"EFFECT OF HONEY ON THE BODY WEIGHT IN HEAD AND NECK CANCER PATIENTS AFTER RADIOTHERAPY"

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ABSTRACT
Body weight loss is a negative consequence of radiotherapy in head and neck cancer. The aim of this study is to determine the efficacy of honey on body weight of the patients.
Materials and Methods: This interventional study was carried out in Radiation Oncology department of Mayo hospital, Lahore. This study involved 82 patients, divided into two groups by random sampling, who received 60-70 Grays of radiation in 22-30 fractions with curative intent. In treatment group, patients were instructed to take 20 mL of honey. In control group, they were advised to rinse with 0.9% of saline. The weight loss during radiotherapy was calculated as the difference between the weight at the start and the end of radiotherapy. The statistical analysis was done by t-test.
Results: In honey-treated group, patients showed static and positive change in body weight when compared to control group and it is statistically significant.
Conclusion: This study showed that oral intake of honey during radiotherapy is valuable for maintaining body weight during and after radiotherapy.

Keywords: Cancer, Honey, Radiotherapy, Weight loss.

INTRODUCTION
Head and neck cancer is the eighth common type among all cancer types in all over the world[1.] The treatment comprises of surgery, radiotherapy and chemotherapy or a combination escorted by restoration therapy and social support[2]. Radiation causes cell death by breaking the strands of DNA. This breakage leads to irreversible loss of the reproductive integrity of the cell and eventual cell death. Radiotherapy not only improves the quality of life of patient but it has several early and late side effects. It often produces significant toxicities, such as mucositis, nausea, and dysphagia, which may limit oral intake and lead to weight loss[3,4]. The consequences of malnutrition during treatment may include an increased risk of complications, poor quality of life, impaired immunity, an interruption of the treatment, and a reduced survival rate[5]. Patients affected by malnutrition due to radiotherapy can be managed with a variety of oral dietary approaches, dietary modification and the use of oral nutritional supplements.

Honey has been used as medicine and dietary product all over the world[6]. A honey bee collect the nectar from the flowers and produce honey, by adding numerous enzymes, evaporates a lot of water and create a high saturated sugar solution[7]. The main nutritional and health relevant components are carbohydrates, mainly fructose and glucose but also about 25 different oligosaccharides[8]. Oral ingestion of honey reduces the weight loss associated with radiotherapy in head and neck cancer patients due to its rich nutritional value and impact in reduction of severity of oral mucositis[9].

MATERIALS AND METHODS
A unicenter, randomized, controlled and clinical human study was conducted at Clinical Oncology department of Mayo hospital, Lahore, Pakistan. The study protocol was approved by the Advanced Studies and Research Board of University of Health Sciences, Lahore, and Ethical Committee of PGMI, Lahore. It was carried out from January 2015 to January 2016.
Inclusion criteria: Patients with histologically confirmed head and neck cancer planned for external

beam radiotherapy, with total radiation dose 60-70 Grays (in 5-6 weeks).

Exclusion criteria: Patients having systemic diseases (Diabetes mellitus, Rheumatoid Arthritis, Systemic Lupus Erythermatous)

82 patients were selected for the study, divided into two groups as control and treatment group by computer generated random numbers. Complete history of the patient and physical examination was done. Signatures on the consent form were obtained as per ethical requirement of the study after explaining the whole procedure. Areas exposed to radiation were marked by surface marking in both groups. Both single and multi-fields were used in this study. The radiations were delivered at a dose of 1.8- 2 Grays 5 days in a week. Equinox and Telecobalt Theratron 780C machines were used.

In the treatment group, patients were given 20 mL of Ziziphus honey, 15 minutes before and after the radiotherapy. They were instructed to swallow slowly to smear layer of honey on the oral and pharyngeal mucosa. Patients were also advised to take 20 mL of Ziziphus honey before sleeping in the night[10]. This treatment protocol of honey was followed from day 1 of radiation till the end of 6th week. They were instructed to take meals in early morning, noon and night not to interfere with ingestion of honey**.** In the control group, patients were given 20 mL of 0.9% of saline 15 minutes before and after radiotherapy[12]. They were advised to rinse saline. They were instructed to keep saline for at least 5 minute duration sand then to spit it out. They were advised to rinse 20 mL of saline in the same manner before sleeping. This treatment protocol of saline was followed from day 1 of radiation till 6 weeks.

At the first day of radiotherapy weight of the patient (kg) was taken on a digital measuring scale. The body weight was monitored after every week till the end of 6th week and was recorded on the patient data form. At the end of 6th week mean body weight was calculated in both control and treatment group. All patients were given dietary consuleing throughout the course. The statistical analysis was done by t-test method by using SPSS 20.0.

Saline was therapeutic agent in control group. Ziziphus honey used in this study was analyzed by PCSIR. The moisture content of this honey was 17.34%. Specific gravity was 1.420. The HMF was 28.42 mg kg and pH was 6.05 and Diastase no was 44.

RESULTS AND ANALYSIS

The characteristics of patients including sex, age and location of primary tumor are presented in [Table I].

In control group body weight was compared before and after radiotherapy. As far as **control group** is concerned, the mean body weight before the radiotherapy was 55.79±8.25Kg and after the radiotherapy body weight was 51.97±8.82Kg. The net reduction of body weight from their baseline was 3.82±1.23. This decrease in body weight was statistically significant **(P=0.046)** (Table II). In the same manner, body weight of treatment group patient was also compared before and after radiotherapy. The mean body weight in the **treatment group**, before the radiotherapy was 55.32±9.57Kg and after the radiotherapy body weight was 59.79±1.73Kg. There was statistical significant difference **(P=0.043)** in body weight of the group treated with honey (Table II).

Table 1:

Patient characteristics	Control (n=41)	Treatment (n=41)
Median age	**50.17**	**49.90**
Male: Female	27:14	33:8
Location of primary tumor		
Oral cavity	23	22
Salivary glands	1	3
Pharynx	8	5
Larynx	9	11
Mean radiation area	24 $(cm)^2$ - 100$(cm)^2$	25$(cm)^2$ - 100$(cm)^2$

Table 2: Comparison of body weight (kg) in control group and treatment group before and after radiotherapy

Groups	**Body weight in (kg) before Radiotherapy**		**Body weight in (kg) after Radiotherapy (6 weeks)**		**P Value**
	Mean	**SD**	**Mean**	**SD**	
Group A Control	55.79	±8.25	51.97	±8.82	**.046***
Group B Honey treated	55.32	±9.57	59.79	±1.73	**.043***

DISCUSSION

Nutritional compromise is common during high dose radiotherapy (RT) or chemo-radiotherapy (CRT) for head and neck cancers. Head and neck cancer patients were at high risk of weight loss due to disease and treatment modalities[4,5]. Data from this study showed that the mean 6.84% body weight of control group patients was reduced after the radiotherapy. The decrease in body weight in control group was statistically significant. In honey treated group the mean body weight of the patients after radiotherapy positively increased or remained static.

A study in 2003, showed that 55% of the patients in honey treated group showed static or gain in weight during radiotherapy compared to 25% in control group[10]. Motallebnejad and her colleagues showed that honey treated group the mean body weight loss was (0-7kg) and 10 patients out of 20 showed no body weight loss. In the control group the mean body weight loss was (2-11kg). The mean body weight loss was studied which was statistically significantly higher in control group[9]. Another study in 2012, revealed that in honey treated group body weight had not reduced after radiotherapy[11]. These all observations regarding the body weight were similar with current study (Table II).

Honey is a heterogeneous mixture of proteins, flower nectar sugars and glandular secretions produced by the honey bees. It has valuable carbohydrates, ascorbic acid and flavonoids rich in nutrition. It has an anti-microbial, anti-inflammatory and analgesic property which helps in healing of oral mucositis which is most debilitating side effect of radiation in head and neck cancer[12]. Thus reducing the number of mucositis in patient relieves the dysphagia associated with it. Ziziphus honey used in this study is superior in quality as compared to Adhatoda vasica and Brassica species. This honey has highest fructose content and highest proline and iron content[8].

There are some limitatitions to our study. In this study patients were heterogenous regarding cancer treatment (fractioned and hyperfractioned radiation therapy), age and tumor location. The study period was also short and it was better to follow the patients for a longer period to find long-term benefits. The data available on effect of honey on body weight depicted that honey had promising effects on maintenance of body weight during and after body weight due to its high nutrient value.

CONCLUSION

The results of this study showed that Ziziphus honey significantly positive effect on body weight of head and neck cancer patients. It is really encouraging to note that patients of head and neck cancer suffering from severe weight loss due to radiotherapy can be lessened to a great extent simply by such a feasible and affordable option.

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