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Side Effects of Radiation Therapy experienced by patients with Head & Neck Cancer, receiving Radiation Therapy

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Abstract

Introduction: Patients diagnosed with head and neck cancer are given radiation therapy for its treatment. Radiation therapy causes side effects which patient experiences while receiving it. The purpose of the study was to assess symptoms of side effects of radiation therapy in patients receiving radiotherapy.

Methodology: Quantitative research approach and descriptive research design was adopted in this study. Purposive sampling method was used to select 46 patients who were diagnosed with cancer of head and neck and were scheduled to receive radiation therapy. Data were collected by interview method using EORTC QLQ H&N 35 questionnaire. On the first day of radiotherapy baseline assessment, on 10th day of radiotherapy 1st assessment of symptoms related to radiation therapy's side effects and on 21st day of radiotherapy 2nd assessment of symptoms caused by side effects of radiation therapy was done.

Results: results revealed a gradual increase in the symptoms of side effects of radiation therapy such as difficulty in swallowing, dryness of mouth, pain etc.

Conclusion: It is concluded that patients having head and neck cancer experience side effects of radiotherapy as radiotherapy progresses.

Keywords: Radiotherapy, Oral Cancer, Smoking, Addiction

Introduction

Hippocrates a Greek physician first describes the term cancer and it was first detected by Percivall Pott in 1775. Cancer is an uncontrolled growth of cells that invade other parts of the body and cause dysfunction. Benign cancer does not spread to other body parts while malignant cancer can spread to other body parts or tissue. In other words, cancer is known as a neoplasm

Head and neck cancer is prevalent in India and it is the sixth most commonly occurring cancer worldwide. It occurs in more in men because of tobacco use. More than two lakh cases of head and neck cancer occur every year and out of these 40 % are of oral cancer. [1,2]

According to the National institute of cancer prevention and research report in the year 2018 main leading cause of mortality in India was cancer. It is estimated that the death rate may increase up to eight lakh and approx. 2.25 million peoples are living with cancer. Around 12 lakh cases increase every year in India. Cancer arises from single-cell can affect any part of the body and may cause from single cell to multistage process. Various factors like hereditary, external agents including physical agents, ultraviolet rays, chemical agents such as tobacco, polluted smoke, contaminated foods and water, and various biological agents like bacteria or viruses contribute to the growth of cancer.

Head and neck cancer includes cancer of oral and nasal cavity, salivary glands, region of larynx and hypopharynx, nasopharynx and oropharynx. According to NCBI report (2015) 57.5% of people were living with cancer worldwide and in India two lakh peoples are affected each year. [3]

A survey conducted in regions of Uttarakhand out of 354 cases cancer of lung was reported to be the foremost cancer type (17.23%) overall. Men were mostly suffering from cancers caused by tobacco and alcohol use such as cancer of lungs, oral cavity, esophagus larynx, and oropharynx. Radiotherapy destroys the cancerous cells and reduces the size of tumor. It is given by two methods one is by external radiation therapy which uses high energy radiation like X-rays and Gamma rays, delivered by machine at the site of tumor and second is by Brachytherapy which is given by introducing the radioactive electrode closer to a cancerous cell in the body. The early and late side effects of radiation treatment is tiredness, low energy, inflammation of mucus membrane, changes in skin, nausea, vomiting and, undernourishment.[4,5]

Side effects of radiation therapy include sticky saliva, dry mouth, speech problem, social eating difficulty, altered taste, and smell sensation, the problem with chewing.

The aim of the study was to measure the side effects of radiation therapy experienced by patients diagnosed with cancer of head and neck are were getting Radiation therapy. [6-8]

Methodology

Quantitative research approach with descriptive research design was used. Study was conducted in Cancer Research Institute, Himalayan Hospital Uttarakhand. Forty five patients undergoing Radiotherapy were selected by purposive sampling method. Inclusion criteria was patients who could understand the Hindi language and who were willing to give written consent for the study. Exclusion criteria was patients who were admitted for palliative care and who were prescribed radiotherapy for less than 21 days. EORTC- QLQ H&N 35 tool was used to collect data regarding side effects of radiation therapy experienced by patients during the course of receiving radiation therapy. Higher score represented higher severity of symptoms.

Ethical permission was taken from Ethics Committee of SRHU, and formal administrative permission was taken from director, Cancer Research Institute and head of the department of radiotherapy. Data collection procedure- Patients with head and neck cancer who were scheduled to receive their first Radiotherapy were selected based on inclusion and exclusion criteria. The researcher explained the purpose of the study to the patients and took written consent for participating in study from them. After that researcher conducted interview with patients and filled the socio-demographic proforma and baseline assessment of symptoms of side effects of radiation therapy was done by using EORTC QLQ H&N 35 questionnaire. On the 10th day of radiation therapy, 1st assessment and on the 21st day of radiation therapy 2nd assessment of symptoms of side effects of radiotherapy was done.

Results

Demographic Characteristics of study participants

Results showed that out of 46 sample maximum 59% of the patients were in the age group of 56-75 years. The majority of 91% were male. All patients were married.

Maximum 70% patients were living in the village. Maximum 37% of patients were educated up to primary education; minimum 13% were educated up to university level. Maximum 43% were farmer and 20% were having private jobs. All of them were living in a nuclear family. Maximum 54% were having 3 children and 10% of them had six children. Only 22% patients had history of cancer in their family, out of these 40% had cancer of the lung, 30% had cancer of the stomach and 30% had cancer of the liver.

Table 1. Frequency and Percentage distribution of personal characteristics of the patients with head and neck cancer

N=46

| SN | Characteristic | | Frequency(f) | Percentage (%) |
|----|--------------------|------------|--------------|----------------|
| 1 | Age | 35-55 | 19 | 41 |
| | | 56-75 | 27 | 59 |
| 2 | Gender | Male | 42 | 91 |
| | | Female | 4 | 9 |
| 3 | Place of living | Village | 32 | 70 |
| | | City | 14 | 30 |
| 4 | Educational status | Uneducated | 12 | 26 |
| | | Primary | 17 | 37 |
| | | Secondary | 11 | 24 |
| | | University | 6 | 13 |
| 5 | Occupation | Government | 4 | 9 |
| | | Private | 9 | 20 |
| | | Corporate | 0 | 0 |
| | | Farming | 20 | 43 |
| | | Business | 3 | 7 |
| | | Other | 1 | 2 |
| | | Unemployed | 9 | 20 |
| 6 | Marital status | Single | 0 | 0 |
| | | Married | 46 | 100 |
| 7 | Type of family | Nuclear | 46 | 100 |
| | | Joint | 0 | 0 |

| | | | | |
|----|-------------------------------------|-------------------|----|----|
| 8 | No of children's | 1-3 | 25 | 54 |
| | | 4-6 | 21 | 46 |
| 9 | Family income (Thousands) | 5-10 thousand | 8 | 17 |
| | | 11-20 thousand | 14 | 30 |
| | | 21-30 thousand | 18 | 39 |
| | | > 30 thousands | 6 | 13 |
| 10 | Family history of cancer | No | 36 | 78 |
| | | Yes | 10 | 22 |
| 11 | Site of cancer in family history | Cancer of lungs | 4 | 40 |
| | | Cancer of stomach | 3 | 30 |
| | | Cancer of liver | 3 | 30 |

Table 2: Frequency and percentage distribution of personal habits of patients with head and neck cancer

| N=46 | | | | |
|------|--------------------------|--------------------|--------------|----------------|
| SN | Characteristic | | Frequency(f) | Percentage (%) |
| 1. | Present smoking habit | No | 46 | 100 |
| | | Yes | 0 | 0 |
| | Past smoking habit | No | 16 | 35 |
| | | Yes | 30 | 65 |
| | No. Of years (N=30) | Less than 10 years | 1 | 3 |
| | | 11-20years | 5 | 17 |
| | | 21-30years | 13 | 43 |
| | | > 30years | 11 | 37 |
| 2 | Present Tobacco habit | No | 46 | 100 |
| | | Yes | 0 | 0 |
| | Past tobacco Habit | No | 25 | 54 |
| | | Yes | 21 | 46 |
| | No of years(N=21) | Less than 10 years | 3 | 14 |
| | | 11-20years | 4 | 19 |
| | | 21-30years | 9 | 43 |
| | | > 30years | 5 | 24 |
| 3. | Present | No | 46 | 100 |

| | | | | |
|--|-----------------------------|--------------------|----|----|
| | alcohol Drinking habit | Yes | 0 | 0 |
| | Past alcohol Drinking habit | No | 11 | 24 |
| | | Yes | 35 | 76 |
| | No of years (N=35) | Less than 10 years | 1 | 3 |
| | | 11-20years | 5 | 14 |
| | | 21-30years | 17 | 49 |
| | | > 30years | 12 | 34 |

Table 3: Mean and standard deviation of symptoms of radiotherapy in patients with head and neck cancer receiving radiation therapy.

N=46

| S.N | Variables | Days of Radiotherapy | Mean±SD | f | p-value |
|-----|--|----------------------|--------------|--------|---------|
| 1 | Pain(HNPA) | 1st Day | 18.59±10.811 | 71.511 | 0.000 |
| | | 10th day | 21.76±9.262 | | |
| | | 21 day | 33.52±9.912 | | |
| 2 | Swallowing (HNSW) | 1st Day | 20.26±9.7110 | 65.919 | 0.000 |
| | | 10th day | 23.24±8.119 | | |
| | | 21 day | 35.00±10.961 | | |
| 3 | Sense Problem(HNSE) | 1st Day | 8.72±12.488 | 52.297 | 0.000 |
| | | 10th day | 13.87±11.758 | | |
| | | 21st day | 25.37±12.37 | | |
| 4 | Speech Problem(HNSP) | 1st Day | 16.74±14.434 | 34.622 | 0.000 |
| | | 10th day | 23.93±11.953 | | |
| | | 21st day | 24.67±12.204 | | |
| 5 | The trouble with Social Eating (HNSO) | 1st Day | 18.26±15.425 | 62.488 | 0.000 |
| | | 10th day | 25.65±12.241 | | |
| | | 21st day | 32.83±15.088 | | |
| 6 | The trouble with Social contact (HNCO) | 1st Day | 18.17±10.214 | 33.797 | 0.000 |
| | | 10th day | 22.13±9.912 | | |
| | | 21st day | 22.72±9.570 | | |
| 7 | Less Sexuality(HNSX) | 1st Day | 56.59±19.962 | 36.00 | 0.000 |
| | | 10th day | 56.59±19.962 | | |
| | | 21st day | 67.57±17.936 | | |
| 8 | Opening Mouth (HNOM) | 1st Day | 34.65±21.159 | 43.786 | 0 |
| | | 10th day | 42.63±17.001 | | |
| | | 21st day | 58.11±16.654 | | |
| 9 | Dry Mouth(HNDR) | 1st Day | 23.67±15.023 | 52.68 | 0 |
| | | 10th day | 37.43±11.577 | | |
| | | 21st day | 59.46±23.408 | | |

| | | | | | |
|----|-------------------------------|----------|--------------|--------|-------|
| 10 | Sticky Saliva(HNSS) | 1st Day | 16.50±16.682 | 56.482 | 0 |
| | | 10th day | 32.35±13.169 | | |
| | | 21st day | 57.28±24.190 | | |
| 11 | Coughing(HNCO) | 1st Day | 20.87±20.264 | 4.333 | 0.115 |
| | | 10th day | 21.57±18.797 | | |
| | | 21st day | 23.72±18.064 | | |
| 12 | Felt Ill(HNFI) | 1st Day | 20.80±16.105 | 45.852 | 0 |
| | | 10th day | 24.39±14.651 | | |
| | | 21st day | 43.37±17.309 | | |
| 13 | Pain Killer(HNPK) | 1st Day | 26.09±44.396 | 11.083 | 0.004 |
| | | 10th day | 54.35±50.361 | | |
| | | 21st day | 45.65±50.361 | | |
| 14 | Weight loss(HNWL) | 1st Day | 23.91±43.127 | 18.167 | 0 |
| | | 10th day | 39.13±49.344 | | |
| | | 21st day | 50.00±50.553 | | |
| 15 | weight Gain(HNWL) | 1st Day | 00.00±000 | 0 | |
| | | 10th day | 00.00±000 | | |
| | | 21st day | 00.00±000 | | |
| 16 | Nutritional Supplement (HNNS) | 1st Day | 10.87±31.470 | 34.522 | 0 |
| | | 10th day | 36.96±48.802 | | |
| | | 21st day | 60.87±49.344 | | |
| 17 | Feeding Tube(HNFT) | 1st Day | 0.00±0.00 | 16 | 0 |
| | | 10th day | 0.00±0.00 | | |
| | | 21st day | 17.39±38.322 | | |

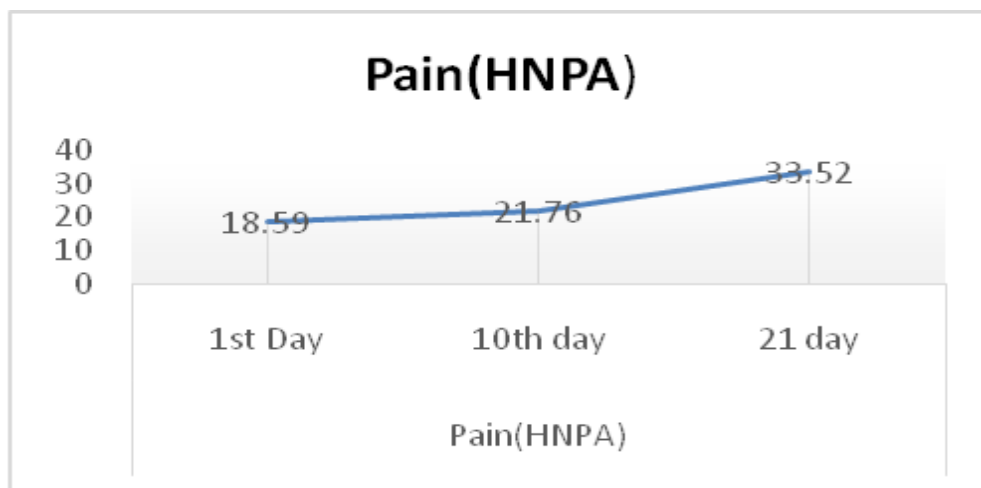


Figure 1. Mean pain score of patients with head and neck cancer undergoing radiotherapy

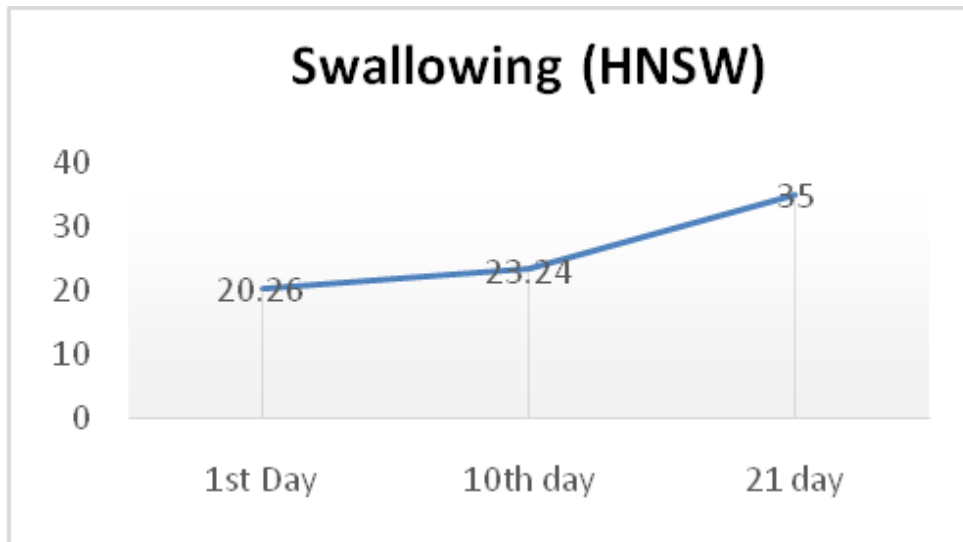


Figure 2. Mean swallowing score of patients with head and neck cancer undergoing radiotherapy.

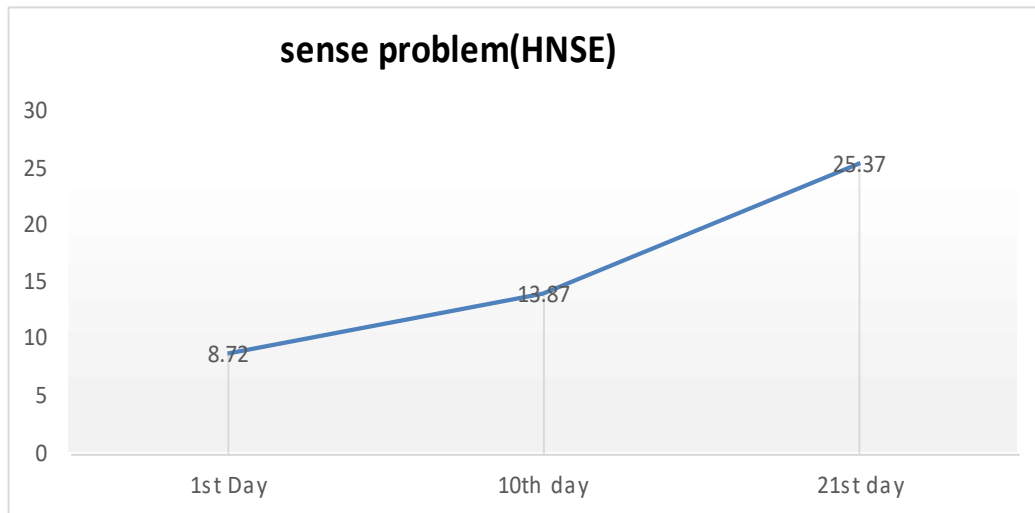


Figure 3. Mean sense problem score of patients with head and neck cancer undergoing radiotherapy

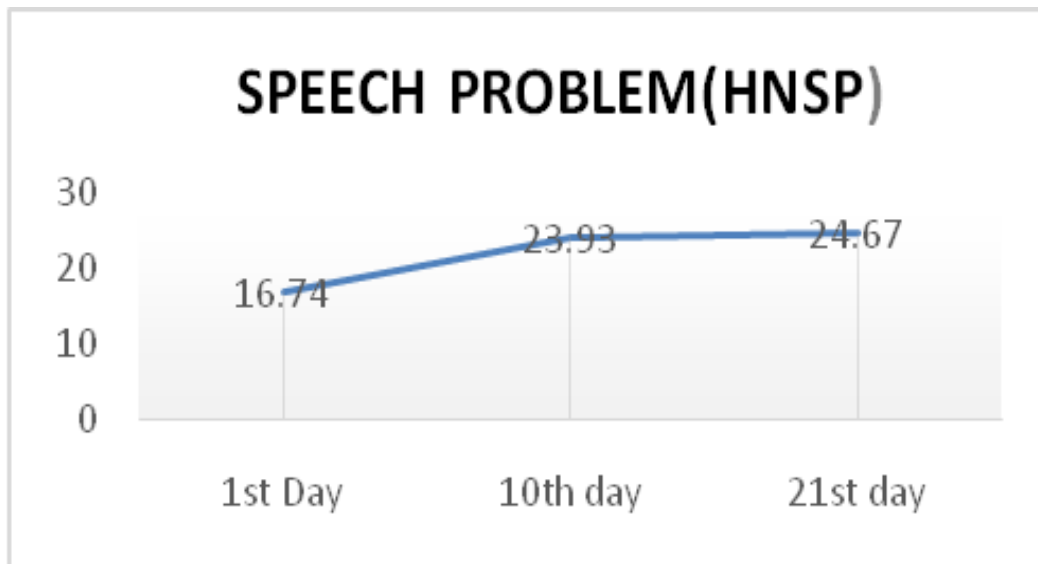


Figure 4. Mean speech problem score of patients with head and neck cancer undergoing radiotherapy

Frequency and percentage distribution of personal habit

Regarding smoking habit: At the time of data collection none of the patients reported that they smoke. However, 65% patients had history of smoking in the past, out of these 43 % smoked for the past 21 to 30 years and 37% smoked for more than 30 years.

Regarding tobacco habits: At the time of data collection none of the patients reported that they take tobacco. However, 46% patients had a history of taking tobacco in the past, out of these 43 % took tobacco for 21 to 30 years and 24% took tobacco for more than 30 years in the past.

Regarding alcohol drinking habits: At the time of data collection none of the patients reported that they drink alcohol. However, 76% patients had a past history of drinking alcohol, out of these, 49 % patients took alcohol for 21 to 30 years and 34% patients took alcohol for more than 30 years.

Out of 46 patients, 43% patients were having tongue cancer, 28% cancer of buccal mucosa, 13% of hypopharynx, 9% of larynx , only 7% had cancer of supraglottis.

Side effects of radiotherapy in patients with head and neck cancer receiving radiation therapy

Analysis of symptoms of side effect of radiotherapy was done by applying non-parametric Friedman's test.

Regarding Pain: There was a gradual increase in the mean score of pain in patients with head and neck cancer, from Day 1st to 10th Day to 21st Day with mean 18.59 ± 10.811 , 21.76 ± 9.262 , 33.52 ± 9.912 and within-group $F=71.511$ ($p=0.00$)

Regarding swallowing difficulty: There was an increase in the mean score of swallowing difficulty from 1st Day to 10th Day and highly increased in 21st Day with mean 20.26 ± 9.7110 , 23.24 ± 8.119 , 35.00 ± 10.961 and within-group $F=65.919$ ($p=0.00$).

Regarding Sense problem: There was a slight increase in the mean score of sense problem (sense of smell and sense of taste) from 1st Day to 10th day to 21st day with mean 8.72 ± 12.488 , 13.87 ± 11.758 , 25.37 ± 12.37 and within the group $F=52.297$ ($p=0.00$).

Regarding Speech problems: There was a slight increase in the mean score of speech problems from 1st Day to 10th day to 21st day with mean 16.74 ± 14.434 , 23.93 ± 11.953 , 24.67 ± 12.204 and within the group $F=34.622$ ($p=0.00$).

Regarding Trouble with social eating: There was a slight increase in the mean score of trouble with social eating from 1st Day to 10th day to 21st day with mean 18.26 ± 15.425 , 25.65 ± 12.241 , 32.83 ± 15.088 and within the group $F=62.488$ ($p=0.00$).

Regarding Trouble with social contact: There was a slight increase in the mean score of trouble with social contact from 1st Day to 10th day to 21st day with mean 18.17 ± 10.214 , 22.13 ± 9.912 , 22.72 ± 9.570 and within the group $F=33.797$ ($p=.000$).

Regarding the Less sexuality problem: In patients with head and neck cancer undergoing radiotherapy, the mean score remained the same for less sexuality as from 1st Day to 10th day then increase in the mean score in 21st day with mean 56.59 ± 19.962 , 56.59 ± 19.962 , 67.57 ± 17.936 and within the group $F=36.00$ ($p=0.00$).

Regarding Dry Mouth: There was a slight increase in mean score dryness of mouth from 1st Day to 10th day while highly increase to 21st day with mean score 23.67 ± 15.023 , 37.43 ± 11.577 , 59.46 ± 23.408 and within the group $F=52.680$ ($p=0.000$).

Regarding Opening Mouth: There was a slight increase in the mean score of difficulty of mouth opening from 1st Day to 10th day to 21st day with mean 34.65 ± 21.159 , 42.63 ± 17.001 , 58.11 ± 16.654 and within the group $F=43.786$ ($p=0.00$)

Regarding Sticky Saliva: There was a high increase in the mean score of sticky saliva from 1st Day to 10th and severe at 21st day with a mean score of 6.50 ± 16.682 , 32.35 ± 13.169 , 57.28 ± 24.190 and within the group $F=56.482$ ($p=0.000$).

Regarding Coughing in patient: There was a slight increase in the mean score of coughing from 1st Day to 10th day to 21st day with mean score 20.87 ± 20.264 , 21.57 ± 18.797 , 23.72 ± 18.06 and within the group $F=4.333$ ($p=0.115$)

Regarding Felt ill: There was a slight increase in the mean score of feeling ill from 1st Day to 10th day to 21st day with mean score 20.80 ± 16.105 , 24.39 ± 14.651 , 43.37 ± 17.309 and within the group $F=45.852$ ($p=0.00$)

Regarding Pain-killer use: There was a high increase in the mean score of taking pain killer from 1st Day to 10th day with mean score 26.09 ± 44.396 , 54.35 ± 50.361 , and slightly decrease in 21st day with mean score 45.65 ± 50.361 and within the group $F=11.083$ ($p=0.004$)

Regarding Weight Loss: There was a high increase in the mean score of weight loss from 1st Day to 10th day to 21st day with mean 23.91 ± 43.127 , 39.13 ± 49.344 , 50.00 ± 50.553 and within the group $F=18.167$ ($p=0.00$)

Regarding Weight gain: There were no changes in weight during the treatment on day 1st and day 10th, and day 21st there was no significant difference between baseline (1st day of radiotherapy) and post-test (10th day, 21st day of radiotherapy).

Regarding taking Nutritional Supplement: There was an increase in the mean score of taking a nutritional supplement from 1st Day to 10th day to 21st day with mean score 10.87 ± 31.470 , 36.96 ± 48.802 , 60.87 ± 49.344 and within the group $F=34.522$ ($p=0.00$)

Regarding Feeding Tube: There was an increase in the mean score of feeding tube from 10th day to 21st day with mean 0.00 ± 0.00 , 17.39 ± 38.322 553 and within the group $F=16.00$ ($p=0.00$).

This revealed that patients receiving radiotherapy for head and neck cancer have gradual increase in side effects.

Discussion

The present study showed that all the patients with head and neck cancer receiving radiotherapy had increase in the symptoms of side effects from baseline to 1st and 2nd assessment. Such as means score of pain increased 18.59 ± 10.811 to 21.76 ± 9.262 to

33.52±9.912, Swallowing difficulty 20.26±9.7110 to 23.24±8.119 to 35.00±10.961. Dryness of mouth. (Sticky Saliva) 6.50±16.682 baseline to 57.28±24.190. use of pain killer at baseline 26.09±44.396 to 45.65±50.361 posttest. Weight loss, at baseline 23.91±43.127 to posttest 50.00±50.553. This revealed that patients had gradual increase in the intensity of symptoms as the radiotherapy progressed. The similar findings were found in study by **Linda et al, (2008) [9]** mean score of quality of life decreased significantly During RT from baseline 85.1 to 69.0 at week 6, with the severity of the oral ulcer. And the score of taking pain killers was increased from baseline 34% to 80% at week 6.

Results were supported by **Murphy et al, (2009) [10]**, that those patients who had a weight loss greater than 10% -after treatment scored significantly worse on 15% of 28% than patients who lost less before treatment. During treatment, the reduction in weight was found for role functioning, fatigue, loss of appetite, quality of life, sticky saliva, and swallowing.

Study results also supported by **Tuomi et al (2021) [11]**, result of QLQ-H&N35 on dryness, sticky saliva, mouth opening, and teeth problem were essentially weakened contrasted with the baseline. The study concludes that the most significant deterioration was found in patient-related xerostomia. Radiation therapy and chemotherapy were fundamentally significantly predictive for quality of life changes over time.

CONCLUSION

It is concluded that patients having cancer of head and neck and receiving radiotherapy experience multiple side effect of radiation therapy. Management strategies such as supportive care, nutritional support, and appropriate medication can help alleviate these side effects, but they can still significantly impact patients' quality of life during and after treatment The intensity of these side effects increases from day one to 21 days as they receive radiotherapy.

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