients with taste and smell alterations TSCs[(2,5)].

Patients rarely address taste alterations, and health care providers often consider them a side effect that is unavoidable and often manage such taste changes using their own trial-and-error interventions, as well as with measures that seem logical or have some clinical support from nurses or physicians who suggest them.[(6)]

Taste and smell alterations (TSAs) have been recognized as a common problem for people with a variety of cancers receiving chemotherapy. Characteristics of TSAs may include increased or decreased sensitivity in one or more of the five basic taste qualities (sweet, sour, salt, bitter) or smell, as well as altered sensory experiences of specific tastes, foods, or odors.[(7-9)] These characteristics may vary both between individuals and for the same individual over time[(10)].

Furthermore, other eating related symptoms, e.g. nausea, oral problems, early satiety and loss of appetite have been found to be interrelated with TSAs[(11,12).] Several authors reported that TSAs alter food enjoyment, preferences and intake, thereby potentially contributing to involuntary weight loss and undernutrition[(12,13)]. Persons with cancer-related TSAs may also perceive them as causing negative emotions such as disappointment, frustration and sadness, interfering with social rituals around meal situations, and altering routines and roles within the family [(14)].

Causes for taste alterations (TAs) in chemotherapy patients in general often remain undetermined. Some authors suggest that the tumor itself contributes to the manifestation of TAs.[15,16] Other factors known to influence taste sensation are poor oral hygiene, gastrointestinal reflux, infections, as well as some medications, especially antibiotics[13].

TAs often start with the beginning of chemotherapy and persist from a few hours to weeks or even months .Various chemotherapeutic substances, such as folinic acid antagonists, cyclophosphamide, platines and taxanes, have been associated with TAs, predominantly with a metallic sensation. Suggested mechanisms include direct effects on the epithelial cells of the taste receptor, such as receptor cell destruction or interference with cellular turnover, as well as secondary effects, such as chemotherapy induced mucositis[3-6].

Self- care is defined as the practice of activities that individuals personally initiate and perform on their own behalf to maintain life, health and wellbeing [17]. Provision of information to patients is one of the most important factors of supportive cancer care across the whole cancer continuum. The goals of providing information are to prepare patients for their treatment, increase adherence to therapy, increase their abilities to cope with the illness and to promote recovery. Teaching patients about their adverse effects reduces fear, increases self-confidence, improves compliance and enhances their participation in self-care[18] .

The nurse has an important role in providing patients with most helpful strategies to deal with taste changes as increasing seasonings, fats and sauces, or eating blander foods, eating smaller, more frequent meals, cold foods, oral hygiene, avoiding beef. This teaching help patients to develop their own strategy for specific taste changes, which lead to improving their nutritional status and quality of life [19,20].

Finally, oncology nurses have a specific role in educating patients who will help them to anticipate taste alterations and follow-up should focus on self-care to cope with actual taste change perceptions [21].

Aim of the study:

The present study aimed to determine the effect of implementing self-care strategies on taste alterations among chemotherapy patients.

Research hypothesis

Chemotherapy patients who follow self care strategies will exhibit improvement of taste alterations than before implementing the self care strategies.

II. Materials And Method

Materials

Research design:

This study is a Pre/post- test one group quasi-experimental research design.

Setting:

This study was conducted at the Oncology Therapy Unit, Alexandria Main University Hospital. The Inpatient unit consists of 12 beds for patients' who receive chemotherapy. The out-patients clinic receives the patients from 8:00 am through 2:00 pm from Saturday to Thursday. About 20 to 25 cancer patients show up at that clinic daily.

Subjects

A convenience sample of 60 patients who had cancer received at least two cycles of chemotherapy or at least three weeks of weekly chemotherapy and experiencing taste changes. The Epi info program was used to estimate sample size using the following parameters:

a- population size= 550 /year
b- Expected frequency = 50%
c- Acceptable error= 10%
d- Confidence coefficient=95
e- Estimated sample size=60

The inclusion criteria of the samples were cancer patients on chemotherapy, male or female, between 20-60 years of age and able to communicate verbally and agreeing to participate in the study. Free from current stomatitis or oral infection. No history of head and neck cancer.

Tools:

Two tools were used to collect the necessary data.

Tool One: Chemotherapy Patient Self Reported Taste Alterations Interview Schedule:

This tool was developed by Wickham et al.,(1999)[22] and modified and translated into Arabic by the researcher after review of relevant literature[2-13]to assess taste alterations after chemotherapy as well as other factors that altered taste. It includes two parts:

Part one: Chemotherapy patient sociodemographic and clinical data including age, sex, marital status, occupation , education , diagnosis , type of chemotherapy , number of cycle, pharmacological therapy to improve taste, health teaching received to improve taste alterations, previous surgery and radiotherapy. In addition to other clinical disorders that affecting tastes alterations. It included 7 items related to difficulties in swallowing solid and liquid foods, dry mouth, loss of appetite, nausea, vomiting and sores in mouth

Part two: **Chemotherapy Patient Self Reported Taste Alterations**: This part included 11 items related to change in the sense of taste ,loss sense of taste, abnormal sensitivity to salt, sweet, sour, bitter, metallic, hot and cold foods and a persistent bad taste in the mouth and strange tastes.

This scale rated on 3 point Likert scale, from not at all change (1), little change (2) to lot change (3).

Scoring system:

The total scores of the scale ranged from 11 to 33 with higher total scores indicating severe taste alterations. The mean percentage total score were classified as follows: Less than 50% indicated mild taste alterations, 50%-less than 75 % indicated moderate taste alterations and more than 75% indicated severe taste alterations.

Tool Two: Chemotherapy Patient Taste Alterations Self Care Strategies Check List: This tool was developed by the researchers based on the recent relevant literature review[17-23] and translated into Arabic by the researcher. It was used to evaluate the self care measures that the patient used to manage the taste change. It included 20-items rated on 4 point Likert scale from did not try(1) to helped a lot(4).The items included adding more seasonings or using less seasoning, eating bland foods, avoiding spicy foods, sucking on hard candy, and so forth. Participants were asked to evaluate these suggestions (e.g. if they would recommend this strategy to other patients who experience taste changes. Two open-ended questions were addressed other foods the patients may have avoided and other things that helped them.

Scoring system

The total scores of tool two scale varied between "helped a lot" that was given a score of (4), while, "helped a little" was given a score of (3),"tried but did not help" was given the score of (2), and score(1) was given for "did not try **". The total score** ranged from 20 to 80 with higher total scores indicating more frequent use of self-care strategies. The mean percent total score were classified as follows: Less than 33% was considered low use of self-care strategies, 33%-less than 66 % was considered moderate use of self-care strategies and more than 66% was considered high use of self-care strategies.

III. Method:

-Written permissions to conduct the study will be obtained from the Ethical Committee at the Faculty of Nursing at Alexandria University.

-An official letter from the Faculty of Nursing was submitted to the general director of Alexandria Main University Hospital as well as to the Oncology Center at the Alexandria Main University Hospital for obtaining permissions to carry out the study after explanation of the study aim.

-Tools of the study were developed by the researchers after extensive review of relevant literature.

-Content validity of the study tools were ascertained by a jury of 5 experts in the fields of Medical Surgical Nursing and Oncology Medicine and necessary modifications were done accordingly.

-Tools were tested for reliability using Cronbach Alpha Coefficient Test. The reliability value for tool I = 0.84 and tool II =0.949.

-Pilot study was carried out on five patients who were excluded from the study sample to assess clarity and applicability of the tools.

-Data collection: Data were collected during a period of 6 months from November 2018 to April 2019. The study was carried out through four phases: assessment, planning, implementation and evaluation.

I- ***Assessment phase:*** During this phase, an exploratory visit was carried out to the Oncology Outpatients Clinic in order to estimate the rate of admissions and suitable time for data collection.
Various personal communications were done with staff nurses and physicians to explain the purpose of the study and gain their best possible cooperation. Patients who met the study criteria were included in the study after explaining the nature and purpose of the study and obtaining their consents.
Initial assessment was carried out for every patient in the study group individually at inpatient unit and out patient clinic before administration of chemotherapy to assess taste changes, other clinical disorders, and self care practices using tool I and II. This initial assessment took 30-45 minutes. This phase continued for 2 weeks.

II- Planning Phase:

Based on the results of assessment phase and the review of related literature, the self care strategies were developed, the objective of self care strategies was established to enhance self-care practices of taste improvement among patients receiving chemotherapy.

Various teaching methods were used in the form of group discussions and interactive lectures. Teaching aids and guides prepared and utilized.
The developed illustrated colored booklets were distributed to each patient in the implementation phase.

III- Implementation phase:

The developed self care strategies for study subjects was conducted and applied individually for each patient in the inpatient Oncology Department and Outpatient Clinic using interactive lecture with the illustrated colored booklet. The self care strategies were implemented in 2 successive sessions, one session per day for two consecutive days per week for six weeks. Each session lasted approximately 45-60 minutes. Firstly, discussion of the session objectives and content were dedicated. Then time was available for patients and their family to participate and interact. At the end of each session, a brief summary was given, emphasizing on the most important points. An illustrated booklet in Arabic was used as teaching learning aids during each session. The patients kept the booklet for remembering the instructions and being motivated for following it at home. Phone contacts were maintained between researcher and patients to ensure follow up visit in the outpatient clinic and program application answer quires.
The first session: This session consisted mainly of theoretical aspects of taste alteration, including the mechanism of taste perception, chemotherapy and change in taste, prevention and treatment.

The second session: This session provided information about self care practices that improve taste alterations including the use of more fats and sauces, eating smaller, more frequent meals, using more condiments, eating more bland foods, adding something sweet with meats, sucking on hard candy, eating more boiled foods, drinking more water with foods, avoiding foods with strong smells, eating more protein foods, using more or less salt, brushing teeth before eating, eating cold foods and increasing seasonings or spice use

IV- Evaluation phase:
Evaluation was done once for each group using the same tool I, II as pre and post-tests, after 3 months. Comparisons of pre and post results were carried out using appropriate statistical analysis in order to determine the effect of implementing self-care program on improvement of taste alterations among chemotherapy patients.

Ethical Considerations
Informed written consent of the patients was obtained after explanation of the aim of the study. Privacy and anonymity were maintained for all participants. Confidentiality of the collected data was assured. Participation in the research was voluntary right to withdraw from the study at any time was confirmed.

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0**. (**Armonk, NY: IBM Corp**)** Qualitative data were described using number and percent. Quantitative data were described using mean, standard deviations. Significance of the obtained results was judged at the 5% level. **The used tests were:**

- **McNemar and Marginal Homogeneity Test**

Used to analyze the significance between the different periods

- **Paired t-test**

For normally distributed quantitative variables, to compare between two periods

IV. Results

Table (1) shows frequency distribution of the studied patients according to their socio demographic and clinical data. The majority of the studied patients were females, more than 50 years old, not working and married. 41.7 % of studied patients were diagnosed with breast cancer and 80% of them were in the third cycle of chemotherapy treatment**. Half of studied patients (50%) received** Cyclophosphamide in single dose or combined with Doxorubicin, Carboplatin and Cisplain. All the studied patients were neither receiving any other medication nor health teaching to improve taste alteration throughout chemotherapy.

Table (2) illustrates the frequency distribution of the studied patients according to other clinical disorders that affecting taste alterations pre implementation of self care strategies. The results revealed that all the studied patients were complained dryness of mouth and lips, nausea, vomiting and loss of appetite, while 60%, 31.7%, 85% of the studied patients had difficulties in swallowing solids, difficulties in swallowing liquid and feeling of depression and frustration respectively.

Table (3) displays the frequency distribution of the studied patients according to self-reported taste alterations pre application of the self care strategies. The results showed that the majority of the patients (85%) had reported a lot of alterations in their taste in the form of persistent bad and strange taste was presented by 98.3% of patients and around half of them had loss senses of taste (51.7%). Also, the results revealed that two thirds (60%) of patients experienced a lot of change in the form of bitter taste and about half of them (48.3%) had metallic taste.

Table (4) demonstrates the frequency distribution of studied patients to manage taste alterations at pre and post 3 months from implementation of the self care strategies. This table revealed that pre implementation of self care strategies, the minority of the studied patients (38.3%.31.7%,30%) reported eating smaller, more frequent meals, eating more boiled foods and drinking more water with foods, respectively, while , after 3 months from implementation of self care strategies, the majority of the studied patients reported eating smaller, more frequent meals (68.3%), eating more bland foods (75%), drinking more water with foods (70%) to manage taste alteration two thirds of them (63.3%) reported avoid foods with strong smells, while half of them used more condiments, used more salt, brushed teeth before eating and ate cold foods.

Table (5) shows comparisons between pre and 3 months post implementation of self care strategies on taste alterations among the studied patients. The majority of the studied patients reported moderate taste alterations before implementation of self care strategies, while 3 months after implementation of the self care strategies the results revealed that 96.7% of patients reported that their taste alterations were mild. Also, this table showed that high statistical significant differences were found between pre and post three months from implementation of self care strategies as ($p < 0.001$).

Table (6) depicts comparisons between pre and 3 months post implementation of self care strategies regarding degree of using self care strategies among the studied patients. It was found that all (100%) of studied group reported low use of self care strategy pre program while, the majority of them (80%) reported high use of self care strategies post implementation of self care strategies with a high statistical significant differences between pre and post three months after implementation of the self care strategies as ($p < 0.001$).

Table (7) Frequency distribution of the studied patients according to the more helpful self care strategies used to manage taste alterations after implementation of self care strategies. It was found that teeth brushing before eating and eating small frequent meals were reported to be more helpful self care strategies used by the patients to manage nausea, vomiting, anorexia and dryness of mouth after health teaching. Regarding metallic taste it was noticed that avoiding meat and using bland food (pasta- yogurt) were used by more than two thirds of the patients (75%,65%) respectively. It was observed that adding seasoning of food, marinate meat & chicken, brushing teeth before eating were used by more than two thirds of patients (70%, 66.7%, 80%) respectively. As for salty taste, the results showed that decrease salty foods & bush teeth before eating were used by (75%, 80%) respectively. As for bitter taste, it was found that adding fruits and sweets with meal. Sucking on hard candy and brushing teeth before eating were used by the majority of patients (66.7%, 70%, 80%) respectively.

V. Discussion

Effective self-care behaviors can assist patients in minimizing the side effects of chemotherapy, decreasing symptom distress, and improving quality of life. So, the present study aimed to determine the effect of implementing self care strategies on taste improvement among chemotherapy patients.

The findings of the present study revealed that the majority of cancer patients undergoing chemotherapy reported changes in their taste and loss sense of taste. These results are consistent with the studies done by Bernhardson et al (2008) and Amézaga et al (2018) who revealed that 77% of patients undergoing chemotherapy reported taste changes[2,24]. Those taste changes may be due to cancer itself and chemotherapy intervention. Several studies supported the results and showed that the causes of taste and smell alterations in cancer patients undergoing chemotherapy is a result of combination of various factors. These include the disappearance of taste buds; dysfunction of the salivary glands, leading to the inability of taste substances to penetrate the taste pores, as well as direct damage to the taste receptors and/or to the nervous system, which transmits signals to the gustatory area in the brain[14-17].

The present study findings revealed that the most frequently used chemotherapeutic drugs given were Cyclophosphamide, Carboplatin, Doxorubicin, and Cisplatin. These drugs were mostly given in single dose or in a combined form. This result is in line with a study done by Mukherjee and Delay (2011) who found that Cyclophosphamide disrupted taste acuity and taste thresholds [25]. Also, several studies revealed that Carboplatin and doxorubicin and cyclophosphamides were the chemotherapy presenting highest rates of chemosensory complaints. Cisplatin and 5-fluorouracil however, were the chemotherapy producing lowest frequencies of alterations. It has been reported that there was a statistical significant association between CT and some chemosensory alteration such as taste loss [3,4,5].

The current study results demonstrated that bitter and metallic taste were the most common taste alteration reported by the majority of the breast cancer patients after the third cycles of chemotherapy treated with cyclophosphamide. This comes in agreement with a study done by Ijpma (2015) who showed that 78% of breast cancer patients described their perceived taste change as bitter and metallic after at least two cycles of chemotherapy with cyclophosphamide, doxorubicin and cisplatin [26].This metallic taste may probably originate from the taste of chemotherapeutic agents, implying a direct influence on taste in the mouth. Many drugs are secreted in saliva and gain direct contact with taste-receptors. Also, several chemotherapeutic agents, such as cisplatin and carboplatin, contain the metal compound platinum and patients may taste this platinum compound during chemotherapy treatment.

Regarding the self-care practice to improve metallic taste, the present study findings revealed that the most helpful self care practices used by the majority of the studied patients who experienced metallic taste is oral hygiene before eating and avoids eating of red meat. This might be due to the iron containing compounds in red meat [27]. This could explain the commonly used management strategy of using plastic utensils instead of metallic silverware during eating by patients. In addition, for bitter taste, the most helpful self care practice used by the majority of patients were adding fruits and sweets with meal and sucking on hard candy. This result is in line with Thorne et al (2015) who found that self care intervention used by patients bothered by bitter taste are adding more/using less seasoning, adding fruits and sweets with meal, eating bland foods, avoiding spicy foods and sucking on hard candy[28].

Concerning other clinical disorders associated with taste changes, the results showed that all the studied patients were complaining of nausea, vomiting dryness of mouth, lips and loss of appetite. This results is in consistent with Coa et al (2015) and Antony (2017) who found that nausea, vomiting, decreased appetite, and dry mouth were common among studied cancer patients undergoing outpatient treatment[29,30]. This study also provides insight into subgroups of patients who may be more prone to experiencing dietary changes during treatment. Moreover, a study conducted by Zabernigg et al.(2010) on taste alterations in cancer patients receiving chemotherapy reported that taste alterations (TAs) were significantly associated with appetite loss, fatigue, nausea/vomiting[4].

Regarding self care practices to improve nausea and vomiting, the results showed that the most helpful self care practices performed to manage nausea and vomiting by the majority of the studied patient were eating small frequent meal, oral hygiene and avoiding strong smell diet. These were in agreement with *Cancer Council*, who reported that the most frequently performed and helped self-care strategies to alleviate nausea and vomiting were eating easy digested food, avoiding spicy food and having small frequent meals[31]. Also *Thompson et. al* pointed that, the majority of patients indicated that receiving nutritional education while going through treatment was very important in helping them to cope with nutritional side effects of chemotherapy & having a balanced diet [32]

The current study results demonstrated that pre implementation of self care strategies, all the studied patients reported low use of self care strategies to improve their taste alterations. These results may be attributed to the fact that all the studied patients neither received any health education regarding taste alterations during chemotherapy neither self care practices pre, during and after chemotherapy and follow up from the heath care provides. These results were in agreement with the study done by Moursy and Ead (2014) who found that self-care practices performed by studied patients were insufficient to provide complete relief of the side effects due to inadequate information about chemotherapy and how to manage [21].

However, after 3 months from implementation of the self care strategies, the majority of the studied patients used high self care strategies and consequently, the self reported taste alteration was mild. This

indicated that implementation of self care strategies had a significant improvement on taste alteration noted among the studied patients. These results were in agreement with Ismail (2019) who found that implementation of self care program for patients with Rheumatoid Arthritis, proved to be effective in improving patients' knowledge and self care health practices [(33)]. Also, a study done by Maikeow (2012) and El-Nemer (2015) who concluded that the applied self-care educational program improved to great extent the knowledge and practice of mastectomy women regarding side effects of chemotherapy and how to alleviate them [(34,35)].

Teaching self-care practices helped the patient to manage many of their side effects, gain self-confidence and improve their physical and psychological well-being. In addition, supportive telephone calls and teaching materials that kept with patients at home and referred to when needed, can be very helpful in reinforcing information. Those results are in line with Williams (2004) who found that his experimental group reported symptom improvements regarding taste changes, nausea and vomiting that increased the use of recommended self-care behaviors, whereas the control group continued to use the same self-care behaviors without effectiveness [(36)].

VI. Conclusion

Based on findings of the present study, it can be concluded that chemotherapy patients who follow self care strategies had a significant improvement of taste alterations than before implementing the self care strategies.

VII. Recommendations

1. The developed booklet about self care strategies to improve taste alterations should be available and distributed to each cancer patient at chemotherapy unit.
2. Nurses at the chemotherapy outpatient clinics must be qualified to provide patients and family members with information regarding chemotherapy, its purpose, side effects and how to manage those side effects.
3. Pre and in-service training programs need to be developed for nurses working with patients receiving chemotherapy about self care strategies to manage side effects of chemotherapy.
4. Patients and family members are required to attend health education and counseling program about chemotherapy related taste alterations and how to deal and cope with those side effects.

Table (1): Frequency distribution of the studied patients according to their socio demographic and clinical data (n = 60)

	Sociodemographic and clinical data	No.	%
1	**Age (years)**		
	<30	2	3.3
	30 – 39	11	18.3
	40 – 49	16	26.7
	50+	31	51.7
	Mean ± SD.	49.30±11.35	
2	**Sex**		
	Male	23	38.3
	Female	37	61.7
3	**Education**		
	Illiterate, read and write	13	21.7
	Primary school	12	20.0
	Secondary school	19	31.7
	Post-secondary school	13	21.7
	University	3	5.0
4	**Occupation**		
	Not working	32	53.3
	Working	28	46.7
5	**Marital status**		
	Single	4	6.7
	Married	43	71.7
	Widow	8	13.3
	Divorced	5	8.3
6	**Religious**		
	Moslem	55	91.7
	Christian	5	8.3
7	**Diagnosis:**		
	Breast	25	41.7
	Lung	9	15.0
	Colon	10	16.7
	Stomach	1	1.7
	Other	15	25.0
10	**Body Mass Index (kg/m^2)**		

	Normal (18.5 – 24.9)	20	33.3
	Overweight (25 – 29.9)	30	50.0
	Obese (≥30)	10	16.7
	Mean ± SD.	27.06±5.47	
11	**Surgical treatment**	44	73.3
12	**Type of chemotherapy**		
	Doxorubicin	21	35.0
	Carboplatin	22	36.7
	Cisplain	16	26.7
	Cyclophosphamide	30	50.0
	Other	7	11.7
	Cycle No.		
	3rd	48	80.0
	4th	9	15.0
	5th	3	5.0
13	**Previous Radiotherapy**	11	18.3
14	**Pharmacological therapy for taste improvement**	0	0.0
15	**Health teaching received**	0	0.0

Table (2): Frequency distribution of the studied patients according to other clinical disorders that affecting tastes alterations pre implementation of self care strategies.(n = 60)

Other Clinical disorders that affecting tastes alterations	Yes		No	
	No.	%	No.	%
Difficulties in swallowing solids	36	60.0	24	40.0
Difficulties in swallowing liquids	19	31.7	41	68.3
Sores in mouth	60	100.0	0	0
Dryness of mouth and lips	60	100.0	0	0
Affected ability to eat	57	95.0	3	5
Loss of appetite	60	100.0	0	0
Nausea	60	100.0	0	0
Vomiting	60	100.0	0	0
Feeling of depression and frustration	51	85.0	9	15

Table (3): Frequency distribution of the studied patients according to self-reported taste alterations pre implementation of the self care strategies (n = 60)

Self–reported Taste Alterations	Not at all alterations		Little alterations		A Lot alterations	
	No.	%	No.	%	No.	%
Change in my taste	9	15.0	0	0.0	51	85.0
Loss sense of taste	15	25.0	14	23.3	31	51.7
Abnormal sensitivity to salt	38	63.3	14	23.3	8	13.3
Abnormal sensitivity to sweet	35	58.3	21	35.0	4	6.7
Abnormal sensitivity to sour	15	25.0	24	40.0	21	35.0
Abnormal sensitivity to bitter	11	18.3	13	21.7	36	60.0
Abnormal sensitivity to metallic	18	30.0	13	21.7	29	48.3
Abnormal sensitivity to hot	1	1.7	39	65.0	20	33.3
Abnormal sensitivity to cold	44	73.3	15	25.0	1	1.7
a persistent bad taste in my mouth	0	0.0	1	1.7	59	98.3
Feel strange tastes	0	0.0	1	1.7	59	98.3

MH: Marginal Homogeneity Test **McN: McNemar test**

p: p value for comparing between **pre** and **post**

*: Statistically significant at $p \leq 0.05$

Table (4): Frequency distribution of studied patients to manage taste alterations at pre and post 3 months from implementation of the self care strategies (n = 60)

Patient self care strategies uses to manage taste alterations	Pre implementation		Post implementation		^{McN}p
	No.	%	No.	%	
Use more fats and sauces	0	0.0	24	40.0	<0.001*
Eat smaller, more frequent meals	23	38.3	41	68.3	<0.001*
Use more condiments	1	1.7	30	50.0	<0.001*
Eat more bland foods/ fluid with foods	27	45.0	45	75.0	<0.001*
Add something sweet with meats	0	0.0	24	40.0	<0.001*
Sucking on hard candy	8	13.3	33	55.0	<0.001*
Eat more boiled foods	19	31.7	34	56.7	<0.001*
Drink more water with foods	18	30.0	42	70.0	<0.001*

Avoid foods with strong smells	16	26.7	38	63.3	<0.001*
Eat more proteins	5	8.3	26	43.3	<0.001*
Use more salt	4	6.7	30	50.0	<0.001*
Brush teeth before eating	0	0.0	30	50.0	<0.001*
Eat cold foods	3	5.0	30	50.0	<0.001*
Increase seasonings or hot spices	0	0.0	18	30.0	<0.001*

McN: McNemar test
p: p value for comparing between **pre** and **post**
*: Statistically significant at $p \leq 0.05$

Table (5): Comparisons between pre and 3 months post implementation of self care strategies on taste alterations among the studied patients. (n = 60)

Self –reported Taste alterations	Pre Implementation of self care strategies		Post 3 months Implementation of self care strategies		Test of significant
	No.	%	No.	%	
-Mild taste alterations	7	11.7	58	96.7	^{MH}p <0.001*
-Moderate taste alterations	45	75.0	2	3.3	
-Severe taste alterations	8	13.3	0	0.0	
Total score Min. – Max. SD.±Mean	30.0–20.0 2.70±24.22		14.0 – 22.0 17.75 ± 2.21		^{t}p <0.001*
% score Min. – Max. SD.±Mean	86.36–40.91 12.27±60.08		13.64 – 50.0 30.68 ± 10.03		

t: Paired t-test **MH: Marginal Homogeneity Test**
p: p value for comparing between **pre** and **post**
*: Statistically significant at $p \leq 0.05$

Table (6): Comparisons between pre and 3 months post implementation of self care strategies regarding degree of using self care strategies among the studied patients. (n = 60)

Degree of using self-care strategies	Pre Implementation of self care strategies		3 months Post Implementation of self care strategies		Test of significant
	No.	%	No.	%	
- Low use of self care strategies	60	100.0	0	0.0	^{MH}p<0.001*
- Moderate use of self care strategies	0	0.0	12	20.0	
- High use of self care strategies	0	0.0	48	80.0	
Total score Min. – Max. SD.±Mean	36.0–20.0 4.83±26.87		73.0–51.0 5.31±64.20		^{t}p <0.001*
% score Min. – Max. SD.±Mean	26.67–0.0 8.05±11.44		88.33–51.67 8.85±73.67		

t: Paired t-test **MH: Marginal Homogeneity Test**
p: p value for comparing between **pre** and **post**
*: Statistically significant at $p \leq 0.05$

Table (7): Frequency distribution of the studied patients according to the more helpful self care strategies used to manage taste alterations after implementation of self care strategies. (n = 60)

Taste alterations	More helpful self care strategies	No	%
Metallic taste	Avoid meat	45	75.0
	& Bland food (pasta-yogurt)	39	65.0
	Bruch teeth before eating	48	80.0
No taste	Add seasoning	42	70.0
	&Marinate meat & chicken	40	66.7
	Bruch teeth before eating	48	80.0
Bitter	Add fruits and sweets with meal	40	66.7

	Sucking on hard candy	42	70.0
	Bruch teeth before eating	48	80.0
Salty	Decrease salty foods	45	75.0
	Bruch teeth before eating	48	80.0
Nausea	Small frequent meal	60	100.0
	&Avoid strong smell diet	48	80.0
	Bruch teeth before eating	48	80.0
Vomiting	Bland foods	12	20.0
	Small frequent meal	60	100.0
	Bruch teeth before eating	48	80.0
Anorexia	Add more proteins	9	15.0
	Cold foods	9	15.0
	Increase fruits intake	39	65.0
	Small frequent meal	60	100.0
	Bruch teeth before eating	48	80.0
Dryness of mouth and lips	Increase Fluid & water intake	45	75.0
	Bruch teeth before eating	48	80.0

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