

Effect of Topical Application of Honey in Management of Radiation Induced Stomatitis

By

¹ Fatma Abd- El Latif Gano, ² Amany Mohammed Shebl, ³Wafaa Ismail Sherief, ⁴ Amira Ahmed Hssanein, ⁵ Inas Ibrahim Abdel Halim

1, 2,3,4 Medical- Surgical Nursing, Faculty of Nursing, Mansoura University

5 Oncology & Nuclear Medicine, Faculty of Medicine, Mansoura University,

Email: fatmagano@yahoo.com

Abstract:

Background: Radiation- induced stomatitis is an early effect of head and neck radiotherapy. Stomatitis can lead to secondary infection, ulceration, and pain leading to malnutrition. Severe stomatitis can result in hospitalization and delay in scheduling treatment, compromising therapeutic efficacy. The literature indicates that honey appears to promote healing, so the researcher investigated whether its anti-inflammatory properties might limit the severity of radiation-induced oral stomatitis. **The aim of this study** is to assess the effect of topical honey application on the management of radiotherapy induced stomatitis. **Materials and Methods:** A quasi experimental research design was utilized and the study was conducted at Mansoura University Hospital, Clinical Oncology and Nuclear Medicine Unit and its In- patients and Out- patients Clinics. 60 patients with head and neck cancer requiring radiation therapy for the first time were assigned to two groups. Thirty patients assigned to the study group received honey, while both the study and control groups received standard head and neck radiation therapy based on a standard protocol. In the study group patients were instructed to take 20 ml of honey 15 minutes before radiation therapy, then again at intervals of 15 minutes and six hours after radiation. In the control group patients were instructed to follow the hospital protocol that was used for prophylaxis of stomatitis. Patients were evaluated weekly for progression of stomatitis using the World Health Organization Oral Toxicity Scale. Data were analyzed using the independent t-test, Mann-Whitney, and Friedman tests. **Results:** The results of the present study revealed that There was statistically significant difference ($p < 0.001$) in oral toxicity scale scores between the study and control groups over the period of five weeks treatment. Regarding the Weight there was an increase in 20% of the study group and only in 3.3% of the control group, this Wt. gain was statistically significant ($p < 0.05$). **Conclusion:** Within the limits of this study the results showed the topical application of natural honey is effective in managing radiation induced stomatitis.

Key word: Radiation- induced stomatitis, Cancer, Radiotherapy, Stomatitis, Honey, World Health Organization Oral Toxicity Scale.

Introduction:

Cancer is a major public health problem in the United States and other developed countries. Currently, one in four deaths in the United States is due to cancer.

Internationally each year, over 12 million people receive cancer diagnosis and 7.6 million die of the disease⁽¹⁾. A total of 1,479,350 new cancer cases (does not include non-melanoma skin cancers) and

562,340 deaths for cancers were projected to occur in the United States in 2009⁽²⁾. Cancer deaths will continue to rise with an estimated 9 million people dying from cancer in 2015 and 11.4 million dying in 2030. In Egypt the number of cancer patients per year is estimated to be 65,000^(3,4). At Mansoura University Hospital, Clinical Oncology and Nuclear Medicine Unit the number of cancer patients who attended the oncology out-patient clinic in 2012 were about 7488 patients. Statistics revealed that 6.4% of these patients suffered from had head& neck cancer⁽⁵⁾.

Chemotherapy and radiotherapy remains the mainstay of treatment for patients with advanced malignant disease that is incurable by local surgery. However, effective use of these therapies is limited by toxic effects. Serious side effects in the upper Gastro-Intestinal system include mucositis, stomatitis, xerostomia, nausea and vomiting^(6,7,8).

Associated symptoms arising during Radiotherapy for head and neck cancer (HNC) include "mouth and throat sores" stomatitis, difficulty swallowing, pain, lost or altered taste (dysgeusia), excessive secretions that may lead to gagging, nausea, and vomiting, loss of appetite, fatigue, weight loss, and aspiration^(8,9). Radiation- induced stomatitis is considered one of the most troublesome acute reactions for the patient being treated for

head and neck cancers, as well as other oral cancers^(9, 10, 11). Stomatitis is perhaps one of the most debilitating and painful side effects of cancer therapy. Approximately 80% of all patients receiving radiation for head and neck tumors endure stomatitis. Seventy- five percent of those with stomatitis complain of acute oral pain. The pain is sometimes so severe that patients receive narcotics to relieve it or they prematurely withdraw from their cancer therapy^(12,13).

The stomatitis process ranges from redness to severe ulceration. It is assumed to be a five phase biologic process which involves: an initiation phase, an inflammatory phase, an epithelial phase, an ulcerative phase, and a healing phase^(14,15).

Nurses are the primary advocates for patients, and play a central role in preventing and managing stomatitis and reducing its burden on patients⁽¹⁶⁾. Nursing care based on knowledge and research form a crucial part of their activities. Oncology nurses play a critical role in the prevention and treatment of stomatitis prior to any anti-neoplastic therapy. In the treatment of stomatitis nutritional safety measure is to be enforced such as avoid acidic, spicy, salty and dry foods. The key to successful treatment of stomatitis is early detection⁽¹⁷⁾.

Honey has been used as a medicament since ancient times. Honey has been used for millennia in the treatment of wounds^(18, 19). Large volume of literature

appearing on the effectiveness of honey in treating the infected wounds and skin ulcers describes the features that indicate that honey has potential for the therapy of periodontal disease, oral ulcers, and other problems of oral health. One of the most important features that may be particularly beneficial in promotion of oral wellness is its antibacterial activity^(20, 21).

Natural honey has been reported to reduce radiation-induced oral stomatitis and multi-center, randomized trials are warranted to validate this finding⁽²¹⁾. In addition to prevention of severe stomatitis, it was observed a positive gain in the body weight. Honey being a natural agent available worldwide may found to be a useful and cost effective treatment in radiation stomatitis⁽²²⁾.

Honey is a by-product of flower nectar and the upper aero-digestive tract of the honeybee, which is concentrated through a dehydration process inside the bee hive. Though honey is an age-old remedy from the time of Egyptian civilization, very recently it has found a place in modern medicine (18). Because of its high viscosity, acidic PH, hydrogen peroxide, high osmolarity, and rich nutritional properties honey can inhibit bacterial growth and enhance healing⁽²³⁾. Also, honey has been used to manage burns, oral infections, surgical wounds, and pressure wounds^(24, 25).

Biswall (2003) used topical honey to manage radiation stomatitis successfully for the first time⁽²¹⁾.

Based on these recent studies it was believed worthwhile to test objectively the effect of honey topical oral application on the management of radiation induced stomatitis. If the present study proves improvement in the oral assessment score for patients, honey would have the advantage of being easily available, highly nutritive, culturally believed in, less costly and free from side effects. Therefore the present study aims at assessing the effect of topical oral honey on the management of radiation induced stomatitis.

Research Hypothesis:

Patients with radiation induced stomatitis who apply oral honey will:

- a- Have improvement in oral assessment score than those who received medical treatment.
- b- Increase their nutritional intake with improved ability to eat.

Subject and Methods

Study design: A quasi experimental research design was utilized in the study to assess the effect of topical honey application on the management of radiotherapy induced stomatitis.

Setting: The study was conducted at Mansoura University

Hospital, Clinical Oncology and Nuclear Medicine Unit and its In-patients and Out- patients Clinics.

Subjects: 60 patients with head and neck cancer requiring radiation therapy for the first time were assigned to two groups. Thirty patients assigned to the study group received honey, while both the study and control groups received standard head and neck radiation therapy based on a standard protocol.

Inclusion criteria:

Adults (18 - 60 years) male & female.

Have head and neck cancer.

Receive radiotherapy for the first time.

* Exclusion criteria:

Diabetic patients, Patients on steroid therapy or oxygen therapy, mouth breathing, and their WBCs count less than 2000/mm³.

Protection of Human Rights

Permission to conduct the proposed study was obtained from director of Clinical Oncology and Nuclear Medicine Unit in Mansoura University Hospital. In addition during the phase of data collection, each patient was informed about the aim of the study and a written informed consent was taken before participation in the study. The researcher emphasized that the participation in the study was entirely voluntary and the

withdrawal from it won't affect their treatment.

Tools: Two tools were used by the researcher based on review of the related literature and used to collect necessary data about the study subjects.

Tool I: Sociodemographic data and medical information sheet

It includes; name, age, gender, marital status, educational level, employment status, working condition, residence, phone number, type of cancer, onset of treatment by radiotherapy, duration of treatment by radiotherapy, patient's body weight, and the past experience in the patient's family of knowing and using honey as treatment for oral conditions.

Tool II: The World Health Organization (WHO) Oral Toxicity Scale

This scale was used to measure anatomical, symptomatic, and functional components of oral mucositis. The severity of the condition is graded from 0 (no oral mucositis) to 4 (alimentation not possible and the patient needs total parental) ⁽²⁶⁾.

Methods:

* Permission to conduct the study was obtained from the hospital administrative authority. Tools were tested for their reliability and validity. The tools were reviewed by a jury composed of five experts in the field of

medical- surgical nursing for revision of its content validity and clarity. A pilot study was carried out 10% of the sample who were excluded from the study. The sample was collected during about 8 months started from the beginning of December 2012 to the end of July 2013.

The studied sample were divided into two groups first group (study group) and the second group (control group), each group consists of 30 head and neck cancer patients who receives radiotherapy for the first time.

The researcher interviewed the studied sample to fill Sociodemographic data sheet and essential oral assessment in prior to the first radiotherapy session, Then the researcher started to teach the patients in both groups how they can make salty water solution and how to use it in oral cleansing at home by applying 1/2 teaspoon of salt to 200 ml of warm water ⁽²⁷⁾ and to use this solution to clean their mouths with soft tooth brush ⁽²⁸⁾, meswak, or cotton flannel as they can tolerate then to rinse their mouth with the same solution, this procedure to be repeated when waking up at morning, after each meal, and at bed time, this was explained before their first radiotherapy session, the importance of

continuous oral care was explained to every patient in that session which took from 20 to 30 minutes.

The researcher assessed all patients at the 5th day of radiotherapy sessions weekly for 5 weeks until the end of radiotherapy treatment. The oral toxicity scale was filled to identify the changes in oral condition to compare the finding of the study. This was done for both groups the study and control group.

Patients in the study group were instructed to take 20 ml of pure natural honey 15 minutes before & 15 minutes after the radiotherapy session then another 20 ml after 6 hours of radiotherapy session and they were asked to keep it in their mouth for 5 minutes or as long as they can tolerate then swallow it.

On the other hand the control group was instructed to follow the hospital protocol for the prophylaxis management of stomatitis which is to take (Diflucan) with the beginning of radiotherapy sessions, and when stomatitis appears to apply miconaz - oral gel 1/2 teaspoonful four times daily for at least one week after the symptoms have disappeared and 10 drops of mycostatin locally on oral mucous

membrane and swishes it in mouth for 5 minutes then swallow it 3 times/ day for at least 10 days.

Results:

Table (1): Illustrates the Sociodemographic Characters of Study Subjects.

The table reveals that, the highest percentage of the study and control groups (80%, 76.7%) respectively were males.

Regarding patients' age, it was observed that in the study group less than half (43.3%) of patients were between 50 to 60 years whereas in the control group it was about one third (36.7%) of patients belonged to the ages of 30 to 39 years and the same proportion for patients between 50 to 60 years. Only about one quarter (26.7%) of patients in the study group was between 30 to 39 years.

Almost one third (30.0%) of patients in the study group were between 40 to 49 years and only about one quarter (26.7%) of the control group was belonged to the same age. Either the study or control groups contain patients between the ages of 20 to 29 years.

Mean age was higher in study group (46.667 ± 8.199) years.

However the difference was not statistically significant ($t=1.306$, $p>0.202$).

As for marital status, the majority of both study and control group (80%) were married.

In relation to educational level, about one quarter (26.7%) of both study and control groups were illiterate. About (13.3%, 10%) of study and control groups respectively were university educated.

Half and almost half (50%, 46.7%) of study and control groups respectively were working.

Concerning level of activity, more than half (56.7%, 66.7%) of study and control groups respectively had moderate activity level.

The results also revealed that the majority (80%) of both study and control groups lived in rural areas.

Table (2): Shows Information about the Patient's Diagnosis & Line of Treatment.

Regarding diagnosis, about one quarter (26.7%) of patients in the study and control groups suffered from Nasopharyngeal non-hodgkin lymphoma.

As for Cancer thyroid 23.3% of patients in the study group suffered from this diagnosis, but just 13.3% of patients in the control group had the same diagnosis.

In relation to Nasopharyngeal carcinoma, almost one quarter (23.3%) of patients in the control group suffered from this cancer and only 6.7% of patients in the study group had the same diagnosis.

However, the difference was not statistically significant ($\chi^2=7.296$, $p>0.505$).

The table also revealed that, almost one third (33.3%) of the study group and more than half (53.3%) of the control group had their radiation sessions on whole neck.

26.7% and 13.3% of study and control groups respectively had the sessions on thyroid bed and its drainage lymph nodes.

However, the difference was not statistically significant ($\chi^2=3.029$, $p>0.553$).

Regarding number of treatment sessions, the study and control groups were equally matched.

Table (1): Shows frequency distribution of Sociodemographic Characteristics of Studied Groups.

Items		Study (n=30)		Control (n=30)		χ^2	p-value
		No.	%	No.	%		
Gender	male	24	80.0	23	76.7	0.098	0.754
	female	6	20.0	7	23.3		
Age	20-	0	0	0	0	t = 1.306	0.202
	30-	8	26.7	11	36.7		
	40-	9	30.0	8	26.7		
	50-60	13	43.3	11	36.7		
	Mean (SD)	46.667 (8.199)		45.0 (8.563)			
Marital status	Single	1	3.3	0	0	1.333	0.721
	Married	24	80.0	24	80.0		
	Widow	4	13.3	4	13.3		
	Divorced	1	3.3	2	6.7		
Educational level	Illiterate	8	26.7	8	26.7	0.820	0.845
	Read and write	10	33.3	13	43.3		
	Secondary	8	26.7	6	20.0		
	University	4	13.3	3	10.0		
Employment status	Work	15	50.0	14	46.7	0.820	0.960
	Not work	10	33.3	11	36.7		
	Housewife	5	16.7	5	16.7		
Level of activity	Low	12	40.0	10	33.3	1.425	0.490
	Moderate	17	56.7	20	66.7		
	Hard	1	3.3	0	0		
Residence	Rural	24	80.0	24	80.0	0.000	1.000
	Urban	6	20.0	6	20.0		

Table (2): Medical Information Regarding Type of Cancer and Course of Treatment.

Items		Study (n=30)		Control (n=30)		χ^2	p-value
		No.	%	No.	%		
Diagnosis	Ca. tongue	3	10.0	2	6.7	7.296	0.505
	Nasopharyngeal NHL	8	26.7	8	26.7		
	Ca. thyroid	7	23.3	4	13.3		
	Nasopharyngeal carcinoma	2	6.7	7	23.3		
	Ca. salivary gland	2	6.7	2	6.7		
	Laryngeal carcinoma	5	16.7	3	10.0		
	Vocal cord Sc.	2	6.7	2	6.7		
	Re. papillary thyroid ca	1	3.3	0	0		
	Ca. tongue Sc.	0	0	2	6.7		
Radiation Site	Oral cavity	3	10.0	2	6.7	3.029	0.553
	Nasopharynx	4	13.3	4	13.3		
	Thyroid bed+ drainage LN	8	26.7	4	13.3		
	Whole neck	10	33.3	16	53.3		
	Laryngeal box	5	16.7	4	13.3		
No. of treatment Sessions	10-20	0	0	0	0	-	-
	21-25	30	100.0	30	100.0		

Table (3): Shows mean score and standard deviation of patients in the studied groups according to the oral assessment by WHO oral toxicity scale.

There was statistically significant difference ($p < 0.001$) in oral toxicity scale between the study and control groups over the five weeks of treatment.

Table (3): Mean score and standard deviation of patients in the studied groups according to the oral assessment by WHO oral toxicity scale.

Items	Study (n= 30)		Control (n= 30)		t	p- value
	Mean	SD	Mean	SD		
Toxicity scale (prior)	0.00	0.000	0.00	0.000	-	-
Toxicity scale (after 1 st week)	0.00	0.000	0.43	0.504	4.709	*0.001
Toxicity scale (after 2 nd week)	0.57	0.504	1.10	0.403	4.529	*0.001
Toxicity scale (after 3 rd week)	1.00	0.000	1.47	0.571	4.474	*0.001
Toxicity scale (after 4 th week)	1.13	0.346	2.00	0.643	6.500	*0.001
Toxicity scale (after 5 th week)	1.47	0.730	2.90	0.607	8.265	*0.001

* p<0.05 (significant)

Table (4): Illustrates the effect size of using honey in the study group after the radiotherapy treatment according to the oral assessment by WHO oral toxicity scale.

A high effect size of using honey for treatment in the study group over the period of the fifth week of treatment was observed

Table (4): The effect size values of using honey in the study group after the radiotherapy treatment according to the oral assessment by WHO oral toxicity scale.

Items	η^2	Effect size
Toxicity scale (after 1 st week)	0.28	High
Toxicity scale (after 2 nd week)	0.26	High
Toxicity scale (after 3 rd week)	0.26	High
Toxicity scale (after 4 th week)	0.42	High
Toxicity scale (after 5 th week)	0.54	High

1- IF $\eta^2 > (15\%)$ then Effect size is High.

2- IF $(6\%) < \eta^2 < (15\%)$ then Effect size is Medium.

3- IF $\eta^2 < (6\%)$ then Effect size is Low.

4- IF $\eta^2 = (0\%)$ then No Effect size

Table (5): Illustrate the changes of Weight in the studied groups.

The Wt. was increased in 20% of the study group and only in 3.3% of the control group, this Wt. gain was statistically significant ($\chi^2=7.820, p<0.05$).

The decreased Wt. in the majority of control group (76.7%) was

statistically significant compared to the decreased Wt. in almost half of the study group (43.3%).

There was no change in about one third (36.7%) of the study group and in less than one quarter (20%) of the control group, that was statistically significant ($\chi^2=7.820, p<0.05$).

Table (5): The changes of Weight in the studied groups

Items	Study (n= 30)		Control (n= 30)		χ^2	p. value	
	No.	%	No.	%			
Body Weight	No change	11	36.7	6	20.0	7.820	*0.05
	Increased	6	20.0	1	3.3		
	Decreased	13	43.3	23	76.7		

* p<0.05 (significant)

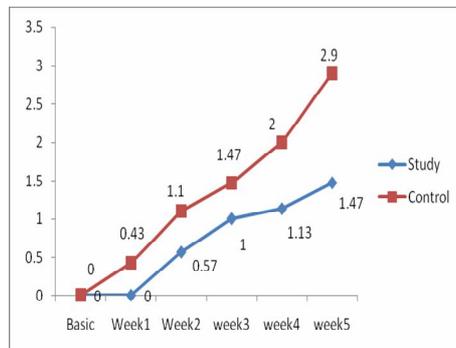


Figure (1): Teh changes in oral toxicity scale of patients over time in the studied groups. Oral Toxicity Scale Mean

When the gap between the two groups of treatment increased, it indicates the better effect of honey as compared to medications in the management of radiotherapy induced stomatitis.

The use of honey on the study group delayed the occurrence of radiotherapy induced stomatitis to the 2nd week.

That indicates the positive effect which honey causes.

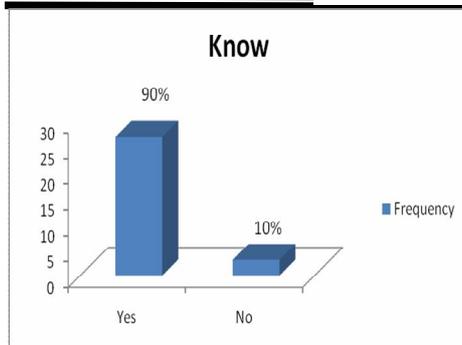


Figure (2): Frequency of patients in the study group who knows that honey can be used for oral dysfunction.

The highest percentage (90%) of the study group already knew that honey can be used for oral problems.

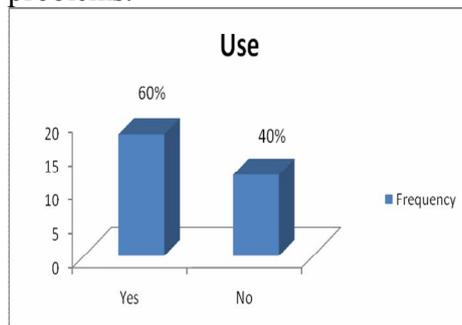


Figure (3): Frequency of patients in the study group who use honey before as a management of oral dysfunction

More than half (60%) of the study group have had past experiences of using honey as a treatment for oral problems before.

Discussion:

The present study revealed that the majority of patients who suffered from head and neck cancer were males. This was congruent with ^(18, 29) who reported that the incidence of this type of cancer is nearly twice as common among men as it is among women. At least 75 percent of head and neck cancers are caused by tobacco and alcohol use which is common in men in our country ⁽³⁰⁾.

In the present study, as regards to age, the results of the study show that the majority of patient's age (43.3%, 36.7%) of study and control group respectively ranged from 50 to 60 years old. This was congruent with **American Cancer Society (2010)** which reported that the risk of being diagnosed with head & neck cancer increases as individuals aged, most cases occur in adults who are middle-aged or older. About seventy seven percent of all head & neck cancers are diagnosed in persons 55 years and older, although younger people can be affected too ⁽³¹⁾.

The present study revealed that the majority of patients were from rural agricultural areas, eighty percent of the study and control group. This may explain different aspects of the sample as, the necessary condition for the study group to complete this study was the acceptance and compliance to use honey as a treatment for

radiotherapy induced stomatitis instead of the conventional pharmacological therapy. This was related to the advantage of being easily available, highly nutritive, culturally believed in, less costly and free from side effects. This was in accordance with **Geoff et al. (2006)** who illustrated that integrated medicine is a holistic approach to cancer care ⁽³²⁾, and congruent too with **Schiff & Ben-Arye (2011)** who reported that Complementary and Alternative Medicine therapies can be effective and safe in treating upper GIT toxicities of chemo/radiotherapy ⁽⁷⁾.

Furthermore, the present study revealed that the percentage of patients in the study group who knew that honey can be used for oral dysfunction was 90% and the patients who traditionally used it before successfully was 60% which emphasis that it's culturally believed in. They used to use honey to treat oral problems especially within their families. This were in-agreement with **Frank (2005) and Schiff & Ben-Arye (2011)** who mentioned that complementary and alternative medicine for cancer treatment is widely used by patients with cancer due to largely patient's demand for integration of therapies which comes from their culture and traditional methods. The familiarity with the use of honey in the majority of the study group makes

it easier for them to follow the researcher's instructions and be compliance to the use of honey ^(33, 7).

Concerning the diagnosis, the present study revealed no significant difference between the study and control groups in the head & neck cancer types that they had, that was may be due to the inclusion and exclusion criteria which the researcher followed in assigning the patients in the sample. Also in relation to this result there was no significant difference between the study and control groups in the number of treatment sessions (25), they were equally matched.

The present study showed improvement in oral assessment scores in patients who apply honey more than patients who apply pharmacological agents that made the first research hypothesis accepted.

In agreement with the present study, **Ludgate (2012)** mentioned that the current radiotherapeutic technique have a range of side effects mainly affecting the fast dividing cells of the mouth. One of these managements which reduce these side effects is the using of a complementary therapy to eliminate the side effects of radiotherapy ⁽³⁴⁾. This is in the line with the present findings, Therefore, The aim of this study is to use the actions and proprieties of

the honey to minimize the radiotherapy induced stomatitis, these actions are being: highly nutritive, moisturizing, potent antibacterial, antiseptic, antifungal, anti-inflammatory, anti-oxidant, immuno-stimulatory agent and analgesic ⁽³⁵⁾.

Regarding the Moisturizing & Healing enhancement effect, the improvement in the condition of mouth in the study group ($p < 0.001$), it started from the second week of the use of honey. **Bogdanov (2012)** has agreed with the present study findings and mentioned that it's related to the osmolarity effect of the honey which draws fluid from underlying tissues and gives honey its proprieties as a skin softener and promote lips healing process and keeps the skin supple and soft. ⁽³⁶⁾.

These Moisturizing & Healing enhancement proprieties are explaining the rapid improvement in the oral condition of the study group more than the control group in the present study; the mean and standard deviation respectively was (2.13 ± 0.346), (3.10 ± 0.607) and ($p < 0.001$). these results were congruent with the result of another study of **Rodri'guez-Caballero (2012)** Who had confirm the same results and advised that the healing properties of honey might also be useful in the management of cancer patients ⁽¹⁹⁾. In this respect **Bardy et al.**

(2008) and Bogdanov (2012) had agreed also about the fact that honey possesses anti-inflammatory, antimicrobial and healing properties that decreased the severity and duration of radiotherapy induced stomatitis in 20% of the study group vs. 75% of the control group of his study ^(37, 36).

Additionally, regarding the better tongue condition which the study group had faster than the control group, the mean and standard deviation respectively were (2.40 ± 0.498), (3.00 ± 0.371) and ($p < 0.001$). **Bardy et al. (2012)** agreed with these results stating that 25% of the study group and 75% of the control group had grad 3/4 stomatitis in similar study. He mentioned also that honey is known to reduce the number of microbes present in the oral cavity. This can be beneficial for head and neck cancer patients who are prone to oral/ oropharyngeal infections and undergoing radiotherapy as honey might reduce the incidence of mouth infections, skin infections and tooth decay ⁽²⁸⁾. This knowledge makes it effective with the protection and treatment of oral inflammatory condition. This appeared in the better oral condition which the study group had faster than the control group.

Charalambous et al. (2013) has mentioned that some studies refer to honey as one of the traditional

medicines that have beneficial properties to health including its ability to facilitate the healing process healing process and delay or prevent the development of ulceration in about 20% of patients who had honey for stomatitis prevention. This justifies the better condition of the oral cavity which the study group had than the control group, as the mean and standard deviation of total score of oral assessment respectively was (15.93 ± 3.778) , (21.57 ± 2.373) ⁽³⁸⁾.

Khanal et al. (2010) has concluded in his study that in the honey group, only 5% of patients developed intolerable mucositis but in the lignocaine group, 75% of patients developed intolerable mucositis. This was matched with the findings of the current study concerning the effect of honey vs. the pharmacological agents. Honey applied to the oral cavity reduces the severity of gingivitis that explains the better condition of the study group. T test showed statistically significant differences ($p < 0.001$)⁽⁴⁰⁾.

Contrarily, in a study done by **Parsons et al. (2012)**, he concluded that in contrast to previous honey trials in Malaysia, Egypt, Iran and India, diluted manuka honey did not decrease the extent and onset of radiation-induced oral mucositis, this may be due to the type of honey which he use or the very small sample size

(28 patients) that his results come from⁽³⁹⁾.

Another important study done by **Rashad (2009)** (who used the same type of honey as the present study "Clover", and conducted in Assiut University- Egypt) also supports these findings reporting that honey rinse prophylaxis was also shown to significantly reduce stomatitis severity in head and neck cancer patients receiving either chemotherapy or radiotherapy. In the treatment group, no patients developed grade four mucositis and only three out of 20 patients (15 per cent) developed grade three mucositis. In the control group, 13 out of 20 patients (65 per cent) developed grade three or four mucositis ($p < 0.05$).⁽⁴¹⁾

One benefit of being the majority of patients from rural agricultural areas was the good body built which they had that enhanced their tolerance to radiotherapy which was reflected on their weights. The current study revealed that, there were significant differences between the weights in the two groups treated with honey and pharmacological agents. There was a significant weight gain in the study group (20%), but on the other hand there was a significant weight loss in the control group (76.7%) after the period of using honey. There was statistically significant no change in 36.7% of

the study group and in 20% of the control group, based on this results we can assume that the study group can eat better than the control group.

These results was in agrees with **Charalambous et al., (2013)** and **Parsons et al. (2012)** who supported the current findings reporting that honey contains numerous compounds which can help head and neck cancer patients undergoing radiotherapy who suffered from malnutrition and increased weight loss^(38,39).

In another trial from Malaysia by **Biswal et al., 2003**, a significant reduction in mucositis was observed among prophylactic honey- treated patients compared to controls. In addition, 55% of patients treated with topical honey showed no change or a positive gain in body weight compared to 25% in the control group, the majority of whom lost weight⁽²¹⁾.

Concerning the Nutritional condition, it was enhanced when treated with honey; that was evidenced by the weight gain (20%) or the no change of weight (36.7%) in the study group. According to **Motallebnejad et al. (2008)** his results was congruent with the results of the present study, his results in the study group the mean weight loss was 1 ± 0.35 (0 to 7 kg). Ten patients showed no weight loss in this group (25%). In the control group the mean weight

loss was 6.3 ± 0.53 (2 to 11 kg); he also reported that Natural honey is a product with rich nutritional qualities that could be a pleasant, simple, and economic modality for the management of radiation stomatitis⁽¹⁸⁾.

Honey has been chosen in the present study because it is cheap, readily available in fresh and acceptable because it has been considered a natural substance with medicinal properties.

Kanal et al. (2010) agreed with this opinion reporting that Honey is readily available, affordable and well accepted by patients making it useful for improving the quality of life in irradiated patients⁽⁴⁰⁾.

Therefore the researcher's second study hypothesis that the patients with stomatitis who apply honey will increase their nutritional intake with improved ability to eat was accepted.

Since oncology patient have to face long difficult treatment periods. The nurse as an advocate to patients should assumed the responsibility to assist and protect patient in all area. These areas are in care, health knowledge and more or less financially⁽⁴²⁾.

The Role of the oncology nurse can be modified based on evidence based knowledge. Complementary and alternative therapies are a diverse group of health care practices, systems, and products that are not part of usual medical

treatment. They may include products such as vitamins, herbs, or dietary supplements. Nature has a variety of products that are available easily and that are at [minimal] prices. One of these products is honey which is known for its beneficial health value⁽⁴³⁾.

Honey has been used medicinally since ancient times by Egyptians, Greeks and Romans, evidence of which can be found in the Bible, Koran, Torah and Talmud⁽⁴⁴⁾. Honey was so highly regarded by the ancient Egyptians that offerings were given as food for gods. Not only did they recognize its healing properties they also used it for embalming and preservation of bodies⁽⁴⁵⁾. The therapeutic uses of honey are wide ranging and include management of wounds, ulcers, burns, eye conditions, skin conditions, herpes, tinea, tonsillitis, gum disease, gangrene and stomatitis^(21; 28; 46).

In conclusion, the invariability of stomatitis after radiation and the results of this, earlier studies, and the present study justify the use of topically applied honey in an attempt to decrease the severity of radiation- induced oral stomatitis and improve the quality of life of cancer sufferers and survivors.

Conclusion:

Based on the findings of the study, the researcher concluded that:-

A significant difference was found in the scores of oral assessment tools between the two groups treated with honey and conventional pharmacological agents, the honey group improved better and faster.

The changes in body weight between the two studied groups were statistically significant, meaning that the improvement of body weight was much more in honey group than it was in the other group.

Recommendations:

Based on the findings of this study, the following recommendations are suggested:

A- Recommendations for patients:

1. Dental visits before, during and after radiotherapy sessions should be encouraged to avoid any complications.
2. Continuous health education program for patients receiving radiotherapy about the possible side effects and how to deal with each one of them immediately.
3. Patients who suffers from stomatitis should be encouraged to frequent & regular mouth care and to apply honey for better management.

B- Recommendations for nurses:

4. - Oral care protocol should be taught to nursing staff concerning with patients receiving radiotherapy in order

to improve the quality of care given to cancer patients.

5. - Regular training programs to keep the oncology nurses updated with the most recent and effective oral hygiene practices, early detection of stomatitis and proper treatment to avoid or decrease oral infection as well as enforcing adequate nutrition rich in proteins, that promote healing and minimize infection.
6. - The nurses at radiotherapy units should give health education to patients about the side effects & its management, and to use honey to avoid stomatitis.

C-Recommendations for further researches:

7. - The effect of honey on patients with head and neck cancer receiving chemo/ radiotherapy.
8. - The impact of honey on prevention of chemotherapy induced stomatitis.
9. - The impact of honey on prevention & management of chemo/ radiotherapy induced stomatitis.
10. - Comparison between honey as mouth rinsing and other antiseptic solutions on chemo/ radiotherapy induced stomatitis.
11. - Standard of oral care technique on patients with

radiotherapy induced stomatitis.

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