EARLY COMPLICATIONS OF RADIOTHERAPY IN PATIENTS UNDERGOING TREATMENT FOR HEAD AND NECK CANCERS AT MULAGO HOSPITAL

BY
DR. JUSTINE NAMWAGALA
M.B.Ch.B (MaK)

DEPARTMENT OF EAR, NOSE AND THROAT, MAKERERE UNIVERSITY

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SUPERVISORS

1. MS WINIFRED ADRINE TUMWIKIRIZE
   M.B.CH.B (MaK); M, MED-E.N.T (MaK); MSC
   CLIN.EPID (McMASTER)

2. DR J.B KIGULA MUGAMBE
   M.B.CH.B (MaK); M, MED RAD; M, RAD. ONCOL

3. DR. P.K EMODEK
   M.B.CH.B (MaK); M, MED-E.N.T (U.O.N)
DECLARATION

I declare that this dissertation has not been submitted before for an award in any other university. All work herein is original otherwise acknowledged.

Signed: ........................................

Justine Namwagala
The dissertation has been submitted for examination to the university with our approval as supervisors.

Supervisors

MISS W.A. Tumwikirize
Dept of E.N.T
Mulago Hospital

DR J B KIGULA MUGAMBE
Dept of radiotherapy
Mulago Hospital

DR P K EMODEK
Dept of E.N.T
Mulago Hospital
DEDICATION

This dissertation is dedicated:

To God the almighty who has been my source of strength, comfort and hope throughout this time.

To my husband for the support and encouragement he gave me throughout this time.

Finally, to my parents for their inspirations and selfless sacrifice given to me throughout my education.
ACKNOWLEDGEMENTS

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OPERATIONAL DEFINITIONS

For the purposes of this study,

**Curative radiotherapy**: Treatment is given with an intention that an individual with disease becomes free of disease and will have the same chance of survival as the rest of the population without the disease\(^\text{10}\).

**Early radiotherapy complications** refer to complications that occur during the course of radiotherapy treatment and immediately after treatment and it takes approximately six weeks.

**Gray** is a unit of absorbed dose of radiation and is equivalent to one joule per kilogram\(^\text{17}\).

**Head and neck cancers** will refer to those cancers in the nasopharynx, paranasal sinuses, oral cavity, oropharynx, hypopharynx and external neck.

**Head and neck region** that area of the body that extends from the clavicle up to the vault.

**Late radiotherapy complications** refer to complications, which occur months to years after treatment\(^\text{14}\).

**Palliative radiotherapy**: The treatment aim is to achieve maximum control of symptoms with minimum side effects in the shortest radiotherapy time\(^\text{10}\).

**Radiotherapy** is the art of using ionizing radiation to destroy tumours while minimizing damage to normal tissues\(^\text{12}\).

**Teletherapy**: The radiation source is from outside the body\(^\text{10}\).
# LIST OF ABBREVIATIONS

<table>
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<tr>
<td>AJC</td>
<td>American Joint Committee on cancer</td>
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<tr>
<td>CHART</td>
<td>Continuous Hyperfractionated Accelerated Radiotherapy</td>
</tr>
<tr>
<td>E.N.T.</td>
<td>Ear, Nose and Throat</td>
</tr>
<tr>
<td>EORTC</td>
<td>European Organisation for Research on Treatment of Cancer.</td>
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<tr>
<td>Gy</td>
<td>Gray</td>
</tr>
<tr>
<td>RTOG</td>
<td>Radiation Therapy Oncology Group</td>
</tr>
<tr>
<td>UICC</td>
<td>Union Internationale Contre Le Cancer. (The International Union Against Cancer.)</td>
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RTOG GRADING SYSTEM

(a) Grade 0: no complication.

(b) Grade 1: mild complication (minor symptoms / signs not requiring treatment or requiring simple outpatient treatment).

(c) Grade 2: moderate complication (Signs and symptoms are controllable on outpatient management and does not require treatment break).

(d) Grade 3: severe (in life threatening condition signs, and symptoms require hospitalization or other interventions and treatment may be interrupted).

(e) Grade 4: fatal complications leading to death.
ABSTRACT

Background: Head and neck cancers are one of the major public concerns in many parts of the world. They are the sixth commonest type of malignancy worldwide,¹ and account for 7.9% of patients admitted in Ear, Nose and Throat Department, Mulago Hospital.² In Mulago Hospital the majority of patients present with advanced stage of disease and radiotherapy is the commonest treatment modality.³ Although radiotherapy is intended for cure and relief of symptoms, it has complications. However, there is no documentation of these complications in Mulago Hospital.

Objectives: To identify the early complications of radiotherapy in patients undergoing treatment for head and neck cancers in Mulago hospital and to determine their frequency and severity.

Methods: A quantitative descriptive study was conducted for a period between June and December 2003. During the 7-month period, a total of 30 consecutive cases with histologically proven head and neck cancers treated by standard conventional radiotherapy, were selected for the study. Each patient was reviewed weekly for six weeks for complications of radiotherapy treatment. The severity of the complications was recorded using a simple grading system.

Results: There were more males (60%) than females (40%) in this study. The commonest age range of patients was between ages 51-60 years (23.3%). Majority 28 (93.3%) presented with stage IV. Amongst the general complications, general malaise and weight loss were the most frequent. In analysis of local complications, oral was the most frequent while ear complications were the least frequent. Trends of severity (progress) across the period of treatment rapidly worsened for most local and general complications.
Conclusions: The study identified a high rate of complications of radiotherapy in patients treated for head and neck cancers. Patients developed more than one complication and they were moderate to severe in nature. The complications worsened across the period of treatment with increasing doses of treatment. Therefore clinicians should know about the complications and prevent them early and properly and they should design better treatment protocols with few complications for these patients.
CHAPTER ONE

1.0 INTRODUCTION

Head and neck cancer is the sixth commonest type of malignancy world wide\textsuperscript{1}. It accounts for approximately 4\% of all carcinomas in Britain\textsuperscript{2} and 40 to 50\% in Southern Asia including the Indian subcontinent\textsuperscript{3}. Head and neck cancers accounts for 7.9\% of patients admitted in Ear Nose and Throat Department Mulago Hospital \textsuperscript{4}. An average of 84 patients with biopsy proven head and neck cancers are seen in the Department of radiotherapy in Mulago Hospital each year \textsuperscript{5}.

A study carried out in Yemen by Nasr\textit{I} et al (2000), revealed that the most common anatomical site was found to be the oral cavity, followed by the nasopharynx and the larynx\textsuperscript{6}. In Mulago Hospital by comparison, the nasopharynx is the commonest anatomical site, followed by the oropharynx, paranasal sinuses and nasal cavities\textsuperscript{4}.

The stage of disease at diagnosis or at first presentation is based on UICC TNM staging. Study done in Uganda show that the majority of patients presented with advanced disease \textsuperscript{4}. Vernham and Crowther (1994) had similar results in their study\textsuperscript{7}. The commonest histological type is squamous cell carcinoma and is found in over 90\% of these tumors\textsuperscript{2,8,9}.

Treatment strategies for an individual patient with head and neck cancer are based on the site, stage and histology of the primary lesion at diagnosis. In the early stage of disease, surgery and radiotherapy are equally effective for some cancers, while in advanced stages of disease; a combination of surgery and radiotherapy or radiotherapy alone are the treatment usually offered\textsuperscript{10}.
Radiotherapy is the main treatment modality used in Mulago Hospital\textsuperscript{4}. Radiotherapy may either be curative or palliative. In curative treatment high dose radiotherapy is delivered with the purpose of killing all the malignant cells present. When used for palliative treatment for head and neck cancers the aim is to reduce the tumour size, the tumour growth rate and direct pressure effects of the tumour on surrounding structures such as pain, upper airway obstruction and neurological symptoms and as well as bleeding.

The Cobalt –60-teletherapy machines are used to deliver high-energy gamma rays for radiotherapy. This ionizing radiation is used to destroy malignant tissue while minimizing damage to normal tissues\textsuperscript{12}. When absorbed it causes selective damage to specific cells and their structures, through direct DNA destruction and formation of free radicals\textsuperscript{13}. Unfortunately during exposure, normal tissue surrounding the tumor is damaged leading to radiotherapy complications. These complications may call for interruption of treatment and may thus affect the treatment outcomes in these patients. They also exacerbate existing functional difficulties and may severely limit ‘normal’ life. The magnitude frequency and severity of the complications patients get during treatment is not known.

Complications of radiotherapy are categorized into early and late, local or systemic\textsuperscript{14}. The early complications to radiotherapy consist of rapid cessation of mitotic activity followed by cellular swelling and if the injury is lethal, dissolution. Small vessel oedema appears with endothelial swelling and thrombosis. The connective tissue becomes oedematous and congested with dilated lymphatic and small vessels. If the injury is severe enough, focal necrosis may occur. Subsequent changes include intimal thickening with obliteration of small vessels, fibrosis and hyalinization of vessel walls and connective tissues with permanent reduction of the epithelial and parenchymal cell population.
Significant pathophysiological effects of these changes are a reduction in the microcirculation (both vascular and lymphatic), loss of parenchyma tissue and proliferation of fibrous tissue. These changes are progressive and may continue for many years. For unclear reasons irradiated tissues are more susceptible to any type of injury, have reduced capacity to repair itself and are more vulnerable to infection. Examples of these tissues include epithelia and bone marrow. In head and neck irradiations, most affected areas are the skin and mucous membranes. Skin erythema is common due to surrounding skin vasodilation. This is followed by a second erythema, which appears after a few weeks of treatment. Injury to cells in the basal layer results in mitotic arrest, leading to dry desquamation of the skin. This progresses to moist desquamation then to ulceration and skin necrosis.

Mucosal reactions are similar to the skin reactions, beginning with erythema progressing to spotty mucositis, and then to areas of ulceration (analogous to moist desquamation). These may coalesce and be covered by a yellow diptheroid membrane that adheres to the underlying submucosa. This is known as radiation mucositis. Radiation of the secretory tissues like the thyroid and parathyroid glands may cause endocrine deficiencies while irradiation of the salivary glands will cause xerostomia.

Patients with hypopharyngeal and laryngeal tumours undergoing radiotherapy may develop laryngeal oedema and acute upper airway obstruction. Other acute local complications include otological complications like serous otitis media, sensorineural hearing loss and vestibular dysfunction. These have been observed when radiating metastatic neck disease, ear, and parotid and paranasal sinus tumours. Irradiation of the nasal cavity and paranasal sinus tumours may lead to development of sore throat and dysphagia. In treatment of carcinomas of the paranasal sinuses and orbital tumours, the eye is frequently irradiated. This leads to ocular complications, which
include retinopathy, injury to the optic nerve, keratoconjunctivitis, cataracts and injury to the lacrimal gland. High dose irradiation to the mandible may lead to osteoradionecrosis of the mandible\textsuperscript{17}.

Radiation causes tumor cell lysis leading to the release of cellular contents and toxins like tumour necrotic factor into the circulation. This leads to the development of systemic complications, which include nausea and vomiting, generalized malaise, body weakness and fatigue\textsuperscript{18}. Long-term complications on the other hand are seen in tissues with low cell turnover and in prominent functional compartment of cells that have retained the capacity for reversion to reproductive phase. These include necrosis such as radionecrosis and fistula formation\textsuperscript{18}.

The study was therefore undertaken to describe the magnitude, frequency and severity of the early complications among patients undergoing treatment for head and neck cancers. It is hoped that the results of this study will help in management of future patients.
1.2 PROBLEM STATEMENT, JUSTIFICATION, RESEARCH QUESTIONS AND OBJECTIVES

1.2.1 Statement of the problem

Head and neck cancer patients form a big proportion of patients in the E.N.T Department Mulago hospital. Majority of these patients present in advanced stage of disease and as a result palliative radiotherapy is the treatment of choice. Although it is intended for cure and relief of symptoms, it has complications. They limit local regional control, call for treatment interruptions and affect treatment outcomes in these patients. These complications exacerbate existing functional difficulties and severely limit 'normal life'. The magnitude, frequency and severity of complications of radiotherapy have not been documented. This study was therefore carried out to establish the magnitude frequency and severity of these complications.

1.2.2 Justification of the study

Mulago Hospital is the National Referral Hospital, and the main center for the treatment of head and neck cancers in Uganda. Radiotherapy is the main treatment modality for cancers of the head and neck. These patients develop complications as a result of treatment. The magnitude of this problem is however not known. This study will provide information on the magnitude, frequency and severity of complications of radiotherapy. The results of this study will contribute to the knowledge available on the early complications of radiotherapy of patients undergoing treatment for head and neck cancers at Mulago Hospital. The results will help design better treatment protocols with fewer complications for these patients.
1.2.3 Research questions

The study was conducted with the following research questions:

1. What are the early complications of radiotherapy seen in patients with head and neck cancers undergoing treatment?

2. What is the frequency of these complications?

3. What is the severity of these complications?

1.2.4 Objectives of the study

General Objective

To contribute to the knowledge available on the early complications of radiotherapy, in patients undergoing treatment for head and neck cancers, and make recommendations for their management.

Specific Objectives

The specific objectives of the study were:

1. To identify the early complications of radiotherapy in patients undergoing treatment for head and neck cancers.

2. To determine the frequency of these complications.

3. To determine the severity of the complications.
CHAPTER TWO

2.0 LITERATURE REVIEW

There are a few documented studies in the literature accessed.

Retrospective Studies

Lee et al in U.S.A (1998) carried out a retrospective study analysis of 88 patients, treated for head and neck cancers with accelerated radiation\(^\text{19}\). Results showed that 47% needed hospitalization for dehydration and complications of mucositis. However the percentage of those who had mucositis and were not hospitalized is unknown. Tumour complications that mimic radiotherapy complications were not put into consideration in this study.

Parson et al in Florida, U.S.A (1993), carried out a retrospective study of 419 patients, treated for cancer of the larynx and hypopharynx with hyperfractionated radiation\(^\text{20}\). Severe acute reactions were documented in 66(16%), patients. Tracheostomy was noted in 3 patients while 8 patients required hospitalization for hydration. There were 18(4%) severe complications of irradiation. These included 11 patients with cartilage, or bone necroses, 1 with esophageal stricture, 3 with severe laryngeal fibrosis and 3 with permanent gastrostomy for swallowing dysfunction. The incidence of the above complications is higher in hyperfractionated radiation compared to conventional radiotherapy. The complications are related to the primary site and fraction dose the patient receives.

In a retroprospective study conducted in France by Nyugen et al (1985), 72 Gy was delivered in 3.5 weeks in 178 patients with advanced squamous cell carcinoma of head and neck cancer\(^\text{21}\). They underwent rapid hyperfractionated radiotherapy. Severe
necrosis was noted in 23% of patients in the first six months. These complications are related to the increased frequency of smaller dose fractions delivered in a shorter time as compared to doses delivered in conventional radiotherapy. However the tumor stage primary site and other early complications were not documented in this study.

Results of a retrospective study, conducted by Stafford (1992) in Russia in 38 patients with malignant head and neck cancers receiving neutron therapy, demonstrated laryngeal oedema and upper airway obstruction. Significant airway obstruction was reported in 2(5.3%), patients, intractable dysphagia in 6(16%) and osteoradionecrosis in 8(21%). All the above patients underwent neutron therapy treatment. The incidence and severity of complications is related to the type of radiation delivered to the patients. However tumor stage and primary site were not documented in this study.

In another retrospective study by Zelesfesky(1992), (N=69), in patients with oropharyngeal carcinoma that had postoperative radiation the following complications were reported: delayed wound healing in 20% of the patients, osteoradionecrosis in 6% of patients and soft tissue ulceration in 2% of the patients. The stage of the oropharyngeal tumour was not documented. This could also affect the occurrence of the complications.

**Prospective Studies**

Chencharick et al (1993) in a prospective study of 74 head and neck cancer patients, determined the subjective changes of mouth dryness, loss of appetite and taste, dysphagia and weight changes before and at weekly intervals during therapy. He reported that 25% of patients were had oral complications prior to initiation of radiotherapy. By the end of therapy over 80% were aware of the oral and nutritional problems. The complications of malignant disease that can mimic radiotherapy complications were not considered in this study. The proportion of patients that developed the different individual complications was not reported. The specific sites of tumour were not documented either.
In prospective study by Merserside W(1999) (N=100), in England it was found that 57% of patients lost weight on commencement of therapy for head and neck cancers. However the individual causes of weight loss was not reported. Malignant diseases per se may cause weight loss. This was not taken into account. The anatomical sites of tumour were not documented in this study. Patients with tumours of the nasopharynx and base of the tongue are at risk of severe weight loss and dehydration because the tumours cause pain and difficulty in swallowing thus affecting total oral input. The proportion of patients with pretreatment weight loss was not reported either.

Bentzen SM et al(2001) in United Kingdom carried out a randomized control trial study of CHART (Continuous Hyper fractionated Accelerated Radiotherapy). He evaluated early morbidity items in 918 patients weekly for the first eight weeks. He found out that the incidence and peak prevalence in confluent mucositis was higher in CHART than after conventional radiotherapy. Other acute radiotherapy complications were not documented in this study.

Gava et al in Italy (1996) in a randomized controlled trial on 80 patients with head and neck cancers undergoing radiotherapy treatment, found mycotic mucositis in 30 of 39 patients without prophylactic mycotic treatment and 19 out of 40 patients who received radiotherapy and fluconazole. However malignant disease as well radiotherapy treatment can cause mycotic infections and this was not taken into consideration in this study. The anatomical sites of the tumour were not documented. Some sites are more prone to mycotic mucositis than others.
Study done in Uganda

The only study done in Uganda by Kigula (1998) was retrospective and not specific for head and neck cancer. He looked at radiotherapy complications experienced by patients with cancers of the different parts of the body using an orthovoltage x-ray machine.
CHAPTER THREE

3.0 METHODOLOGY

3.1 Study Design

This was a case series study with follow up of patients with histologically proven head and neck cancers undergoing radiotherapy during the treatment period.

3.2 Study setting

This study was conducted in the ENT and Radiotherapy departments, Mulago Hospital. ENT Department is the referral unit for most patients with head and neck cancers in Uganda. It is the main unit for assessment, diagnosis and follow up of these patients. Radiotherapy Department is the main center and only one for the treatment for head and neck cancers in Uganda. All the patients received treatment on a daily basis with a weekend break for the duration of treatment.

3.3 Study population

The study population was patients with histologically proven head and neck cancers, who were receiving radiotherapy.

3.4 Sampling procedure

Patients with histologically proven head and neck cancers and had been scheduled for radiotherapy, were recruited into the study consecutively, during the study period until the sample size was obtained.

3.5 Sample size estimation

The sample size for this study was calculated using the Kish and Leslie formula\textsuperscript{29}. The aim was to establish the frequency of early complications of radiotherapy in patients undergoing treatment for head and neck cancers. It was estimated that an average of eighty-four patients present with head and neck cancers in the Department radiotherapy annually\textsuperscript{3}. 
From observation, it was realized that up to 98% patients got mucositis complication during radiotherapy treatment.

The Sample size was therefore calculated as follows:

\[ n = \frac{K}{1 + \frac{K}{N}} \]

\( n \) was the sample size for the study.

Where \( N \) was the total number of patients who presented with head and neck cancers.

\( N = 84. \)

\( K = Z^2pq \)

\( d^2 \)

Where \( Z \) were the confidence limits at 95 % C.I. and \( Z = +1.96 \)

Where C.I. was the confidence interval

\( P = 98\% \) (was the estimated prevalence rate of the problem under study)

\( q = (100-p)\% = 2\% \)

\( d = 5\% \) (precision of estimation)

Then \( K = (1.96)^2(98)(2) \)

\( 5^2 \)

\( = 752.9536 = 30.12 \)

\( 25 \)

\( n = \frac{30.12}{1 + \frac{30.12}{84}} \)

\( n = 30.12 \)
Sample size was **22 Patients**.

Thirty patients were recruited in order to compensate for those who might have been lost during follow up.

### 3.6 Selection Criteria

#### a) Inclusion Criteria

All patients who met the following criteria were to be included in the study;

(i) Patients who were presented with histologically proven head and neck cancer and were scheduled for radiotherapy treatment.

(ii) Patients who consented to participate in the study.

#### b) Exclusion Criteria

(i) Patients who withdrew their consent.

(ii) Patients who had had previous radiotherapy for head and neck cancers.

### 3.7 Measurements

The categories of measurements below were taken:

Clinical variables included

a) Social demographic characteristics like age, gender, tribe, and occupation.

b) The clinical and pathological characteristics like, anatomical site of tumour, staging of disease and treatment modality.

c) The presence of general and local complications that included weight loss, skin and mucosal changes and nausea and vomiting, bone pain, nose bleeding, loss of appetite, loss of taste, were recorded. Other measurements include clinical features like partial or total hair loss, presence of nasal, ear and oral ulcers, candidiasis, dry mouth, upper airway obstruction, dysphagia, sensation of blockage and laryngitis.
The severity of the early complications of radiotherapy was subjectively assessed using a simple grading system (0-4). It was as follows:

a) Grade 0: no complication.

b) Grade 1: mild complication

c) Grade 2: moderate complication

d) Grade 3: severe complication

e) Grade 4: fatal complications leading to death.

3.8 Data Collection Technique

Patients with suspected head and neck cancer were identified from the ENT clinic, ENT ward and radiotherapy department. A detailed history was taken and a clinical examination carried out. A biopsy was taken for histological diagnosis and staging of disease was done at the same time. Patients confirmed with histological diagnosis scheduled for radiotherapy were recruited into the study and a pre radiotherapy assessment then carried out. This was followed by a weekly assessment during radiotherapy treatment for six weeks. During these assessments general and local complaints as attributable to radiotherapy were identified. The general and local examination of the ear, nose and throat region were done. All patients were interviewed, examined and investigated by the principal investigator, under validation. The frequency of the complications was determined and a simple scoring criteria was used to grade the severity of these complications. All the information was recorded on a data collection form (Appendix III).

3.9 Quality Control

The questionnaire was pre-tested before commencement of the study and the appropriate modifications were made before data entry in order to minimize errors. This was done to ensure the internal validity of the study. Raw data was securely stored and none was lost during the study.
3.10 Data Management

The quantitative data was checked for completeness, consistency and accuracy. The raw data was sorted and entered into the computer using EPI-INFO and analyzed using SPSS computer programme with help of a statistician.

Frequency tables, proportions and graphs were used to summarize the quantitative data and were presented in forms of means and percentages for continuous variables. Linear regressions were used in trend analysis of the complications in these patients.

3.11 Ethical Considerations.

Consent to carry out the study was sought from the Ear, Nose and Throat and Radiotherapy departments, Faculty of Medicine Research Committee, Mulago Hospital and National Council of Science and Technology. Informed consent was obtained from the patients before being included in the study.

3.12 Dissemination of results

Copies of the dissertation will be availed to the following places: Ear Nose and Throat Department, Albert Cook Library and School of Postgraduate Studies, Makerere University. The study results will also be availed for publications and presentations at seminars and conferences.
CHAPTER FOUR: STUDY RESULTS

During the 4-month period, a total of 30 cases with histologically proven head and cancers scheduled for radiotherapy were identified. All the patients had been admitted on the ENT ward. The purpose of the study was to determine the frequency and severity of the early radiotherapy complications. There were 18 males (60%) and 12 females (40%). The main treatment modality was Radiotherapy (93.3%) in majority of cases. The remaining 6.7% had a combination of radiotherapy and surgery.

4.1 AGE DISTRIBUTION

Table 1 shows age distribution of the patients. The majority of the patients were between 51-60 years of age (23%) followed by 21-30 years (20%). The youngest was 13 years of age and eldest was 86 years of age. The mean age was 48 years, the median was 50 years and the mode was 60 years.

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-20</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>21-30</td>
<td>6</td>
<td>20.0</td>
</tr>
<tr>
<td>31-40</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>41-50</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>51-60</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>61-70</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td>71-80</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>80+</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>

4.2 DISTRIBUTION BY TRIBE

Distribution of cancer cases by tribe is shown in Table 2. Baganda formed the biggest number (26.7%) followed by Banyankole (13.3%), Banyole (6.7%), Basoga (6.7%), Iteso
(6.7%) and Bagisu (6.7%). Among those shown, as “others” were those tribes with one case. These include the following tribes: Acholi, Karamojong, Lugbara, Luo, Mufumbira, Munyoro, Mutoro, Nubian, and Nyarwanda.

Table 2: Distribution by Tribe.

<table>
<thead>
<tr>
<th>Tribe</th>
<th>Frequency</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baganda</td>
<td>8</td>
<td>26.7</td>
</tr>
<tr>
<td>Banyankole</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Bagisu</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Banyole</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Basoga</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Iteso</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Others</td>
<td>10</td>
<td>33.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.3 DISTRIBUTION BY DISTRICT OF ORIGIN

Table 3 shows district of origin. The majority of patients came from Luwero district followed by Kampala and Mbale districts. Soroti and Kiboga districts had 2 cases each. The districts included in “others”, each had one case: Arua, Bugiri, Bushenyi, Kayunga, Kibaale, Kyenjojo Lira, Masaka, Masindi, Mbarara, Mubende, Mukono, Nakapiripiti, Ntungamo, Tororo, and Wakiso.
Table 3: Distribution by District of origin

<table>
<thead>
<tr>
<th>District</th>
<th>Frequency</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luwero</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Kampala</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>Mbale</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>Kiboga</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Soroti</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Others</td>
<td>16</td>
<td>52.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.4 DISTRIBUTION BY OCCUPATION

Distribution of the cancer cases by occupation is shown in Table 4. The peasants formed the majority of cases, 16 (53.3%), followed by Businessmen, 6 (20.0%).

Table 4: Distribution by Occupation

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Frequency</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peasants</td>
<td>16</td>
<td>53.3</td>
</tr>
<tr>
<td>Business</td>
<td>6</td>
<td>20.0</td>
</tr>
<tr>
<td>House wife</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Self-employed</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Student</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Pupil</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Driver</td>
<td>1</td>
<td>3.3</td>
</tr>
</tbody>
</table>

**Total**     | **30**    | **100**     |
4.5 DISTRIBUTION BY ANATOMICAL REGION

Case distribution by anatomical region is shown in Table 5. The nasopharynx with 10 (33.3%) of the cases was the commonest region, followed by paranasal sinus 5 (16.7%) and hypopharynx, larynx together with oropharynx, 4 (13.3%) each. There were two cases of metastatic carcinoma of cervical lymph node as occult primary. The oral cavity had the lowest number of cases, 1 (3%).

<table>
<thead>
<tr>
<th>Anatomical Site</th>
<th>Frequency</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasopharynx</td>
<td>10</td>
<td>33.3</td>
</tr>
<tr>
<td>Paranasal Sinuses</td>
<td>5</td>
<td>16.7</td>
</tr>
<tr>
<td>Hypopharynx</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Larynx</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>External Neck</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Oral cavity</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

4.6 STAGING

According to the Table 6, majority of cancer cases were in stage IV, (83.3%), followed by stage III (10%) and stage II was the least with (3.3%).

<table>
<thead>
<tr>
<th>Staging</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not known</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Stage II</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Stage III</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>Stage IV</td>
<td>25</td>
<td>83.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
4.7 RADIOTHERAPY COMPLICATIONS

The summary of general and local complications are shown in the Table 7. Majority 98%, patients and 98.6% developed general and local complications respectively. Oral complication with 98.3% of patients was the commonest oral complication while ear with 67.8% was the least frequent.

TABLE 7 Summary of the radiotherapy complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>% of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) General</td>
<td>98.3</td>
</tr>
<tr>
<td>(2) Local</td>
<td></td>
</tr>
<tr>
<td>(a) Oral</td>
<td>98.3</td>
</tr>
<tr>
<td>(b) Hypopharyngeal and laryngeal</td>
<td>93.7</td>
</tr>
<tr>
<td>(c) Nasal</td>
<td>71.8</td>
</tr>
<tr>
<td>(d) Eye</td>
<td>69.5</td>
</tr>
<tr>
<td>(e) Ear</td>
<td>67.8</td>
</tr>
</tbody>
</table>

4.7.1 General complications

(a) Frequency of the general complications

The frequency of the general complications for patients undergoing treatment for head and neck cancers are shown in table 8. General malaise and weight loss were the commonest complications with a frequency of 28 (93.3%) patients, each. They were followed by loss of appetite 27 (90%); skin hyper pigmentation and pallor had a frequency of 26 (87.6%), each. Nausea and vomiting was the least frequent complication 12 (40%).
TABLE 8: Frequency of the general radiotherapy complications

<table>
<thead>
<tr>
<th>General Complications</th>
<th>Frequency (n=30)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) General malaise</td>
<td>28</td>
<td>93.3</td>
</tr>
<tr>
<td>(b) Weight loss</td>
<td>28</td>
<td>93.3</td>
</tr>
<tr>
<td>(c) Loss of appetite</td>
<td>27</td>
<td>90</td>
</tr>
<tr>
<td>(d) Skin hyperpigmentation</td>
<td>26</td>
<td>86.7</td>
</tr>
<tr>
<td>(e) Pallor</td>
<td>26</td>
<td>86.7</td>
</tr>
<tr>
<td>(f) Bone tenderness</td>
<td>16</td>
<td>53.3</td>
</tr>
<tr>
<td>(g) Alopecia</td>
<td>16</td>
<td>53.3</td>
</tr>
<tr>
<td>(h) Nausea and vomiting</td>
<td>12</td>
<td>40</td>
</tr>
</tbody>
</table>

(b) Severity of the general complications

The severity of the radiotherapy complications was recorded using a simple grading system: where none scored 0, mild scored 1, moderate scored 2. Severe scored 3 and these patients were in a life threatening condition and required surgery, hospitalization or other interventions. Fatal scored 4 and patients died due to the complications.

Table 9 shows the severity levels of the general complications. It shows the highest ever achieved score for each of the patients that underwent treatment and had complication in question during the six weeks of treatment. Among the patients who had general malaise, 13 (46.4%), patients scored 3, 11 (39.3%) scored 2 and 4 (14.3%), scored 1. Of those who had nausea and vomiting, 5(41.7%), patients scored 1, 4 (33.3%) scored 2 and 3 (25%) scored 1. Score 2 with 14 (53.8%) patients, was the commonest, followed by score1 with 8(30.8%), and score 3 with 4 (15.4%), in those who had pallor. Out of 16 patients who had bone pain, 8 (50%) scored 2, 6 (37.5%) scored 1 and 4 (15.4%) scored 3. Severity score 2 and score 3 had 12 (46.2%), patients each; among those who had loss of appetite and 2 (7.7%) of patients scored 1. Out of 28 patients who had weight loss, 12 (42.9%)
scored 2 and 8(28.6%) patients each scored 1 and 3. severity score 3 formed the majority of the patients, 17 (65.4%) with skin hyperpigmentation, followed by score 2, 7(26.9) and score 1 with 2 (7.7%). Of those who had alopecia, 8(50%) patients, scored 3, 6(37.5%) scored 2 and 2 (12.5%) scored 1.

Table 9: Severity of the general complications

<table>
<thead>
<tr>
<th>General complications</th>
<th>Highest ever achieved score of severity of general complications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 %</td>
</tr>
<tr>
<td>(a) General malaise</td>
<td>14.3</td>
</tr>
<tr>
<td>(b) Nausea and vomiting</td>
<td>41.7</td>
</tr>
<tr>
<td>(c) Pallor (n=26)</td>
<td>30.8</td>
</tr>
<tr>
<td>(d) Bone tenderness (n=16)</td>
<td>37.5</td>
</tr>
<tr>
<td>(e) Loss of appetite (n=27)</td>
<td>3.7</td>
</tr>
<tr>
<td>(f) Weight loss (Kg): (n=28)</td>
<td>28.6</td>
</tr>
<tr>
<td>(g) Skin Hyper pigmentation (n=26)</td>
<td>7.7</td>
</tr>
<tr>
<td>(h) Alopecia (n=16)</td>
<td>12.5</td>
</tr>
</tbody>
</table>

(c) Trends of the general complications

The severity of the early complications was expressed as the maximum-recorded grades. The time intensity of these complications was expressed as the area under the curve of the graph of severity grade verses time. The severity trend is the linear regression coefficient of the complication against time. Using 2-tailed t-test, the t value was obtained and it is significant when it is above 2. $R^2$ (Coefficient of determination) indicates how much the dependent variable is explained by time in weeks. In this study the trend visa-a-vie severity of the radiotherapy complications was interpreted as indicated in the table below.
TABLE 10  Trend vis-a-vie severity of complication

<table>
<thead>
<tr>
<th>Index</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 0</td>
<td>Improvement (Remission)</td>
</tr>
<tr>
<td>0-0.25</td>
<td>slow worsening</td>
</tr>
<tr>
<td>0.26-0.5</td>
<td>moderate worsening</td>
</tr>
<tr>
<td>0.6-1</td>
<td>fast worsening</td>
</tr>
<tr>
<td>&gt; 1</td>
<td>rapid worsening</td>
</tr>
</tbody>
</table>

Table 11 below shows six weeks severity trends (progress) of the general complications. Skin hyperpigmentation, bone tenderness, pallor, alopecia and loss of appetite rapidly worsened across the period of six weeks. General malaise, weight loss and nausea and vomiting fast worsened across the above period.

Table 11: Severity trends for the general complications

<table>
<thead>
<tr>
<th>Complications</th>
<th>Severity Trend</th>
<th>Standard error</th>
<th>t</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin hyperpigmentation</td>
<td>1.1917</td>
<td>0.0721</td>
<td>16.52</td>
<td>0.6393</td>
</tr>
<tr>
<td>Bone tenderness</td>
<td>1.1687</td>
<td>0.1422</td>
<td>8.22</td>
<td>0.3090</td>
</tr>
<tr>
<td>Pallor</td>
<td>1.1317</td>
<td>0.1565</td>
<td>7.23</td>
<td>0.2638</td>
</tr>
<tr>
<td>Alopecia</td>
<td>1.1169</td>
<td>0.0858</td>
<td>13.02</td>
<td>0.5239</td>
</tr>
<tr>
<td>Loss of appetite</td>
<td>1.0629</td>
<td>0.1163</td>
<td>9.14</td>
<td>0.3640</td>
</tr>
<tr>
<td>General malaise</td>
<td>0.9877</td>
<td>0.1158</td>
<td>8.53</td>
<td>0.3328</td>
</tr>
<tr>
<td>Weight loss</td>
<td>0.8155</td>
<td>0.1262</td>
<td>6.46</td>
<td>0.2224</td>
</tr>
<tr>
<td>Nausea and vomiting</td>
<td>0.8126</td>
<td>0.1158</td>
<td>8.53</td>
<td>0.2414</td>
</tr>
</tbody>
</table>

(d) Trends of severity of general malaise.

Figure 1 below shows the trends (progress) of severity of complications across the period of 6 weeks. General malaise moderately worsened across the period of 6 weeks.
(e) **Trend of severity of nausea and vomiting**

Figure 2 shows the trends (progress) of severity of nausea and vomiting across the period of 6 weeks. Nausea and vomiting slowly worsened across the period of 6 weeks. There was a very slight increase in the severity of nausea and vomiting later in the course of radiotherapy.

(f) **Trend of severity of skin hyperpigmentation**

Figure 3 below shows the trend (progress) of severity of skin hyperpigmentation across the period of 6 weeks. Skin hyperpigmentation fast worsened across the period of 6 weeks. There was a significant increase in the severity of skin pigmentation later in the course of radiotherapy.
Figure 3: Six weeks trend for skin hyperpigmentation

4.7.2 LOCAL COMPLICATIONS

Patients developed multiple local complications. Amongst the local complications experienced by the patients, oral complications were the commonest followed by hypopharynx and laryngeal, nasal and eye complications in that order. Ear complications were the least frequent.

(a) Frequency of the oral complications

The frequency of the oral complications for patients undergoing treatment for head and neck cancers are shown in Table 12. Xerostomia was the commonest oral complications with frequency of 29 (96.7%), patients, followed by oral mucositis, loss of taste and odynophagia with frequency of 28 (93.3%), each. Candidiasis 17 (56.7%) was the least frequent complication.
### Table 12: Frequency of the oral complications.

<table>
<thead>
<tr>
<th>Oral Complications</th>
<th>Frequency (n=30)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xerostomia</td>
<td>29</td>
<td>96.7</td>
</tr>
<tr>
<td>Oral Mucositis</td>
<td>28</td>
<td>93.3</td>
</tr>
<tr>
<td>Loss of taste</td>
<td>28</td>
<td>93.3</td>
</tr>
<tr>
<td>Pulpitis</td>
<td>24</td>
<td>80</td>
</tr>
<tr>
<td>Gingivitis</td>
<td>24</td>
<td>80</td>
</tr>
<tr>
<td>Odynophagia</td>
<td>28</td>
<td>93.3</td>
</tr>
<tr>
<td>Candidiasis</td>
<td>17</td>
<td>56.7</td>
</tr>
<tr>
<td>Dental Caries</td>
<td>21</td>
<td>70</td>
</tr>
</tbody>
</table>

#### (b) Severity of the oral complications

Table 13 shows the severity levels of the oral complications. It shows the highest ever achieved score for each of the patients that underwent treatment and had complication in question during the six weeks of treatment. Among those who had xerostomia, 19 (65.5%), patients scored 3, 8 (27.6%) scored 2 and 2 (6.9%), scored 1. Of those who had oral mucositis, 19(67.9%), patients scored 3, 8 (28.6%) scored 2 and 1 (3.6%) scored 1 respectively. Severity score 3 with 17 (60.7%) patients, was the commonest, followed by score 2 with 11(39.3%), in those who had loss of taste. Out of 24 patients who had pulpitis, 12(50%), scored 3, 8 (33.3%) scored 2 and 4 (16.7%) scored 1. Severity score 2 had 11 (45.8%), patients, score3 had 10 (41.7%), and score 1 had 3(12.5%); among those who had gingivitis. Out of 28 patients who had odynophagia, 19(67.9%) scored 3, 8(28.6%) scored 2, and 1 (3.6%) scored 1. Severity score 1 with 11 (64.7%) patients, was the commonest, followed by score 2 and score 3, with 3 (17.6%) each in those who had candidiasis, Out of 21 patiets who had dental caries, 10(47.6%), scored 1, 8(38.1%) scored 2 and 3(14.3%) scored 3.
Table 13  Severity of the oral complications

<table>
<thead>
<tr>
<th>Oral Complications</th>
<th>Highest ever achieved score of severity of complications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 %</td>
</tr>
<tr>
<td>Xerostomia (n=29)</td>
<td>6.9</td>
</tr>
<tr>
<td>Oral Mucositis (n=28)</td>
<td>3.6</td>
</tr>
<tr>
<td>Loss of taste (n=28)</td>
<td>0</td>
</tr>
<tr>
<td>Pulpitis (n=24)</td>
<td>16.7</td>
</tr>
<tr>
<td>Gingivitis (n=10)</td>
<td>12.5</td>
</tr>
<tr>
<td>Odynophagia (n=28)</td>
<td>3.6</td>
</tr>
<tr>
<td>Candidiasis (n=17)</td>
<td>64.7</td>
</tr>
<tr>
<td>Dental Caries (n=21)</td>
<td>47.6</td>
</tr>
</tbody>
</table>

(c) Severity trend of the oral complications

The table below shows the trends (progress) of the oral complications. Pulpitis, gingivitis, loss of taste and odynophagia rapidly worsened across the period of six weeks. Xerostomia, oral mucositis, dental caries and candidiasis fast worsened across the above period.

Table 14  Severity trend for oral complications

<table>
<thead>
<tr>
<th>Oral complications</th>
<th>Severity trend</th>
<th>Standard error</th>
<th>t-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulpitis</td>
<td>1.1639</td>
<td>0.1018</td>
<td>11.44</td>
<td>0.4777</td>
</tr>
<tr>
<td>Gingivitis</td>
<td>1.1245</td>
<td>0.1050</td>
<td>10.72</td>
<td>0.4455</td>
</tr>
<tr>
<td>Loss of taste</td>
<td>1.1135</td>
<td>0.1019</td>
<td>10.93</td>
<td>0.4551</td>
</tr>
<tr>
<td>Odynophagia</td>
<td>1.0647</td>
<td>0.1216</td>
<td>8.75</td>
<td>0.3489</td>
</tr>
<tr>
<td>Xerostomia</td>
<td>0.9914</td>
<td>0.1003</td>
<td>9.89</td>
<td>0.4009</td>
</tr>
<tr>
<td>Oral mucositis</td>
<td>0.9832</td>
<td>0.1001</td>
<td>9.82</td>
<td>0.4027</td>
</tr>
<tr>
<td>Dental caries</td>
<td>0.9274</td>
<td>0.1229</td>
<td>7.47</td>
<td>0.2671</td>
</tr>
<tr>
<td>Candidiasis</td>
<td>0.9178</td>
<td>0.3119</td>
<td>7.03</td>
<td>0.2647</td>
</tr>
</tbody>
</table>
Trend of severity of xerostomia

Figure 4 below shows the trend (progress) of severity of xerostomia across the period of 6 weeks. Xerostomia moderately worsened across the period of 6 weeks. There was a gradual increase in the severity of xerostomia later in the course of radiotherapy.

Figure 4: Six weeks trend for xerostomia

Trend of severity of oral mucositis

Figure 5 below shows the trend (progress) of severity of oral mucositis across the period of 6 weeks. Oral mucositis moderately worsened across the period of 6 weeks. There was a gradual in the severity of oral mucositis later in the course of radiotherapy.

Figure 5: Six weeks trend for oral mucositis
Figure 6 below shows the trend (progress) of severity of candidiasis across the period of 6 weeks. Candidiasis slowly worsened across the period of 6 weeks. There was a very slight increase in the severity of candidiasis later in the course of radiotherapy.

\[ y = 0.1635x + 0.1433 \quad R^2 = 0.2225 \]

**Figure 6: Six Weeks Trend For Candidiasis.**

*(g) Frequency of the hypopharyngeal and laryngeal complications*

The frequency of the hypopharyngeal and laryngeal complications for patients undergoing treatment for head and neck cancers are shown in Table 15. Dysphagia with 29 (6.7%), patients, was the most frequent followed by laryngitis 14 (46.7%), sensation of obstruction 11 (36.7%), and upper airway obstruction 9 (30%), respectively.

**Table 15: Frequency of the hypopharyngeal and laryngeal complications**

<table>
<thead>
<tr>
<th>Hypopharynx And Larynx complications</th>
<th>Frequency (n=30)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysphagia</td>
<td>29</td>
<td>96.7</td>
</tr>
<tr>
<td>Pharyngeal mucositis</td>
<td>27</td>
<td>90</td>
</tr>
<tr>
<td>Laryngitis</td>
<td>14</td>
<td>46.7</td>
</tr>
<tr>
<td>Sense of obstruction</td>
<td>11</td>
<td>36.7</td>
</tr>
<tr>
<td>Upper airway obstruction</td>
<td>9</td>
<td>30</td>
</tr>
</tbody>
</table>
(h) **Severity of hypopharyngeal and laryngeal complications**

Table 16 shows the severity levels of the hypopharyngeal and laryngeal complications. It shows the highest ever achieved score for each of the patients that underwent treatment and had complication in question during the six weeks of treatment. Among those who had dysphagia, 23 (79.3%), patients scored 3, 5 (17.2%) scored 2, and 1 (3.4%), scored 1. Of the 11 patients who had sensation of blockage, 4 (36.4%), patients scored 3, 3 (27.3%) each scored 2 and 1 (9.1%) patient scored 4. One patient with score 4 (9.1%), had advanced oropharyngeal tumour and developed severe blockage, laryngngeal oedema and upper airway obstruction. On fifth day of treatment and died on her way to theatre for a tracheostomy. Severity score 3 with 5 (35.7%) patients, was the commonest, followed by score 2 and score 1 with 4 (28.6%) each, in those who had laryngitis. Severity score 4 was the least common with 1 (7.1%). Out of 27 patients who had pharyngeal mucositis, 19 (70.4%) scored 3, 5 (16.7%) scored 2 and 3 (10.0%) scored 1. Out of 9 patients who had upper airway obstruction, 4 (44.4%), scored 1, 3 (33.3%) scored 3 and 1 (11.1%) each of patients scored 1 and 4.

**Table 16**

<table>
<thead>
<tr>
<th>Hypopharynx and complications</th>
<th>Larynx</th>
<th>Highest ever achieved score of severity of complications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 %</td>
<td>2 %</td>
</tr>
<tr>
<td>Dysphagia (n=29)</td>
<td>3.4</td>
<td>17.2</td>
</tr>
<tr>
<td>Sense of obstruction (n=11)</td>
<td>27.3</td>
<td>27.3</td>
</tr>
<tr>
<td>Laryngitis (n=14)</td>
<td>28.6</td>
<td>28.6</td>
</tr>
<tr>
<td>Pharyngeal mucositis (n=27)</td>
<td>11.1</td>
<td>18.5</td>
</tr>
<tr>
<td>Upper Airway obstruction n=9</td>
<td>44.4</td>
<td>11.1</td>
</tr>
</tbody>
</table>
(i) Severity trends of the hypopharyngeal and laryngeal complications

The table below shows the trend (progress) of the hypopharyngeal and laryngeal complications in a period of six weeks. Dysphagia and pharyngeal mucositis rapidly worsened while sensation of obstruction upper airway obstruction and Laryngitis fast worsened across the above period.

Table 17: Severity trend of the hypopharyngeal and laryngeal complications.

<table>
<thead>
<tr>
<th>Hypopharyngeal complications</th>
<th>Severity trend</th>
<th>Standard error</th>
<th>t-value</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dysphagia</td>
<td>1.0376</td>
<td>0.1026</td>
<td>10.10</td>
<td>0.4115</td>
</tr>
<tr>
<td>Pharyngeal mucositis</td>
<td>1.1336</td>
<td>0.1013</td>
<td>11.19</td>
<td>0.4631</td>
</tr>
<tr>
<td>Sensation of obstruction</td>
<td>0.7866</td>
<td>0.1172</td>
<td>6.71</td>
<td>0.2321</td>
</tr>
<tr>
<td>Upper airway obstruction</td>
<td>0.7758</td>
<td>0.1224</td>
<td>6.34</td>
<td>0.2125</td>
</tr>
<tr>
<td>Laryngitis</td>
<td>0.6960</td>
<td>0.1107</td>
<td>6.29</td>
<td>0.2032</td>
</tr>
</tbody>
</table>

(j) Trend of severity of dysphagia

Figure 7 below shows the trend (progress) of severity of dysphagia across the period of 6 weeks. Dysphagia moderately worsened across the period of 6 weeks. There was a gradual increase in the severity of dysphagia later in the course of radiotherapy.

Figure 7: Six Weeks Trend For Dysphagia.
(k) **Trend of severity of pharyngeal mucositis**

Figure 8 below shows the trend (progress) of severity of pharyngeal mucositis across the period of 6 weeks. Pharyngeal mucositis worsened across the period of 6 weeks. There was a significant increase in the severity of pharyngeal mucositis later in the course of radiotherapy.

\[ y = 0.3635x + 0.8969 \quad R^2 = 0.4654 \]

**Figure 8: Six weeks trend for pharyngeal mucositis**

(l) **Trend of severity of upper airway obstruction**

Figure 9 below shows the trend (progress) of severity of upper airway obstruction across the period of 6 weeks. Upper airway obstruction slowly worsened across the period of 6 weeks. There was a very slight increase in the severity of upper airway obstruction later in the course of radiotherapy.

\[ y = 0.0323x + 1.4062 \quad R^2 = 0.0031 \]

**Figure 9: Six weeks trend for upper airway obstruction**
(m) Frequency of the ear complications

The frequency of the ear complications for patients undergoing treatment for head and neck cancers are shown in Table 18. Otitis externa was the most frequent with 10 (33.3%) patients, followed by otitis media 4 (13.3%), sensorineural 2 (6.7%), and tinnitus 1 (3.3%), respectively.

<table>
<thead>
<tr>
<th>Ear Complications</th>
<th>Frequency (n= 30)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otitis Externa</td>
<td>10</td>
<td>33.3</td>
</tr>
<tr>
<td>Otitis Media</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Sensorineural hearing</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Sensorineural loss</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tinnitus</td>
<td>1</td>
<td>3.3</td>
</tr>
</tbody>
</table>

(n) Severity of the ear complications

Table 19 shows the severity levels of the severity of the ear complications. It shows the highest ever achieved score for each of the patients that underwent treatment and had complication in question during the six weeks of treatment. Among those who had otitis externa, 6 (60.0%), patients scored 3 and 4 (40.0%), scored 2. Of those who had otitis media, 2 (50.0%), patients scored 3, 1 (25.0%) each scored 2 and 1. All 2 (100%) patients with sensorineural hearing loss scored of 3.

<table>
<thead>
<tr>
<th>Ear Complications</th>
<th>Highest ever achieved score of severity of complications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 %</td>
</tr>
<tr>
<td>Otitis Externa (n=10)</td>
<td>0</td>
</tr>
<tr>
<td>Otitis Media (n=4)</td>
<td>25.0</td>
</tr>
<tr>
<td>Sensorineural Hearing loss (n=2)</td>
<td>0</td>
</tr>
</tbody>
</table>
(o) **Severity trends of the ear complications**

Table 20 shows the severity trends of the ear complications across the period of six weeks. All the ear complications fast worsened across the above period.

<table>
<thead>
<tr>
<th>Ear Complications</th>
<th>Severity trend</th>
<th>Standard error</th>
<th>t-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Otitis Externa</td>
<td>1.2062</td>
<td>0.0768</td>
<td>15.70</td>
<td>0.6109</td>
</tr>
<tr>
<td>Otitis Media</td>
<td>1.1711</td>
<td>0.0820</td>
<td>14.28</td>
<td>0.5602</td>
</tr>
<tr>
<td>Tinnitus</td>
<td>1.0423</td>
<td>0.0890</td>
<td>11.71</td>
<td>0.4616</td>
</tr>
<tr>
<td>Sensorineural hearing loss</td>
<td>1.0001</td>
<td>0.0894</td>
<td>11.18</td>
<td>0.4384</td>
</tr>
</tbody>
</table>

(P) **Frequency of the nasal complications**

The frequency of the nasal complications for patients undergoing treatment for head and neck cancers are shown in Table 21. Epistaxis and anosmia with 7 (23.3%), patients each were the most frequent followed by rhinosinusitis 6 (20%), and nasal ulcers 4 (13.3%), respectively.

**Table 21: Frequency of the nasal complications**

<table>
<thead>
<tr>
<th>Nasal Complications</th>
<th>Frequency out of 30</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal ulcers</td>
<td>4</td>
<td>13.3</td>
</tr>
<tr>
<td>Rhinosinusitis</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Epistaxis</td>
<td>7</td>
<td>23.3</td>
</tr>
<tr>
<td>Anosmia</td>
<td>7</td>
<td>23.3</td>
</tr>
</tbody>
</table>

(q) **Severity of the nasal complications**

Table 22 shows the severity levels of the nasal complications. It shows the highest ever achieved score for each of the patients that underwent treatment and had complication in question during the six weeks of treatment. Among those who had nasal ulcers, 3 (75%), patients scored 2, and 1 (25%), scored 3. Of those who had rhinosinusits, 3(50.0%),
patients scored 2, 2(33.3%) scored 1 and 1(16.7%) scored 3. Severity score 1 with 4 (57.1%) patients, was the commonest, followed by score 2, with 2(28.6%) and score 3, with 1(14.3), in those who had epistaxis. Out of 7 patients who had anosmia, 3 (42.9 %) scored 1, and 2 (28.6%) each, scored 2 and 3.

<table>
<thead>
<tr>
<th>Table 22: Severity of the nasal complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal Complications</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Nasal ulcers (n=4)</td>
</tr>
<tr>
<td>Rhinosinusitis (n=6)</td>
</tr>
<tr>
<td>Epistaxis (n=7)</td>
</tr>
<tr>
<td>Anosmia (n=7)</td>
</tr>
</tbody>
</table>

(r) Severity trends of the nasal complications

Table 23 shows the severity trends of nasal complications. Nasal ulcers, rhinosinusitis and epistaxis rapidly worsened while anosmia and xerostomia fast worsened across the six weeks period.

<table>
<thead>
<tr>
<th>Table 23: Severity trends of the nasal complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nasal complications</td>
</tr>
<tr>
<td>Nasal ulcers</td>
</tr>
<tr>
<td>Rhinosinusitis</td>
</tr>
<tr>
<td>Epistaxis</td>
</tr>
<tr>
<td>Anosmia</td>
</tr>
<tr>
<td>Xerostomia</td>
</tr>
</tbody>
</table>
(s) Frequency of the eye complications

The frequency of the eye complications for patients undergoing treatment for head and neck cancers are shown in Table 24. Conjunctivitis and Keratitis with 3 (10.0%) patients each were the most frequent followed by retinopathy 2 (6.7%).

<table>
<thead>
<tr>
<th>Eye Complications</th>
<th>Frequency (n= 30)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctivitis</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Keratitis</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Retinopathy</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Xerophthalmia</td>
<td>1</td>
<td>3.3</td>
</tr>
</tbody>
</table>

(t) Severity of the eye complications

Table 25 shows the severity levels of the eye complications. The tables below show the highest ever achieved score for each of the patients that underwent treatment and had complication in question during the six weeks of treatment. Among those who had conjunctivitis, 2 (66.7%), patients scored 2, and 1 (33.3%), scored 1. Of those who had keratitis, all 2(100%), patients scored 1. The only patient with xerophthalmia scored 1 and the only 2 patients with retinopathy, scored 3.

<table>
<thead>
<tr>
<th>Eye complications</th>
<th>Highest ever achieved score of severity of complications</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 %</td>
<td>2 %</td>
</tr>
<tr>
<td>Conjunctivitis (n=3)</td>
<td>33.3</td>
<td>66.7</td>
</tr>
<tr>
<td>Keratitis (n=2)</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Xerophthalmia (n=1)</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
(t) **Severity trend of the eye complication**

Table 25 shows the severity trend eye complications. Conjunctivitis, xeropthalmia and keratitis fast worsened while slowly worsened across the six week period.

**Table 25 Severity trend of the eye complications**

<table>
<thead>
<tr>
<th>Eye Complications</th>
<th>Severity trend</th>
<th>Standard error</th>
<th>t-value</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctivitis</td>
<td>1.1177</td>
<td>0.1008</td>
<td>11.08</td>
<td>0.4535</td>
</tr>
<tr>
<td>Xeropthalmia</td>
<td>1.1638</td>
<td>0.0980</td>
<td>11.87</td>
<td>0.4927</td>
</tr>
<tr>
<td>Keratitis</td>
<td>1.0919</td>
<td>0.1035</td>
<td>10.55</td>
<td>0.4293</td>
</tr>
<tr>
<td>Retinopathy</td>
<td>0.8810</td>
<td>0.1085</td>
<td>8.12</td>
<td>0.3041</td>
</tr>
</tbody>
</table>
CHAPTER FIVE

5.1 DISCUSSION

Head and neck cancers are the sixth commonest type of malignancy worldwide\(^1\). They account for 7.9\% of patients admitted in the Ear, Nose and Throat Department. An average of eighty-four patients with head and neck cancers is seen annually in the radiotherapy Department\(^2\). Most of these patients present late and palliative Radiotherapy is offered as treatment of choice. There is no documentation of these complications in Mulago Hospital. The purpose of this study was to describe the early complications of these patients undergoing treatment for head and neck cancers and determine their frequency and severity. Thirty patients with histologically proven head and neck cancers were recruited and received standard conventional radiotherapy.

Males formed the big proportion of patients (m=60\%, f=40\%). This could be due to the fact that most of the ENT cancers are diseases of lifestyle. Smoking and alcohol are risk factors to acquiring cancers of the oral cavity, pharynx and larynx. A similar trend was found an earlier study done by Tumwirize\(^4\). Luwero district had the most number of cases followed by Kampala and Mbale District. This was different from a study done by Tumwirize\(^4\) where Kampala district had the highest number of patients. Another possible reason could be the earlier study done was a retrospective one where records were used to extract the information while this one was prospective and information was got directly from patients.

The biggest number of study patients were Baganda. This is consistent with an earlier study done by Tumwirize\(^4\) at Mulago. It also matches with the ethnic composition of
catchment districts. Satisfactory explanations could not be got but the possible explanations include: proximity from Mulago Hospital, economic status of the patients with cancer and accessibility to the radiotherapy unit.

More than three quarter of patients presented with stage IV of disease and palliative radiotherapy was offered. This is in agreement with studies done by Vernham and Crowthwer 7 and Tumwikirize 4. The cause of presenting late could be attributed to the accessibility to the referral health services. Many of these patients are of a low social economic status and tend to seek medical services late. There could also be due to a poor referral system in the peripheral health units.

These patients were generally of low social economic status; 53% were peasants, 26.7% were businessmen. A similar trend was observed in other studies by Nasr et al 6 in Yemen, and by Tumwikirize 4 in Uganda. Peasant farmers form 80% of population in Uganda. The results are not representative of the social economic pattern of the country and one would have expected a higher percentage. A country survey could have given a better picture. A low social economic status and no access to medical treatment could have contributed to the above figures.

The peak age group was 51-60years. This age group is at risk for head and neck cancers combined with other risk factors like smoking and alcohol. The 21-30age group came second. One of the possible reasons could be the present AIDS epidemic since it occurs in the younger age group. That was why patients with these cancers presented earlier than expected.
From the anatomical distribution, the majority of patients had nasopharyngeal carcinoma (30%), followed by paranasal sinuses (16.7%), and hypopharynx, larynx and oropharynx, (13.3%). Nasrl in Yemen in observed a different trend where the oral cavity was found to be the commonest anatomical site.

Generally patients presented with multiple general and local radiotherapy complications. Among the general complications, general malaise and weight loss were the most frequent with 93.3% of patients. Other general complications included loss of appetite (90%), skin hyper pigmentation and pallor with (87.6%) each. The weight loss was slightly higher than what was documented in literature by Merseyside W. et al 25, where 57% of patients with head and neck cancers lost weight on commencement of radiotherapy. The high frequency of skin hyper pigmentation could be related to the number of patients who had been irradiated (40%) for nasopharynx and metastatic neck disease.

The highest severity score for all the general complications was 3. One possible explanation could be that most patients come late very sick and with compromised immunity to fight the complications when they occur. Most of the general complications gradually worsened later in the course of radiotherapy. Trend (progress) of severity of complications across the treatment period slowly worsened for nausea and vomiting and pallor. This could be attributed to the fact that patients were constantly on haematinics for the anemia and nausea and vomiting was treated at earliest opportunity with medications or fluids depending on the severity.

General malaise, bone tenderness and loss of appetite moderately worsened across the treatment period. The moderate trend could be related to the medications like analgesics and multivitamins given to these patients to treat these patients. Symptoms
could also be considered as a complication of treatment though it could be explained by progressive disease.

Skin reactions were mainly hyperpigmentation around the lateral and posteral lateral aspects of the neck, pre and post auricular areas, and angle of the mandibles. These skin complications were severe in nature (65.4% of patients) and peaked between the third and sixth week of treatment. This could be explained by the fact that there was a highly significant increase in the severity of skin complications for a given dose and over the treatment period with increasing field size. This is consistent with a study done by Bentzen SM\textsuperscript{26} in the UK. Alopecia complication was severe in 50% of patients. There was also a highly significant increase in the severity of alopecia later in the course of radiotherapy.

Oral complications were the most frequent local complications followed by oropharynx and hypopharynx in that order. This was similar with what was found in a study by Bentzen SM\textsuperscript{26} in the UK. Increased frequency and severity of complications could possibly have been related to the number of patients who had tumours in the above anatomical sites.

Least frequent local complications were the eye complications possibly because only 5 patients presented with tumours in paranasal sinuses and majority of these with stage IV tumours. Palliative radiotherapy was given a duration of three weeks. This explains for the relatively low frequency and severity of the above complications. There were no similar studies got in the literature accessed for comparison.
Amongst the oral complications, xerostomia had the highest frequency. This was followed by oral mucositis, loss of taste, odynophagia and candidiasis in that order. A similar pattern was observed in studies done by Lee et al\textsuperscript{19} and Chencharick et al\textsuperscript{24}. This could also be explained by the fact that mucous membranes are one of the most frequently affected areas by head and neck irradiations. These complications worsened across the period of treatment, with increasing doses of treatment.

Amongst the ear complications otitis externa had the highest frequency and maximum severity. This was related to the high number of patients irradiated for nasopharyngeal tumour and metastatic neck disease.

Oral mucositis, xerostomia, loss of taste, pulpitis, gingivitis and odynophagia moderately worsened across the treatment period. Similar trends were observed in a study by Merseysideby\textsuperscript{23} in UK. The moderate trend could be related to the medications like analgesics, anesthetic creams and multivitamins were given to these patients during radiotherapy treatment.

Only nine patients developed upper airway obstruction. Some patients came with upper airway obstruction due to oropharyngeal, laryngeal and hypopharyngeal tumours. These low rates were due to the precautions that were taken before radiotherapy. Surgical intervention was done prior to radiotherapy for some of the patients and this explains the low severity score of one.
5.1 CONCLUSIONS

1. This study has identified a high rate of complications of radiotherapy in patients treated for head and neck cancers.
2. The complications were general and local in nature and included general malaise, nausea and vomiting, loss of appetite, skin hyperpigmentation, alopecia, xerostomia, oral mucositis to mention but a few.
3. Patients developed more than one complication during the treatment for head and neck cancers.
4. Most of the complications were moderate to severe and in some cases made the patients ill, prolonged radiotherapy treatment and caused treatment interruptions.
5. These complications worsened across the period of treatment with increasing doses of treatment.
6. The majority of patients came from nearby districts of Kampala and Luwero prompting speculation of inaccessibility of patients with head and neck cancers from other areas of the country.

5.2 RECOMMENDATIONS

1. Education should be stepped up to prevent cancer in order to eliminate the necessity for treatment and hence the complications.
2. Health care and referral system across the country should be improved.
3. Clinicians managing the patients need to know about the complications and prevent them early and properly.
4. If possible better means of treatment should be sought.
5. Further research should be carried out to identify the risk factors responsible for the high severity and frequency of the complications so that these can be targets for preventative measures.
6.0 REFERENCES


4. Tumwikirize A.W (2002). Patterns of head and neck cancers seen in Department of Ear, Nose and Throat, Mulago Hospital: Retrospective study. ENT Departmental archives.

5. Cancer registry Radiotherapy Department, Mulago Hospital.


20. **Parson JT et al** (1993): Twice day radiotherapy for squamous cell carcinoma for head and neck; the University of Florida experience. Head and Neck; 15(2) 87-96


28. Kigula Mugambe J B (1998). Experience with orthovoltage therapy machine being used as the only radiotherapy equipment Mulago Hospital. IAEATEC DOC 614:77-85

7.00 APPENDICES

7.1 APPENDIX I: CONSENT FORM

CONSENT FORM FOR THE STUDY: EARLY COMPLICATIONS OF
RADIO THERAPY IN PATIENTS UNDERGOING TREATMENT FOR
HEAD AND NECK CANCER UNDERGOING TREATMENT

Dr. Justine Namwagala, a Senior House Officer in the Ear, Nose and Throat
department, Mulago Hospital, is conducting a study on the early radiotherapy
complications for patients undergoing treatment for head and neck cancers in Mulago
Hospital.

- The study will involve me being asked some questions about my experience,
  which I will be requested to answer as honestly as I can. I will also undergo any
  necessary physical or other examinations as may be required from time to time.
- The results of this study may be beneficial to me and all other patients undergoing
  treatment.
- All information will be kept strictly confidential, my recruitment is voluntary and
  I am free to drop out any time. Should I choose to drop out, I will not be denied
  any medical care that is appropriate to my illness.
- For further queries about the study, I have been urged to feel free to ask Dr
  Justine Namwagala, Department of E.N.T., Mulago Hospital on Tel No.: 077489555.

I, .......................................................... after considering the explanation of the
study and after having understood the contents of the consent and do hereby give my
consent to Dr. Justine Namwagala to include ...........................................(myself/
son/daughter/other) state of relationship in the study as a participant.

.......................................................... Date............................

Signature
..........................................................

Witness (Name and Signature) Date............................
7.2 APPENDIX II: DATA COLLECTION FORM

EARLY COMPLICATIONS OF RADIOTHERAPY COMPLICATIONS SEEN IN
PATIENTS UNDERGOING TREATMENT FOR HEAD AND NECK CANCERS IN
MULAGO HOSPITAL

Demographic information: (IDENTIFICATION)

1. Serial Number.............2. IPNO.............3. OPNO.............Date../../...
4. Date of admission..............................................
5. Name.................................................................
6. Age..............................years
7. Sex...............................1= Male
              2= Female
8. Tribe.............................9. Occupation.....................
10. Address; Village.....................Sub county.....................
                          County.....................District.....................

Details of the cancer

1. Biopsy number............... .
2. Histological type............... .
3. Anatomical site............... .

4. Staging; 1=stage I    2= Stage II   3= Stage III   4= Stage IV
15. Treatment Modality: 1= Radiotherapy 2= Surgery + Radiotherapy 3= Chemotherapy
    + Surgery +Radiotherapy
16 | **General Complications** | Pre-rad assessment | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 |
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>(a)</td>
<td>General malaise</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(b)</td>
<td>Nausea and vomiting</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(c)</td>
<td>Pallor</td>
<td></td>
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</tr>
<tr>
<td>(d)</td>
<td>Bone tenderness</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(e)</td>
<td>Loss of appetite</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>(f)</td>
<td>Weight loss (kg)</td>
<td></td>
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</tr>
<tr>
<td>(g)</td>
<td>Skin Hyper pigmentation</td>
<td></td>
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</tr>
<tr>
<td>(i)</td>
<td>Alopecia</td>
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</table>

**17. LOCAL COMPLICATIONS**

**I. Ear Complications**

<table>
<thead>
<tr>
<th>Pre-rad assessment</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Otitis Externa</td>
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<tr>
<td>(b) Otitis Media</td>
<td></td>
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<tr>
<td>(c) Sensorineural hearing loss</td>
<td></td>
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<tr>
<td>(d) Tinnitus</td>
<td></td>
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<tr>
<td>(e) Vertigo</td>
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</table>

**II. Nasal Complications**

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<tr>
<th>Pre-rad assessment</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Nasal ulcers</td>
<td></td>
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<tr>
<td>(b) Rhinosinusitis</td>
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<tr>
<td>(c) Epistaxis</td>
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<tr>
<td>(d) Anosmia</td>
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</table>

**III. Eye Complications**

<table>
<thead>
<tr>
<th>Pre-rad assessment</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Conjunctivitis</td>
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<td></td>
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<tr>
<td>(b) Keratitis</td>
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<tr>
<td>(c) Xerophthalmia</td>
<td></td>
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<tr>
<td>(d) Cataracts</td>
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<tr>
<td>(e) Retinopathy</td>
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**IV. Oral Complications**

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<th>Pre-rad assessment</th>
<th>Week 1</th>
<th>Week 2</th>
<th>Week 3</th>
<th>Week 4</th>
<th>Week 5</th>
<th>Week 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Xerostomia</td>
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<tr>
<td>(b) Oral Mucositis</td>
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<tr>
<td>(c) Loss of taste</td>
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<tr>
<td>(d) Pulpitis</td>
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<tr>
<td>(e) Gingivitis</td>
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<tr>
<td>(g) Odynophagia</td>
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<tr>
<td>(f) Candidiasis</td>
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<tr>
<td>(i) Dental Caries</td>
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<tr>
<td>V</td>
<td>Hypopharynx and Larynx complications</td>
<td>Pre-rad assessment</td>
<td>Week 1</td>
<td>Week 2</td>
<td>Week 3</td>
<td>Week 4</td>
</tr>
<tr>
<td>(a) Dysphagia</td>
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<tr>
<td>(b) Sense of blockage</td>
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<tr>
<td>(c) Laryngitis</td>
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<tr>
<td>Pharyngeal mucositis</td>
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<tr>
<td>(d) Upper airway obstruction</td>
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</tbody>
</table>

**LAB INVESTIGATIONS**

| (a) | Hb |
| (b) | WB C |

The following scoring system will be used:

0- None
1- Mild
2- Moderate (Controllable on out patient management)
3- Severe (in life threatening condition requiring surgery and hospitalization)
4- Fatal
APPENDIX III

GRADING OF SEVERITY OF RADIOTHERAPY COMPLICATIONS

(a) Grade 0: no complication.

(b) Grade 1: mild complication (minor symptoms / signs not requiring treatment or requiring simple outpatient treatment).

(c) Grade 2: moderate complication

(d) Grade 3: severe

(e) Grade 4: fatal complications leading to death.