



St. Paul's Hospital Millennium Medical College

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St. Paul Hospital Millennium Medical College
Graduate Study Program

CLINICAL PROFILE OF PEDIATRIC SOLID TUMORS AT SPHMMC.

By - Deme Abdissa, MD

Addis Ababa, Ethiopia

March, 2024



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Millennium Medical College**
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A THESIS PROPOSAL TO BE SUBMITTED TO DEPARTMENT OF PEDIATRICS AND CHILD HEALTH, SAINT PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE FOR THE PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE CERTIFICATE IN PEDIATRICS AND CHILD HEALTH.

ADDIS ABABA, ETHIOPIA

March, 2024

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Annex 1 ----- Study tool

Acronyms and abbreviation

CI..... Confidence Interval

EOPD.....Emergency Out-patient Department

PI.....Principal Investigator

SPHMMC.....Saint Paul's Hospital Millennium Medical College

SPSS..... ..Statistical Package for Social Sciences

WHO..... World Health Organization

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Abstract

Introduction: Pediatric solid tumors are a significant health challenge worldwide. Understanding the clinical profile and pattern of these tumors is crucial to provide timely and appropriate treatment to patients. Moreover, evaluating the treatment outcome of pediatric solid tumors is essential to determine the efficacy of different treatment modalities.

Objective: The purpose of the study was to study the epidemiological characteristics and outcomes of children with solid tumors at SPHMMC.

Methods: an institution-based cross-sectional retrospective study was conducted using a structured and standardized questionnaire. Histologically proven solid tumors who were registered at SPHMMC Hematology and Oncology unit, between March 2021 to December 2023 was included in the study. Descriptive and analytical statistics was employed.

Result: There are a total of 173 pediatric solid tumor patients. 56.1% of them were males. Most patients came from Oromia region. The most frequent solid tumors were retinoblastoma, Wilm's tumor and Rhabdomyosarcoma . 86 patients are still on treatment, 23 patients went into complete remission, 4 relapse, 2 were defaulters, 5 lost from follow- up , 21 died, 5 referred to other hospital , 10 left against medical advice.

Conclusion: The study revealed a diverse array of patients, encompassing various ages, genders, geographic locations, and tumour types. Among the diagnoses, prevalent tumours included retinoblastoma, Wilm's tumour, and rhabdomyosarcoma. Chemotherapy appeared as the primary treatment approach, often complemented by surgery or other adjunctive therapies tailored to the specific tumour type and its stage. A significant portion of patients achieved remission, while the majority are still undergoing treatment or follow-up care. There are a small percentage of relapse, defaulters and loss to follow-up with mortality rates were observed. These findings emphasize the importance of interdisciplinary collaboration among healthcare providers to ensure comprehensive care for paediatric oncology patients. Early detection strategies and community-based awareness programs aimed at promoting early presentation to healthcare facilities could potentially improve outcomes by facilitating timely diagnosis and intervention. Such collaboration should encompass coordinated efforts in diagnosis, treatment planning, psychosocial support, and survivorship care.

Keywords: *clinical profile, outcomes of treatment, pediatric solid tumors*

1. Introduction

1.1 Background

Cancer in children and adolescents is rare although the overall incidence of childhood cancer has been slowly increasing since 1975.(1) Worldwide, the annual number of new childhood cancer exceeds 200,000 and >80% of these are from the developing world.(1) Seven out of 10 children with cancer in the resource rich countries are cured, with 5-year survival rates for certain cancers such as Hodgkin's lymphoma and retinoblastoma approaching 95%.(2, 3) Recent studies have shown that this success in survival can be replicated in the developing world through shared expertise.(3) Childhood cancer remains the leading cause of disease-related mortality in children. Malignant solid tumors account for approximately 30% of childhood cancers.(4) The predominant histology of specific solid tumors varies significantly with age. Dramatic improvements in survival have been achieved in children and adolescents with cancer. Between 1975 and 2010, childhood cancer mortality decreased by >50%.(5) This success can be attributed to several factors. These include enrollment of patients into well-designed prospective clinical trials, systematic collection of tissue to better define the biology of disease, availability of more effective chemotherapy agents, use of multimodal therapy, better supportive care, and more refined diagnostic imaging methods that accurately define the extent of disease.(6)

St. Paul Hospital Millennium Medical College is a tertiary healthcare institution in Ethiopia that offers comprehensive care to pediatric patients with solid tumors. However, despite the existence of management protocols, limited information is available on the clinical profile, treatment patterns, and outcomes of pediatric solid tumor patients in this tertiary hospital. Moreover, while some studies have reported the incidence and histopathological classification of solid tumors in Ethiopian children, these studies have not provided insights into the clinical profile and treatment outcomes of these tumor.

1.2 Statement of the problem

Pediatric solid tumors are rare and complex malignancies that pose a significant challenge to clinicians, particularly in low-income countries like Ethiopia. Despite the existence of management protocols, there is limited information on the clinical profile, pattern, and treatment outcomes of pediatric solid tumor patients in St. Paul Hospital Millennium Medical College. Furthermore, treatment options for these tumors often entail multiple modalities, ranging from chemotherapy to surgery, radiation therapy, or a combination of these modalities. Thus, there is a pressing need to study the clinical profile, admission patterns, and outcomes of pediatric solid tumor patients in St. Paul Hospital Millennium Medical College to optimize the management of these malignancies and enhance patient outcomes.

1.3 Significance of the study

Pediatric solid tumors are rare but life-threatening malignancies that affect children and adolescents. Treatment of these tumors often requires a multidisciplinary approach, and the success of treatment depends on several factors such as the clinical profile of the patients, the pattern of the tumor, and the treatment outcomes. This research aims to evaluate the clinical profile, pattern, and treatment outcomes of pediatric solid tumor patients in St. Paul Hospital Millennium Medical College. The information obtained from this study will help to identify the existing trends in the diagnosis, treatment, and management of this condition in Ethiopia, enabling improved patient care and management for better health outcomes. Furthermore, the findings of this research may enhance the understanding of the epidemiology and management of pediatric solid tumors in similar resource-poor settings.

2. Literature review

2.1 Epidemiology of Paediatric Solid Tumours

Paediatric solid tumours are a heterogeneous group of neoplastic diseases that affect children and adolescents worldwide. It represents a rare but severe form of childhood cancer, which poses significant challenges to patients all over the world, particularly in resource-poor settings. They make up nearly 30% of all childhood cancers globally with a wide range of incidence rates across different regions and populations.

A study by Hessissen et al. (2019) in Morocco showed that the most common paediatric solid tumours were nephroblastoma (29.6%), followed by neuroblastoma (24.1%) and rhabdomyosarcoma (14.8%). Another study conducted by Mwanda et al. (2016) in Kenya revealed that Burkitt's lymphoma was the most frequent pediatric solid tumor (52.7%) followed in second place by nephroblastoma(13.6%) and rhabdomyosarcoma(9.1%). According to Hessissen et al.'s study, most patients had late-stage disease at presentation (65.9%).

Several population-based studies have shown differences in incidence or prevalence of paediatric solid tumours according to geographical location, ethnicity or socio-economic status among others . For instance developed countries generally have higher overall incidence rates compared to developing nations possibly attributable to disparities in healthcare systems, environmental exposures, and genetic predispositions. Also, certain genetic disorders such as Li-Fraumeni syndrome and neurofibromatosis predispose children to developing some types of solid tumors in childhood; a reason why screening for these mutations and counseling is critical when dealing with populations at risk.

Inadequate healthcare infrastructure also complicates the care of pediatric solid tumors in Ethiopia by several factors including poor access to healthcare, lack of standard treatment protocols, and lack of medical resources.

Reports from Ethiopia suggest that about 4-5% of all diseases affecting children are cancers with only a fraction being represented by solid tumors. Solid tumor is among the pediatric cancers seen in Ethiopia which include Wilms' tumor, neuroblastoma and retinoblastoma (7).

2.2. Treatment Modalities in Pediatric Oncology

Literature review indicates that identification of prognostic factors is essential in the management of pediatric solid tumors. In Ethiopia, research done on childhood cancers indicated clinical staging, histology and tumor size as important determinants of treatment outcomes. Furthermore, the combination of chemotherapy with surgical intervention has been shown to be effective in the management of pediatric solid tumors.

Studies have also emphasized a need for multidisciplinary care involving paediatricians, oncologists and surgeons (8). Combining various treatments can improve its efficacy and increase survival rates. Previous studies have proven that adjuvant chemotherapy significantly improves both disease-free and overall survival rates following complete surgical resection among localized solid tumours. Similarly; multimodality approach combining chemotherapy with radiation therapy may benefit patients with advanced or metastatic solid tumors. Including palliative care measures for children with advanced or metastatic tumors is also instrumental in improving quality of life and reducing suffering.

Survival rates for neoplasms of children have increased dramatically over the past few decades due to improvement in diagnosis and treatment strategies (9). However, In Ethiopia, the survival rates for paediatric solid tumours remain low because they are diagnosed later when it is too late for the treatment that is inadequate and there is limited access to medical care. Different literatures have found out diverse impediments to care like: poverty, lack of awareness, illiteracy, social stigma and bad transport systems (10). These elements lead to delayed patients' presentation limiting their access to specialized care which in turn impairs prognosis.

On the other hand, research carried out in other developing countries shows that context specific guidelines for the management of childhood solid tumour is necessary. Therapeutic strategies based on common solid tumours and clinicopathological characteristics including medical resources available can be developed. Use of these guidelines would ensure uniformity in patient management and comprehensiveness leading to improved treatment results among neoplastic patients.

2.3 Factors Affecting Treatment Outcomes

In spite of survival rates for several paediatric malignancies having risen due to advances in diagnostic techniques and treatment modalities, differential access to healthcare resources as well as socioeconomic factors still have an impact on outcomes.

The outcome of treatment of paediatric solid tumours in East Africa varies depending on tumour type, stage at presentation as well as health care service accessibility. For instance, a study by Hessissen et al (2019) conducted in Morocco showed that for paediatric solid tumours, the five-year survival rate was 53.6%; with higher survival rates seen in neuroblastoma (87.5%) and rhabdomyosarcoma (77.8%) cases compared to nephroblastoma cases (35.7%). The study by Mwanda et al. (2016) in Kenya reported that the overall survival rate for paediatric solid tumours was 63.3%, with the highest survival rates observed in patients with nephroblastoma (83.3%) and Burkitt's lymphoma (76.5%).

Paediatric solid tumours' treatment outcome in East Africa can vary as a result of different factors. For instance, the availability of healthcare services, stage at presentation and type of tumor are all factors that can influence how the treatment will turn out. Moreover, it has been found through a study conducted by Hessissen et al. (2019) in Morocco that access to healthcare resources such as radiotherapy and chemotherapy was significantly associated with better prognosis. This research also identified that people with advanced stage disease had worse outlook than those with early-stage disease. Also, it was shown that this type of cancer had an effect on the result of treating it; thus, patients suffering from neuroblastoma and rhabdomyosarcoma had a better chance for recovery compared to individuals having nephroblastoma.

In conclusion, this review of literature shows major determinants contributing towards the clinical profile, pattern and treatment outcomes of paediatric solid tumours in Ethiopia. The findings demonstrate the necessity for comprehensive care delivered by multidisciplinary teams and tailored treatment protocols that address specific needs of paediatric cancer patients living in low-resource areas. An upcoming research project into paediatric solid tumours' clinical profile, pattern and treatment outcomes at St. Paul Hospital Millennium Medical College is expected to

give insights on diagnosis, management as well as prognosis due to which the prognosis of these tumours and contribute to the growing body of knowledge in this field.

3. Objectives

3.1 General Objective

- To assess the clinical profile, pattern and treatment outcome of pediatric solid tumor admitted in SPHMMC.

3.2 Specific Objectives

1. To assess the demographic and clinical characteristics of each pediatric solid tumor at SPHMMC
2. To determine the pattern of pediatric solid tumor at SPHMMC
3. To evaluate the treatment outcome of pediatric solid tumors at SPHMMC

4. Methods

4.1 Study Area

The study was conducted in SPHMMC pediatrics department on all pediatric solid tumor patients which are seen at our hospital at ER, ward and follow up clinic. St. Paul's millennium medical college is the second largest hospitals in the capital Addis Ababa with a catchment population of more than 5 million. The hospital was established in 1969 by the late emperor Haile Selassie in collaboration with the German Evangelical Church and is currently governed by a board under the federal ministry of health. In addition to an inpatient capacity of more than 700 beds, on average 1200 emergency and outpatient clients are seen daily in the hospital. The pediatric hematology patients are seen at EOPD, hemato oncology clinic and dedicated hematology-oncology ward was established in 2020 GC. The dedicated ward was designed to admit Solid tumor cases only but after January 2016 E.C it has moved to a newly renovated ward with expanded beds and human resource capacity. Since then, liquid tumors like leukemias are also admitted and got treated.

4.2 Study Period

The study was done on patients who are seen from March 2021 to December 2023GC (Megabit 2013- Tir 2016).

4.3 Study Design

A Hospital based cross-sectional retrospective study was conducted.

4.4 Source Population

All children with a diagnosis of pediatric cancer at SPHMMC Pediatric ward.

4.5 Study Population

All children who are admitted with a diagnosis of solid tumor (histology confirmed) at SPHMMC, Pediatrics department who fulfil the inclusion criteria.

4.6 Study Unit

All children who are admitted with a diagnosis of pediatric solid tumor (histology confirmed) at SPHMMC, Pediatrics department during the study period and who fulfill the inclusion criteria.

4.7 Inclusion Criteria

All children with pediatric solid tumor who are admitted at SPHMMC, pediatrics hemato oncology unit within the study timeline.

4.8 Exclusion criteria

Children who have an incomplete chart or whose medical chart can't be retrieved.

4.9 Sample size determination and Sampling Technique

4.9.1 Sample size determination

All consecutively admitted patients to pediatric oncology unit from March 2021 to December 2023GC (Megabit 2013- Tir 2016 E.C).and met the criteria will be included in this study.

4.10 Dependent and Independent variables

4.10.1 Dependent Variables

Outcome of Pediatric Solid tumor

4.10.2 Independent variables

Age, Sex , Address , Year of enrollment/ admission, Religion , Stage of the disease , risk stratification of the disease, Site of a disease, Treatment modality used and Treatment outcome

4.11 Data collection and Analysis

4.11.1 Data collection techniques

The data for this study was collected from registration log book and patient chart. The data was collected by structured check list/ study tool for medical record review developed for this study. Phone call follow up was done to trace patient's outcome.

The data was be collected by nurses and residents. The data collectors were continuously supervised by the primary investigator during data collection process.

4.11.2 Data processing & analysis

After the collected data was checked for completeness and consistency it was then cleaned, coded and entered into EPI- Info version 7 and then exported in to SPSS Version 29.0 for analysis. Descriptive and analytical statistics including bivariate and multivariate analysis was computed and Logistic regression model was used to identify the association b/n dependent and independent variables. Data was presented using frequency tables and Chi-square test and odds ratio was determined when appropriate. P-value less than 0.05 will be considered statistically significant.

4.11.3 Data Quality Assurance

Each day the collected data was checked for accuracy and completeness. The participant's names was not be documented and the data was de-identified after the questionnaire is completed. The collected data was then stored in a secure location and only the investigator had access to this location.

4.12 Ethical consideration

The ethical clearance was obtained from SPHMMC ethical review committee, written consent was obtained from hospital administration, and confidentiality of the information was ensured using codes rather than names during registering data.

4.13 Operational Definitions

- Paediatric solid tumour: Paediatric solid tumours are abnormal masses of tissue that form in the body of children and adolescents. These types of tumours can occur in any part of the body, including the brain, bone, muscle, and internal organs. Types of Paediatric Solid Tumours include Neuroblastoma, Wilms tumour, Rhabdomyosarcoma, Osteosarcoma, Ewing Sarcoma, Hepatoblastoma, and Retinoblastoma, to name a few.
- Pattern: The number and frequency of specific types of solid tumours diagnosed in children (aged 0-18 years) at St. Paul Hospital over a certain period of time categorized by tumour site, histological subtype, and age group.

- Clinical profile: The clinical characteristics of paediatric patients with solid tumours, including demographic data (gender, age, ethnicity), clinical presentation (symptoms, signs, duration), diagnostic methods (imaging, biopsy), tumour staging, and comorbidities. This could involve standardized questionnaires or medical record reviews.
- Treatment outcomes: The clinical outcomes of paediatric patients with solid tumours, assessed by measures such as overall survival, disease-free survival, event-free survival, response to chemotherapy, recurrence rates, and adverse effects of treatment. This could be obtained through medical record reviews or follow-up surveys. But in our case, since the study assess the near 3 year data, short term outcomes like death, cured/ remission, relapsed, left against medical advice or treatment default will be studied.

4.14 Dissemination of the result

The result of the study will be presented to the department of pediatrics and child health and also to hemato- oncology unit. The findings will be sent for publication on relevant scientific journals and disseminated online.

5. Result

5.1 Demographic data

There are a total of 173 pediatric solid tumor patients seen at our hospital from March 2021 to December 2023GC (Megabit 2013- Tir 2016). 19 patients were seen on 2013 EC (11%), 35 seen on 2014 E.C (20.2%), 89 patient seen on 2015 E.C (51.4%) and 30 patients on the 2016 E.C(up to tir) (17.3%) [Fig 1].

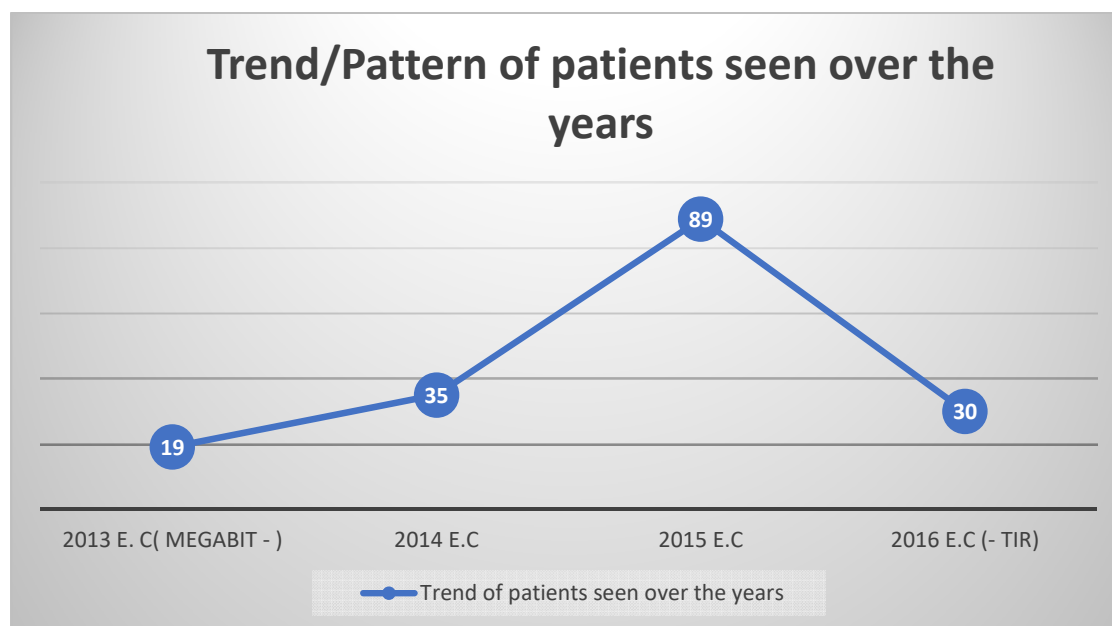
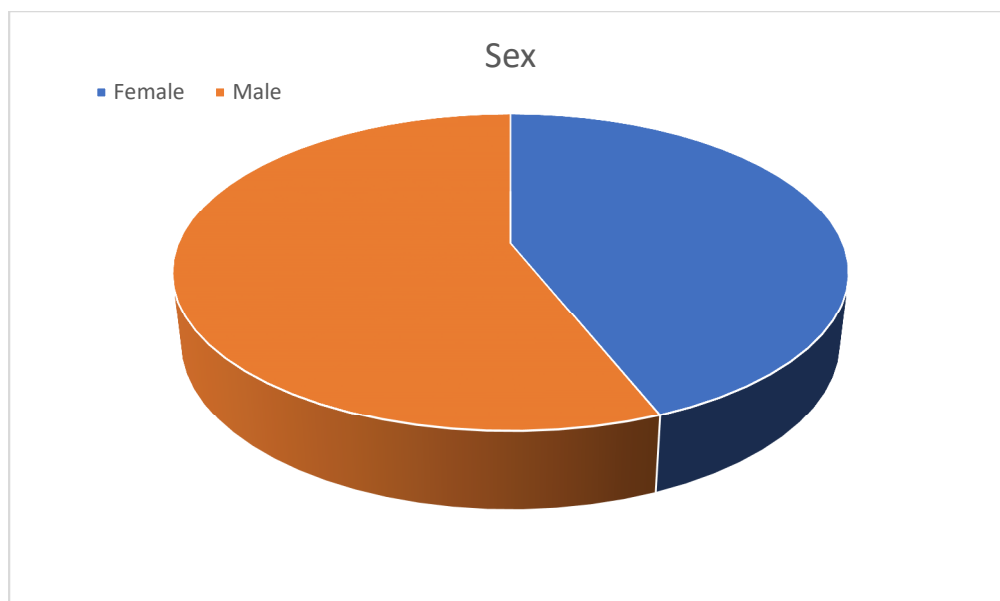


Figure 1 – Year of Enrollment (Trend)

There were 56.1% male and 43.9% female patients (M:F ratio was 1.27:1) [Figure 2 and Table 1]



Sex	Frequency	Percent
Female	76	43.9
Male	97	56.1
Total	173	100.0

Figure 2 and Table 1 – Sex Distribution

Most patients (55.5%) were from Oromia region followed by Addis Ababa (18.5%) and Amhara region (11.6 %). [Table 2 and Figure 3] There were 6% infants (<1 year), 52 % were between age 1-5 years , 30.6 % patients were between the age of 5 -10 years and 13.3% were above the age of 10 years.[Table 3 and Figure 4]

Adress	Frequency	Percent
Oromia	96	55.5
Addis Ababa	32	18.5
Amhara	20	11.6
SNNP	17	9.8
Sidama	4	2.3
Tigray	1	0.6
Benshangul	2	1.2
Harar	1	0.6
Total	173	100.0

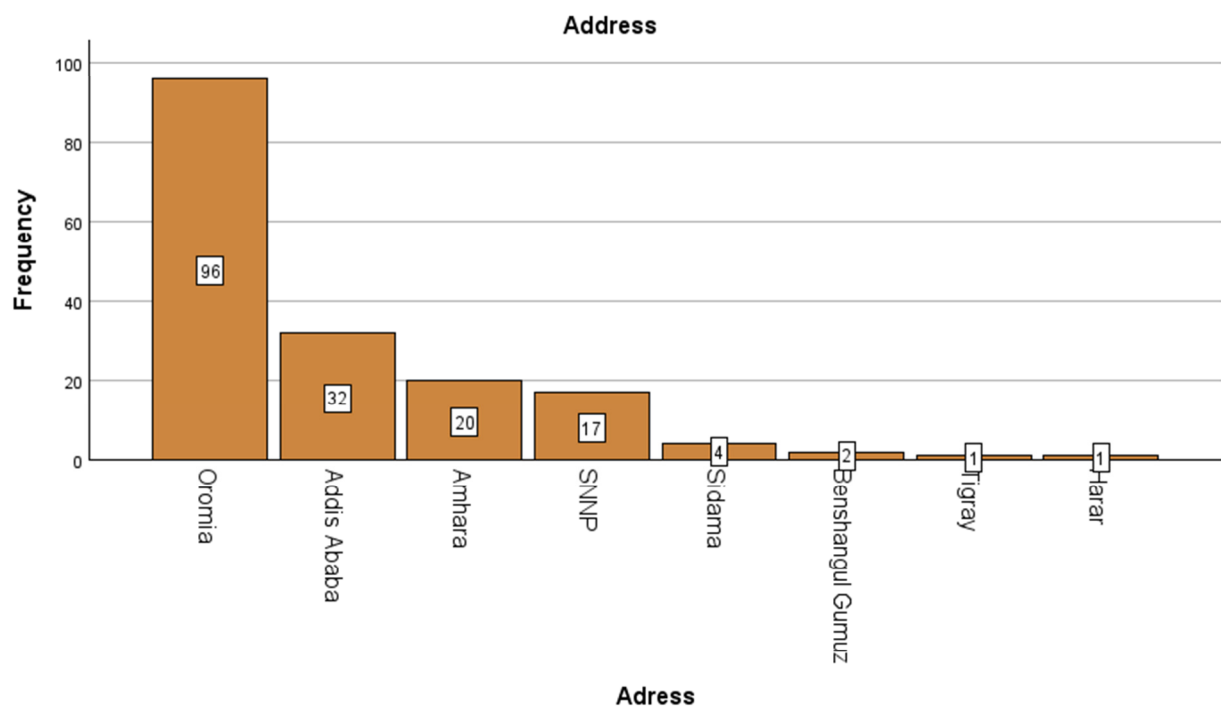


Table 2 and Figure 3 – Adress of the patients

Age Group	Frequency	Percent
<1 yrs	7	4.0
>=1-5 yrs	90	52.0
>=5- 10 yrs	53	30.6
>=10 yrs	23	13.4
Total	173	100.0

Table 3- Age Distribution

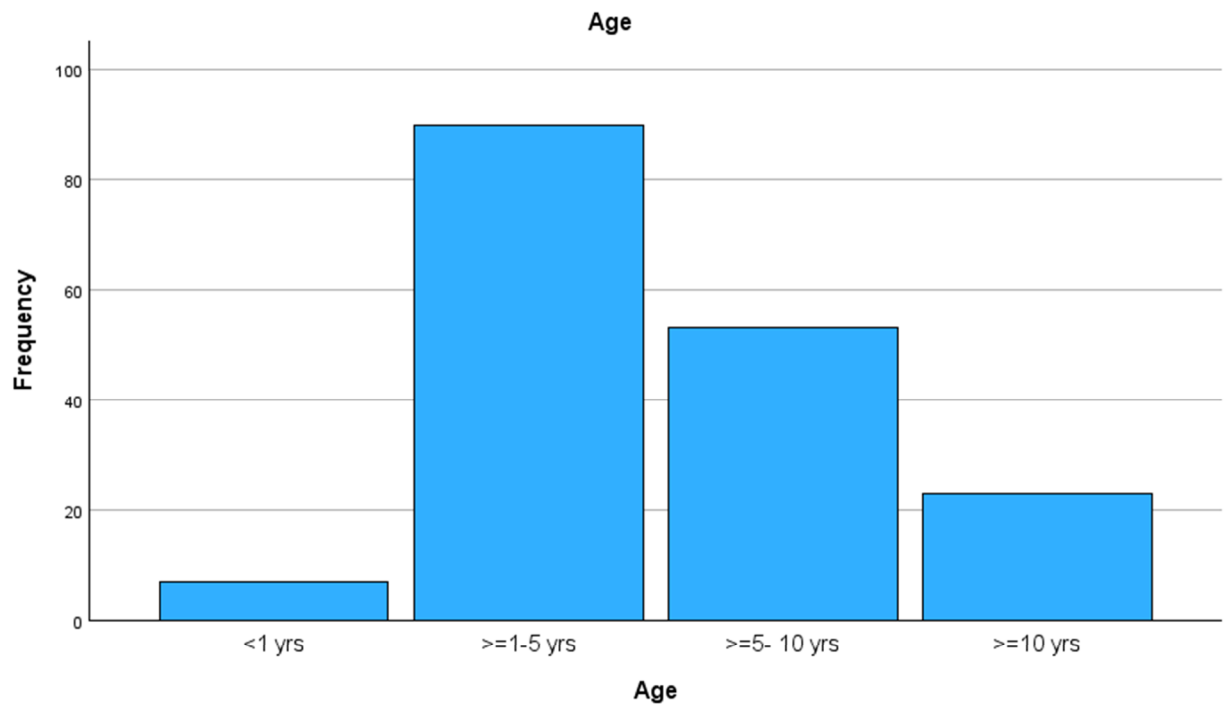


Figure 4 – Age distribution

5.2 Tumor distribution

The most frequent were Retinoblastoma (30.6%) followed by (in descending order of frequency) Wilm's tumor (17.3%), Rhabdomyosarcoma (13.3%), Hodkin's lymphoma (10.4 %), other tumors (Functional adrenocortical tumors, brain tumors, osteosarcoma) (9.2 %), germ cell tumors (6.4 %), Non-Hodgkin lymphoma (4%), Nasopharyngeal cancer (2.9%), Neuroblastoma (1.7%) and Hepatoblastoma (1.2%). [Table 4 and Figure 5].

Diagnosis	Frequency	Percent
Retinoblastoma	53	30.6
Wilm's Tumor	30	17.3
Rhabdomyosarcoma	23	13.3
Hodkin's Lymphoma	18	10.4
Germ Cell Tumor	12	6.9
Non-Hodkin's Lymphoma	6	3.5
Ewing sarcoma	5	2.9
Nasopharyngeal cancer	5	2.9
Neuroblastoma	3	1.7
Hepatoblastoma	2	1.2
Others(Functional Adrenocortical tumors, brain tumors etc)	16	9.2
Total	173	100.0

Table 4 - Major Tumor Distribution

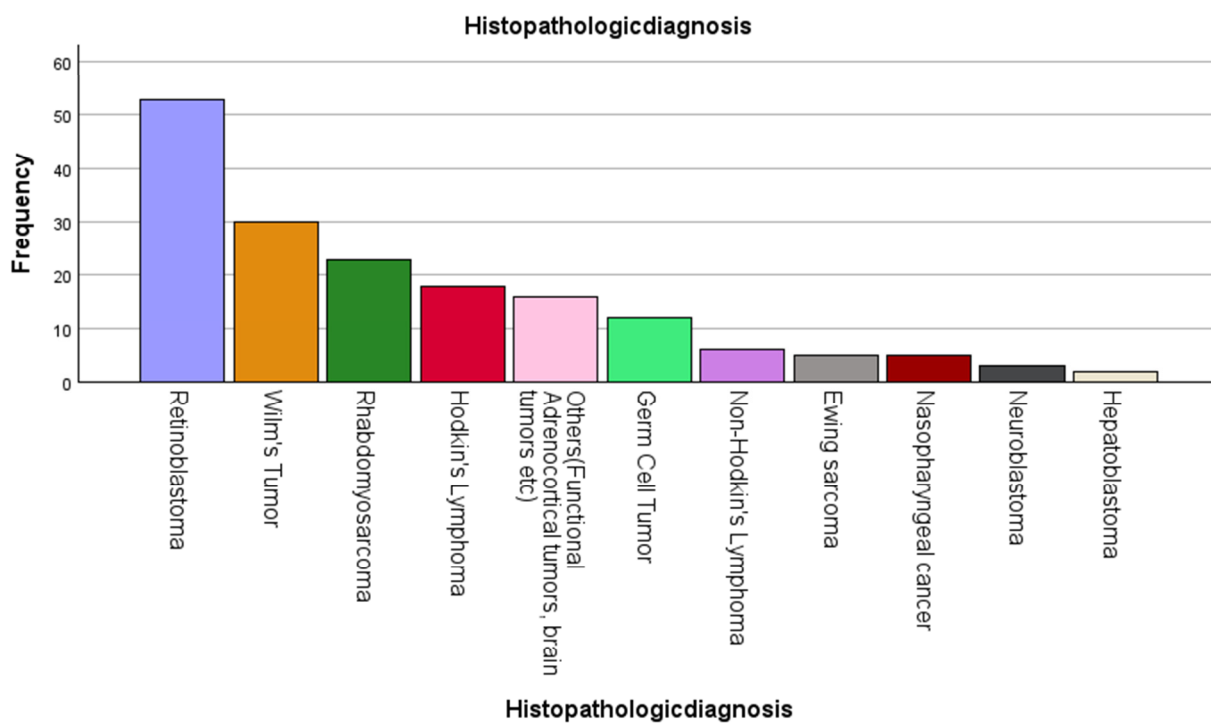


Figure 5- Major Tumor Distribution

Tumor	Sex		Age Distribution			
	M	F	< 1 yr	>=1-5 yr	>=5-10 yr	>=10yrs
<i>Retinoblastoma</i>	33	20	11	40	2	0
<i>Wilm's Tumor</i>	14	16	2	18	7	3
<i>RMS</i>	12	11	0	10	12	1
<i>HL</i>	15	3	0	2	8	8
<i>GCT</i>	3	9	0	3	5	4
<i>NHL</i>	1	5	0	1	2	3
<i>Ewing Sarcoma</i>	3	2	0	1	3	1
<i>Nasopha. ca</i>	2	3	0	1	1	3
<i>Neuroblastoma</i>	1	2	0	1	2	0
<i>Hepatoblastoma</i>	2	0	1	1	0	0

Table 5 – Sociodemographic characteristics of Pediatric Solid Tumors

5.4 Individual tumor characteristics

Retinoblastoma

There are a total of 53 Retinoblastoma patients. They were more common in males (62%) and mostly presented in children in the age group of 1–5 years (75%) followed by infants up to 12 months (21%), 5- 10 years (4%) and none in above 10 years age group. The commonest presenting feature is leukocoria (white pupillary reflex) (59%) followed by buphtalmos (23.1%), Red eye (13.5%) and strabismus (3.8%) [Fig 6]. The Majority of duration of presenting illness is 1-6 months (47.2%), 6-12 months (22.6%), <1 months(18.9%) and > 12 months (11.3%) [Fig 7]. Among these, 43.4% occurred on the right eye, 37.7% on the left side and 18.9% bilateral. Most of the tumors were diagnosed in Group E (70.2%), followed by Group C (14.9%), Group D (12.8%), and Group B (2.1%).

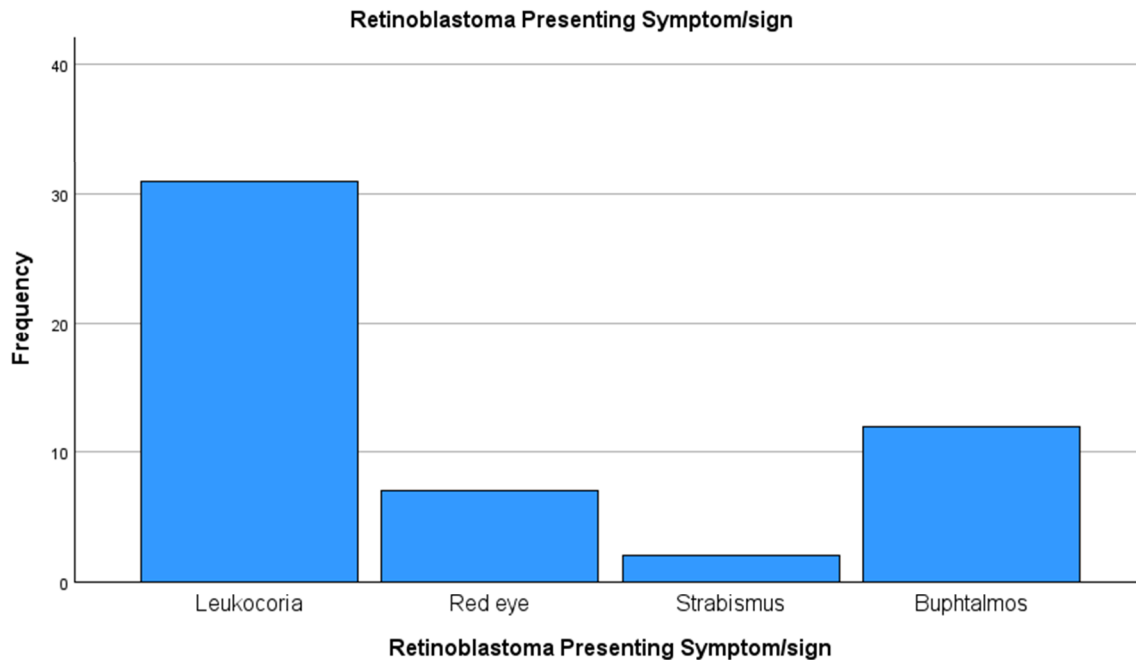


Figure 6 – Retinoblastoma presenting feature

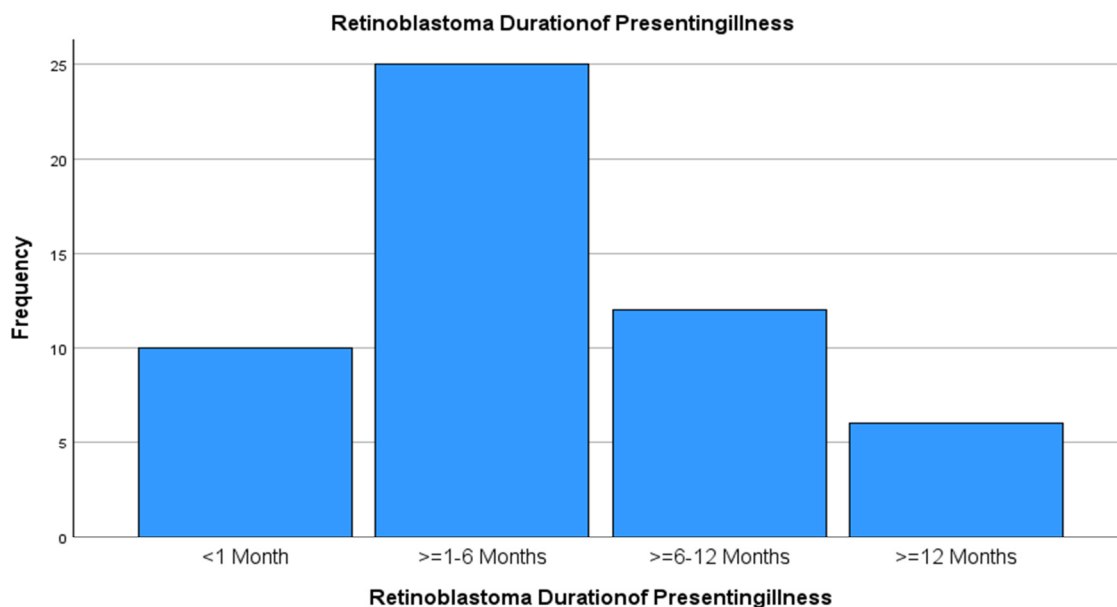


Figure 7- Retinoblastoma duration of presenting illness

Most patients were treated with chemotherapy with enucleation (69.2%), chemotherapy alone (23.1%), chemotherapy with laser therapy (5.8%) and chemotherapy with radiotherapy (1.9%) [Fig 8]. 30 patients were on treatment (56.6%), 13 achieved remission (24.5%), 2 lost from follow up (3.8%), 1 refer to other hospitals (1.9%), 1 left against medical advice (1.9%) and 6 patients died (11.3%) [Fig 9].

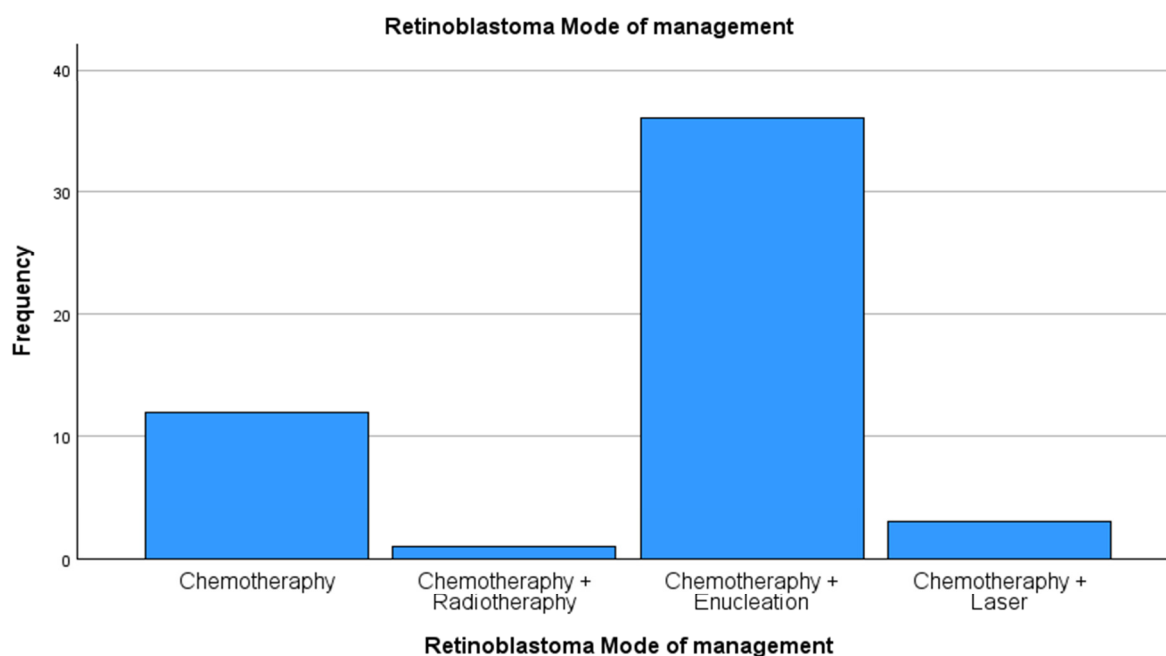


Figure 8– Retinoblastoma Mode of Management

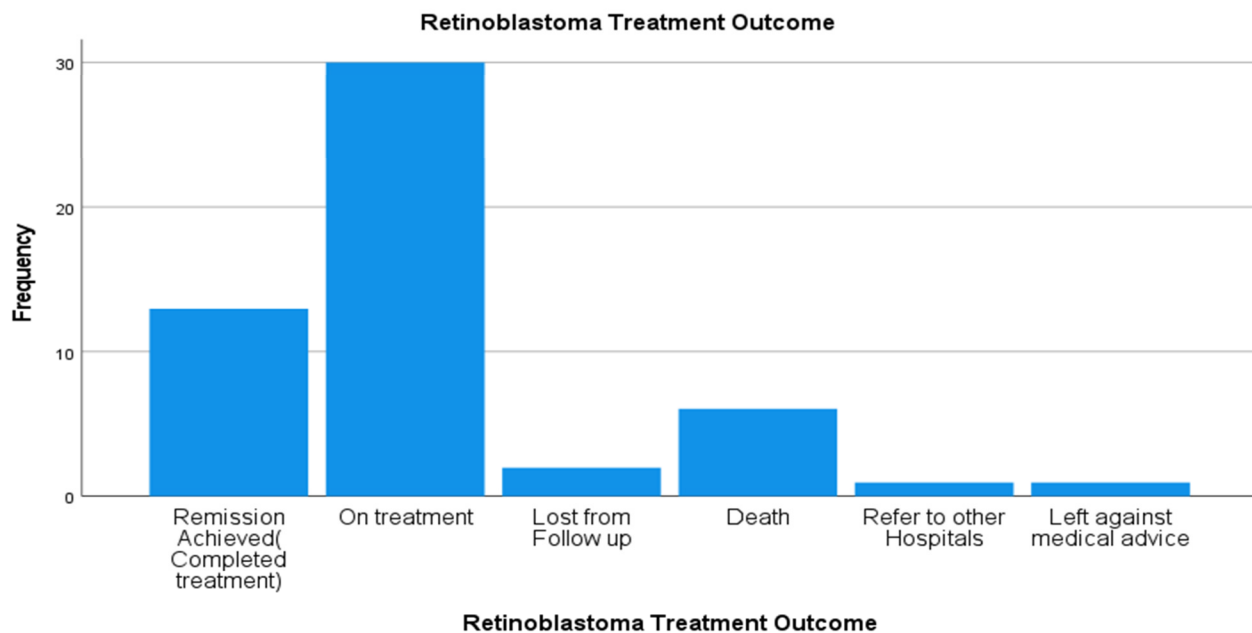


Figure 9 – Retinoblastoma treatment outcome

Wilm's Tumor

There are a total of 30 Wilm's tumor patients. They were more common in males (47%) and mostly presented in children in the age group of 1 - 5 years (60 %) followed by 5- 10 years (23%), above 10 years (11%) and infants up to 12 months (6 %). The commonest presenting feature is abdominal mass (96.7%) followed by abdominal pain (3.3%). The Majority of duration of presenting illness is within 1-6 months (70%), <1 months (20%) and 6-12 months (10%) [Fig 10]. Among these, 53.3% occurred on the left side, 30% on the left side and 16.7% bilateral. Most of the tumors were diagnosed in stage IV (50%), followed by stage II (16.7%), stage I and Stage III each (13.3%), and stage V (6.7%) [Fig 11].

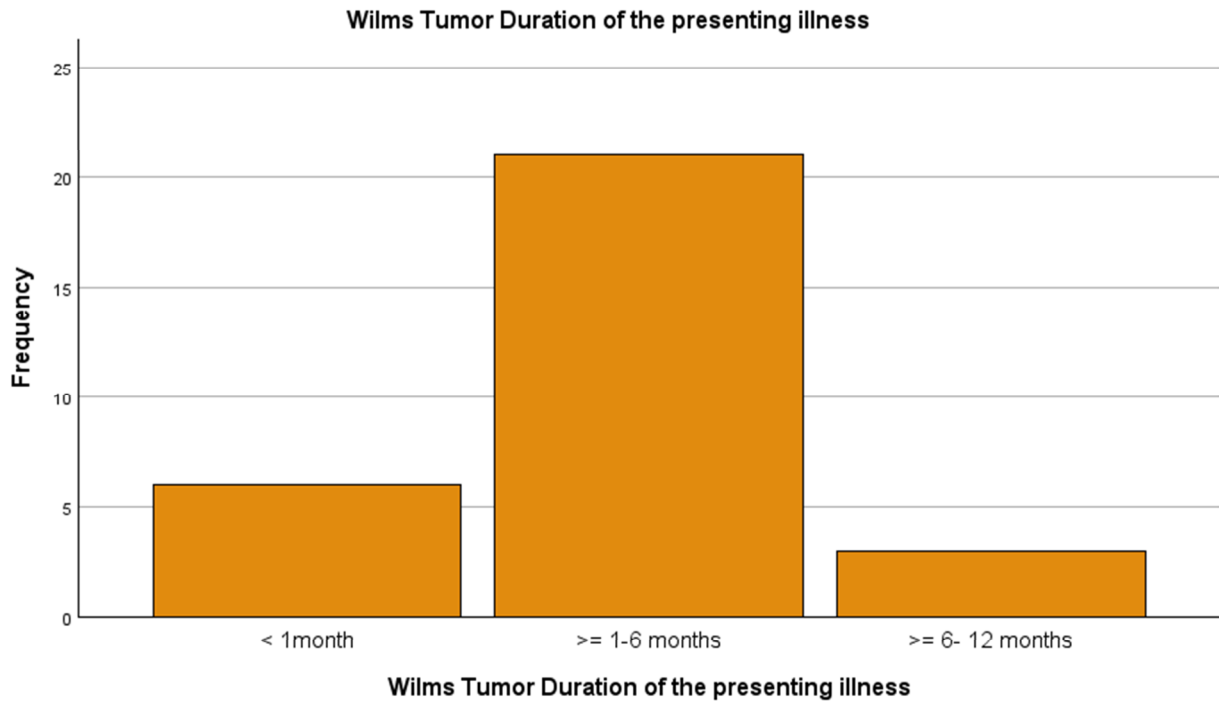


Figure 10 – Wilm’s Tumor duration of the presenting illness

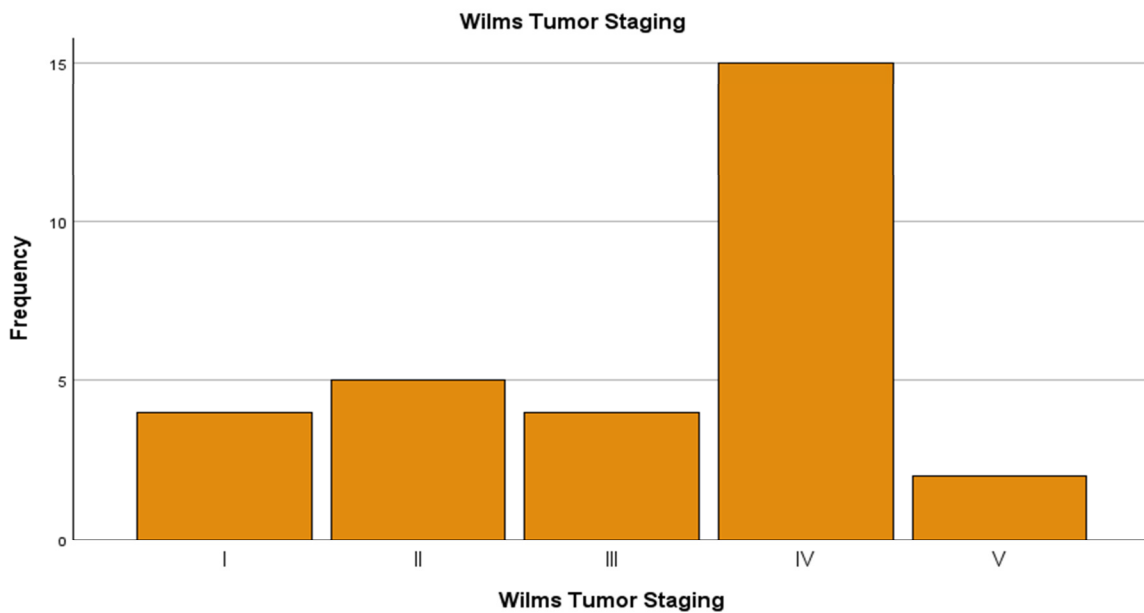


Figure 11 - Wilms Tumor staging

21 patients were treated with chemotherapy alone (75%), 6 patients with chemotherapy and surgery (21.4%), 1 patient with surgery alone (3.6%) [Fig 12]. 13 patients were on treatment (43.3%), 2 patients relapsed (6.7%) , 7 left against medical advice (23.3), 1 achieved remission

(3.3%), 1 patient referred to other hospitals (3.3%) and 6 died (20%)[Fig 13]. None of the patients had immunohistochemistry profiles.

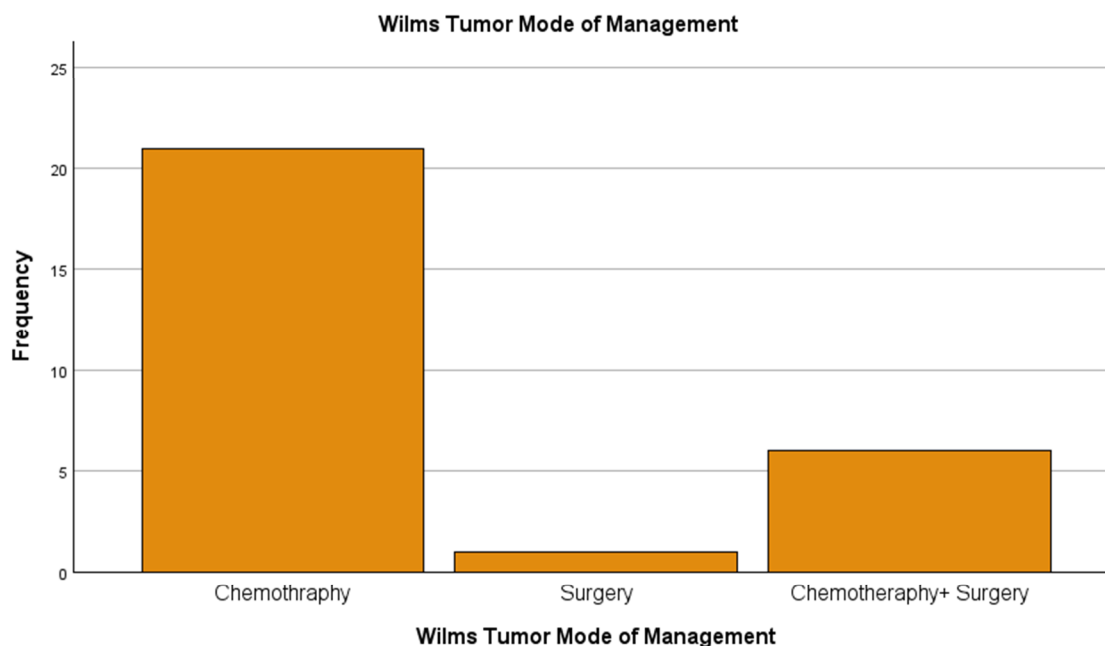


Figure 12 - Wilm's Tumor mode of Management

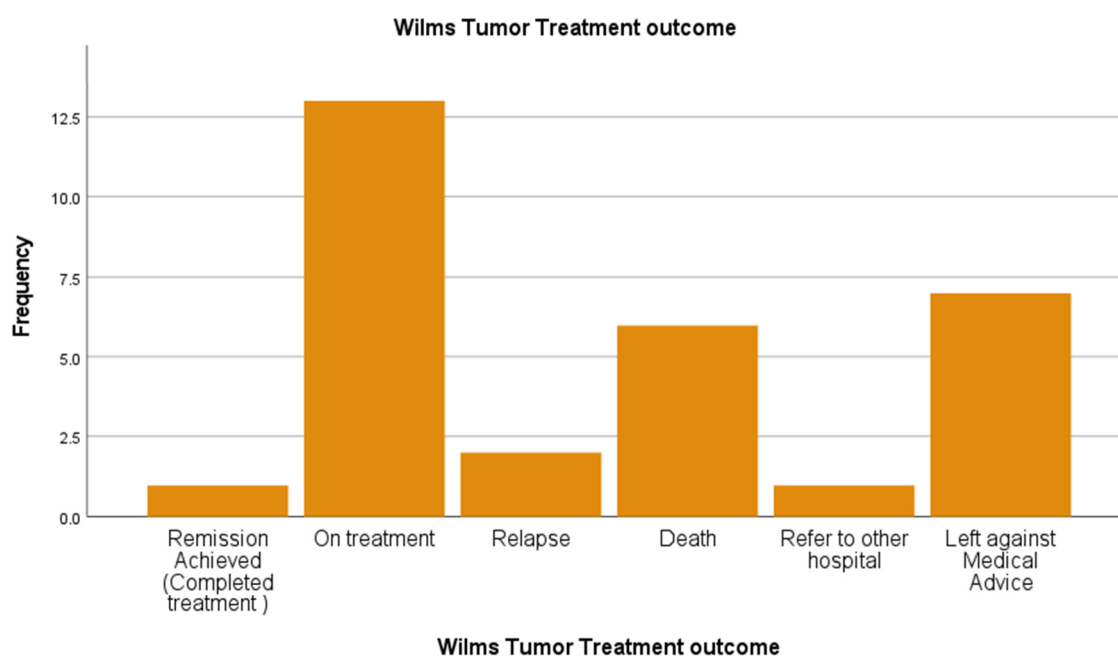


Figure 13 – Wilm's Tumor Treatment Outcome

Rhabdomyosarcoma

There are a total of 23 rhabdomyosarcoma patients. They were more common in males (52%) and mostly presented in children in the age group of 5-10 years (52%) followed by 1-5 years (44%), above 10 years (4%) and none in infants less than 12 months. The commonest presenting site is head and neck (60.9%) followed by genitourinary (17.4%), extremities (8.7%), Gastrointestinal (8.7%), and other sites (4.3%) [Fig 14]. The Majority of duration of presenting illness is within 6-12 months (56.5%), 1-6 months (4.6%) and >12 months (8.7%) [Fig 14].

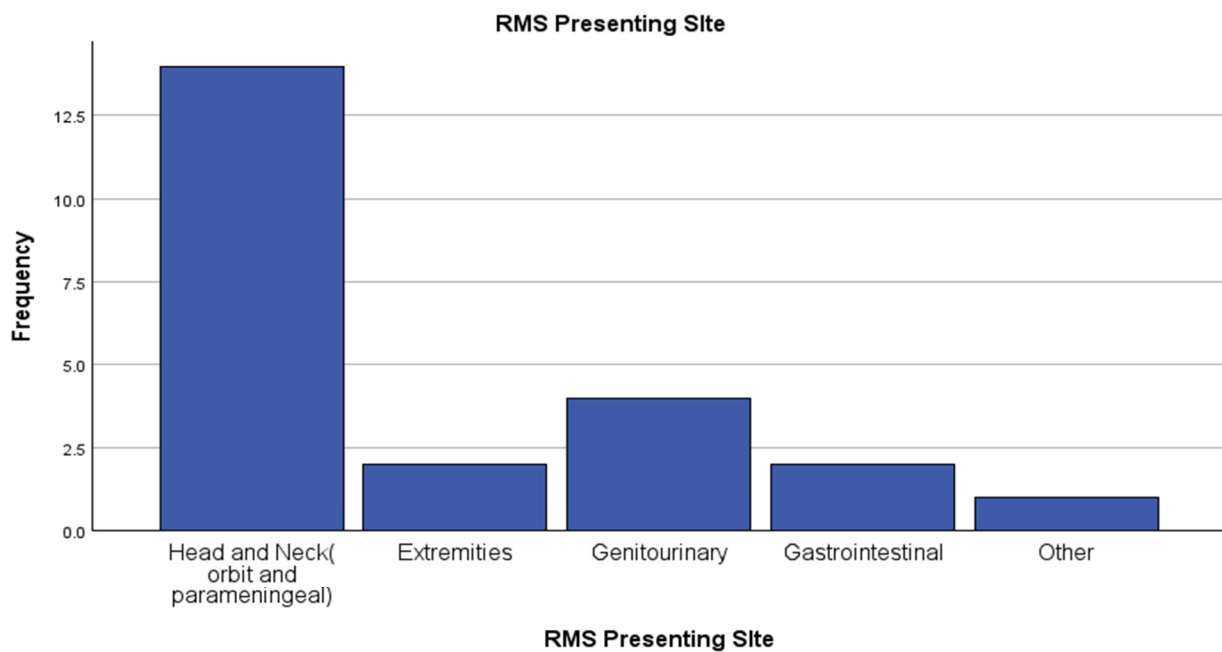


Fig 14 – RMS Presenting Site

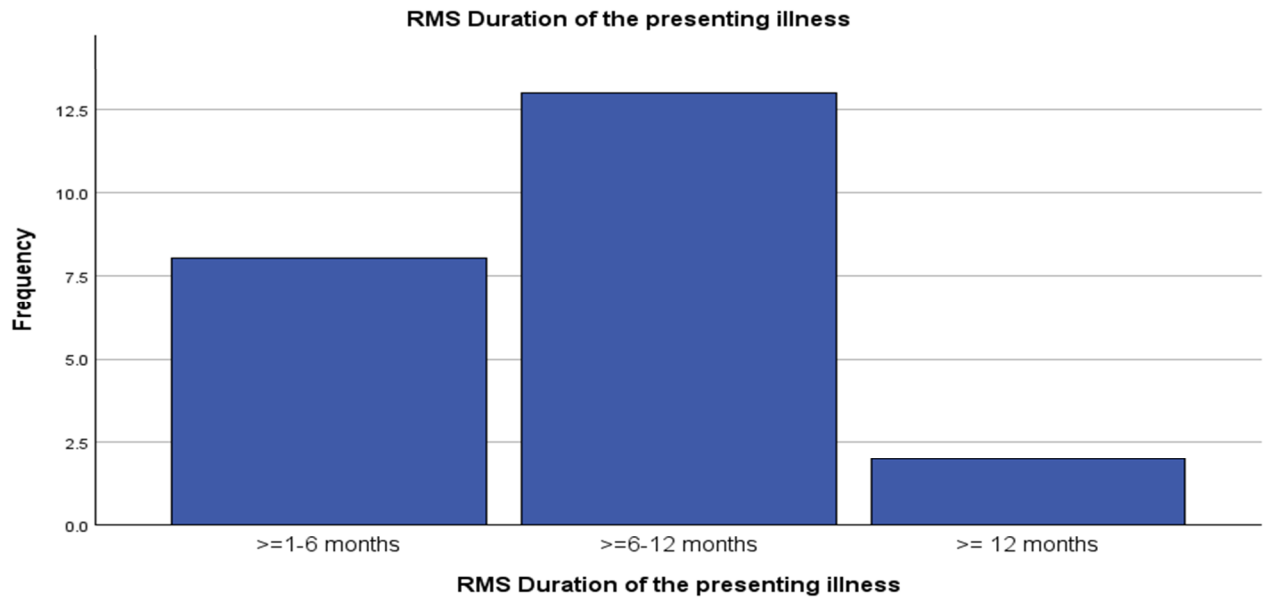


Figure 15 - RMS Duration of the presenting illness

Most of the tumors (10 patients) were diagnosed in stage III (50%), followed by 5 stage IV (25%), 4 stage II (20%) and 1 Stage I (5%) [Fig 15]. Majority of them were diagnosed with high risk (52.2%), Intermediate risk (39.1%), Low risk (8.7%) [Fig 16].

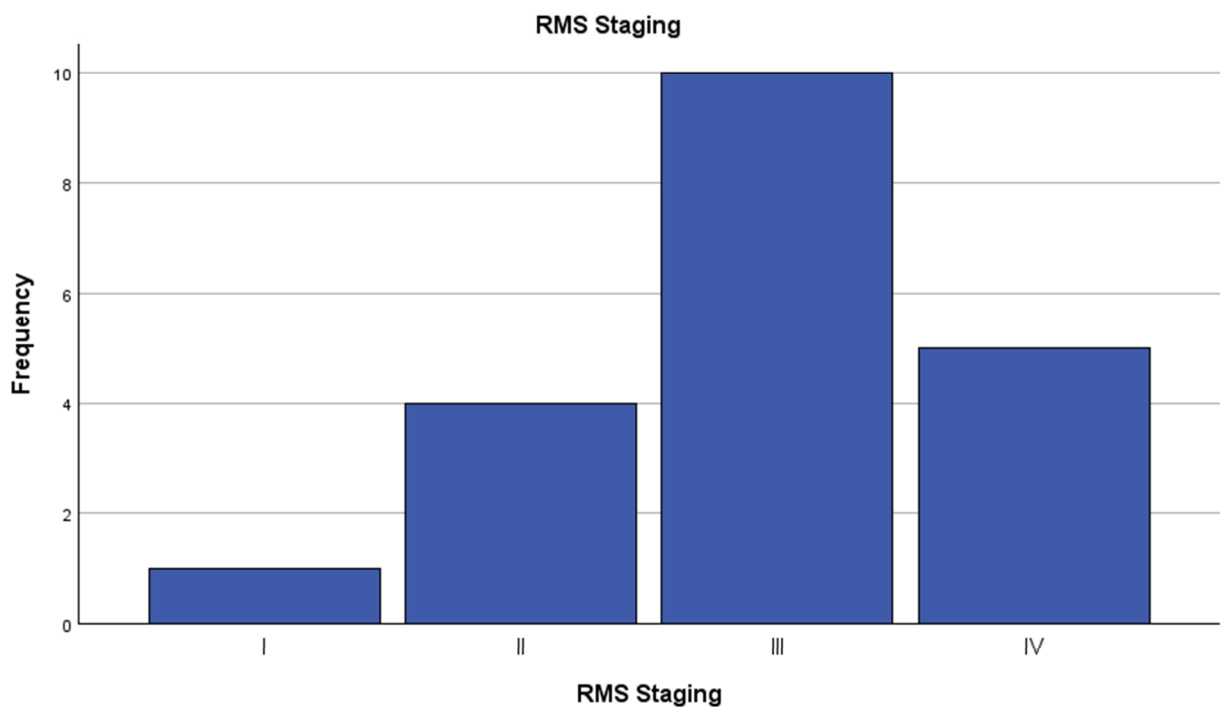


Figure 16 – RMS Staging

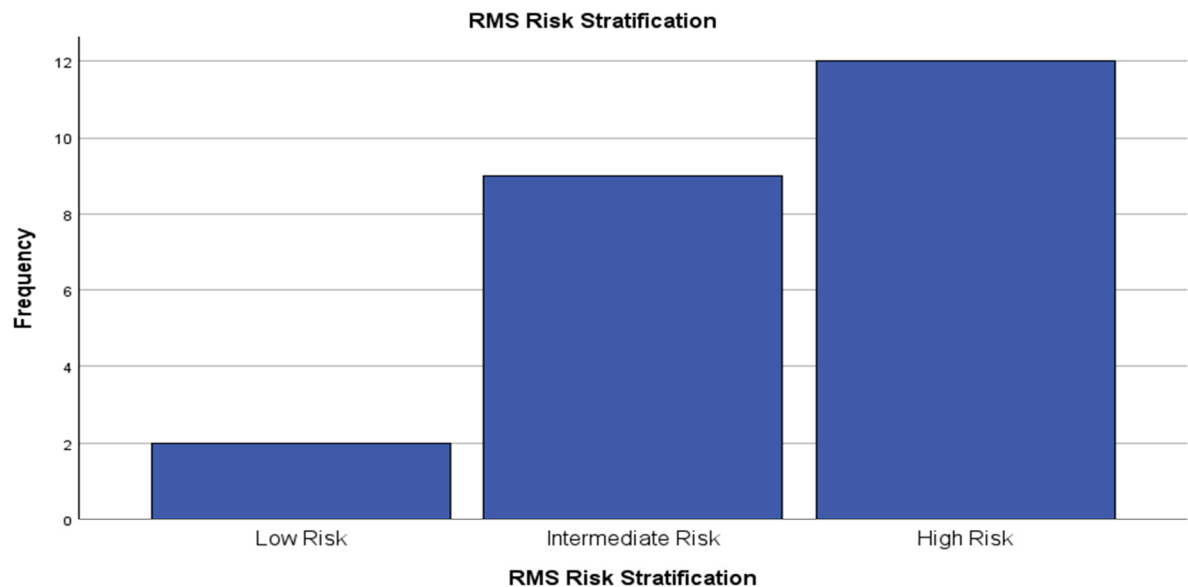


Figure 17 – RMS Risk Stratification

Majority of patients were treated with chemotherapy alone (61.9%), chemotherapy and surgery (38.1%), [Fig 17]. 12 patients were on treatment(52.2%), 1 patient achieved remission (completed treatment) (4.3%), 2 patients defaulted treatment for more than 1 month (8.7%), 2 patients referred to other setup (8.7%), 1 patient relapsed (4.3%), 5 died (21.7%) [Fig 18]. 4 of the patients had immunohistochemistry markers done specific to RMS (17.3%).

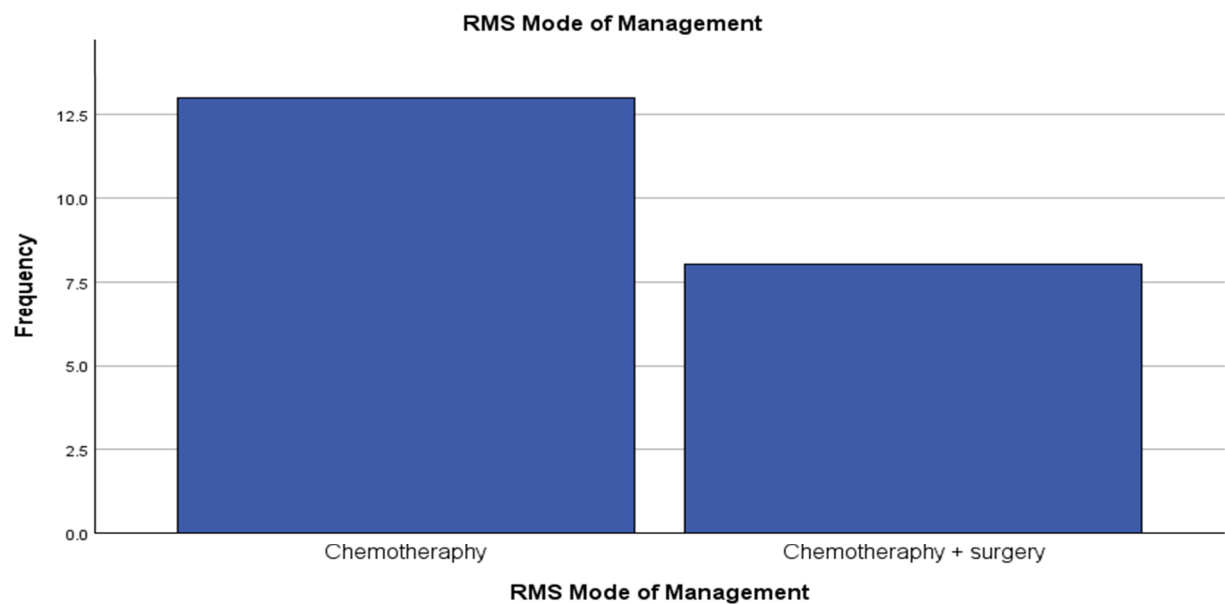


Figure 18 – RMS Mode of management

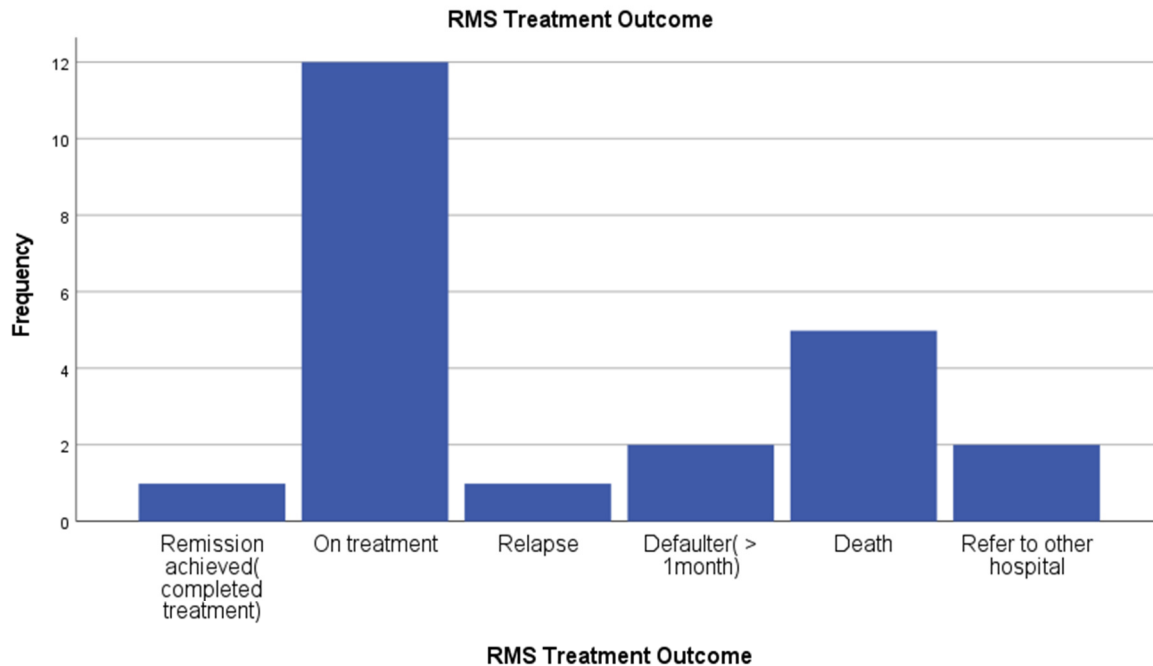


Figure 19 – RMS Treatment Outcome

Hodkin's Lymphoma

There are a total of 18 Hodgkin Lymphoma patients. They were more common in males (83%) and mostly presented in children in the age group of 5- 10 years and above 10 years (44%) each, 1-5 years (12%) and none in the infancy age group. The commonest presenting feature is Lymphadenopathy (76.5%) followed by LAP, Mediastinal mass, B symptoms combined (11.8%), Mediastinal mass (5.9%) and B symptoms (5.9%) [Fig 19]. The Majority of duration of presenting illness is within 6- 12 months (52.9%), >12 months (29.4%), 1-6 months (11.8%) and <1 month (5.9%) [Fig 20].

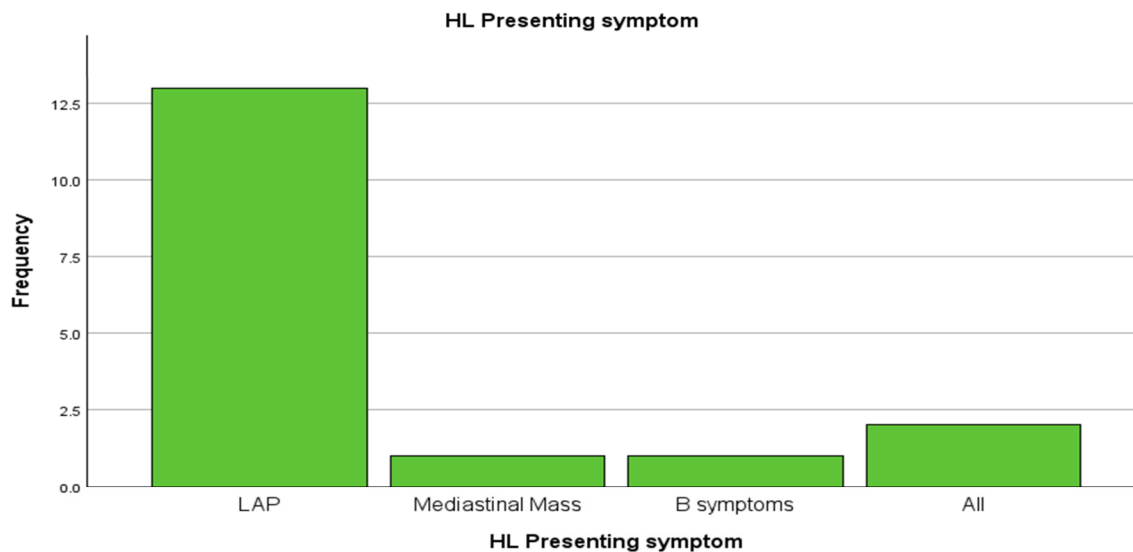


Figure 20- HL Presenting symptom/sign

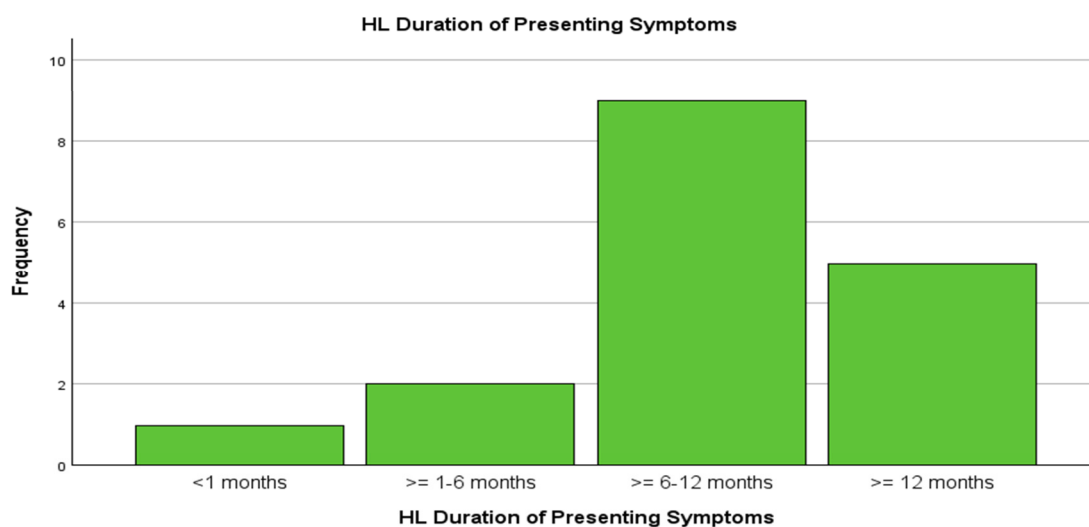


Figure 21 – HL Duration of presenting illness

Predominant histology was Classic HL (82.4%) followed by Nodular lymphocyte predominant HL (17.6%) [Fig 21]. Most of the patients were diagnosed in stage III (62.5%), followed by stage IV (18.8%), stage II (12.5%), and Stage I (6.3%). Majority of the patients were stratified as Intermediate risk (52.9%), High risk (41.2%) and Low risk (5.9%) [Fig 22].

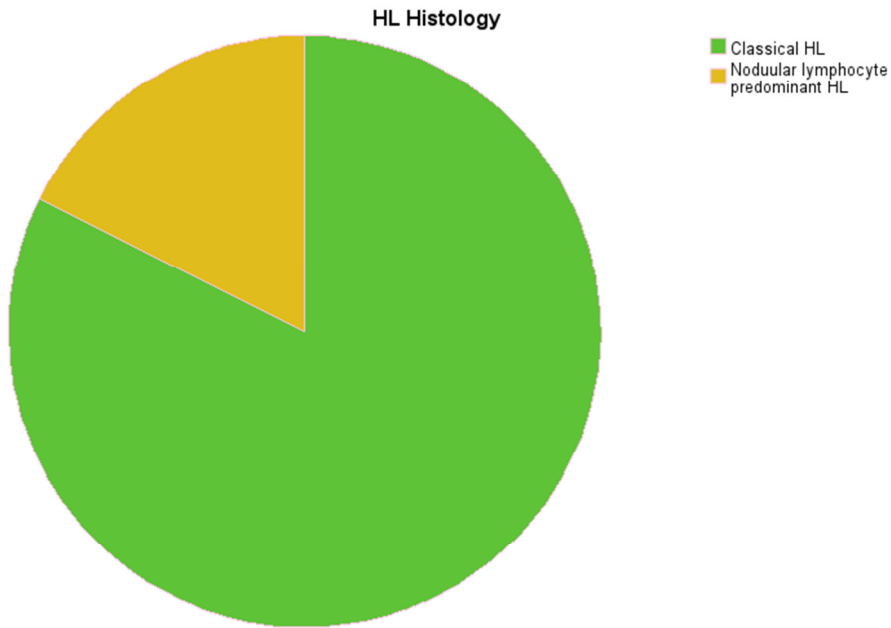


Figure 22 – Predominant Histology of HL

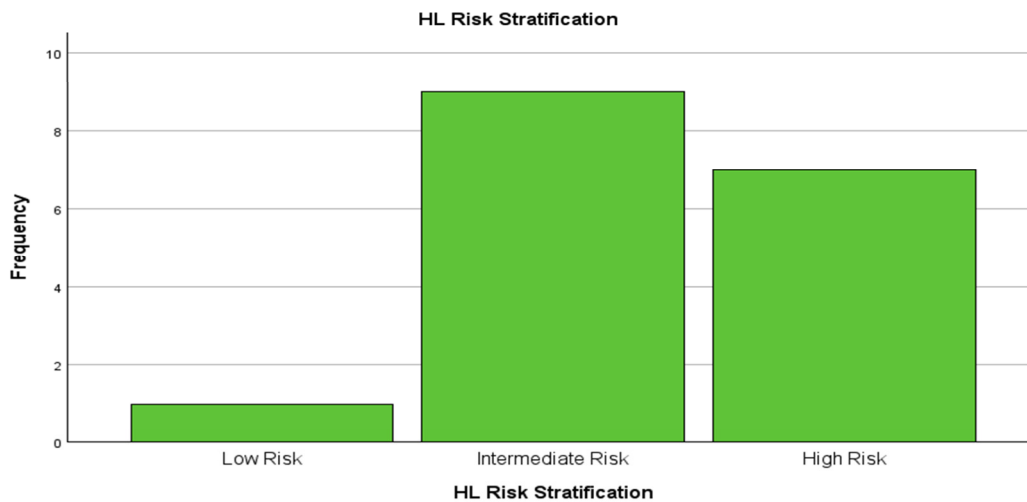


Figure 23 – HL Risk Stratification

All of the patients were treated with chemotherapy. Most patients achieved remission (47.1%), on treatment (47.1%), lost from follow up (5.9%) [Fig 23]. 3 patients had immunohistochemistry studies (16.6%).

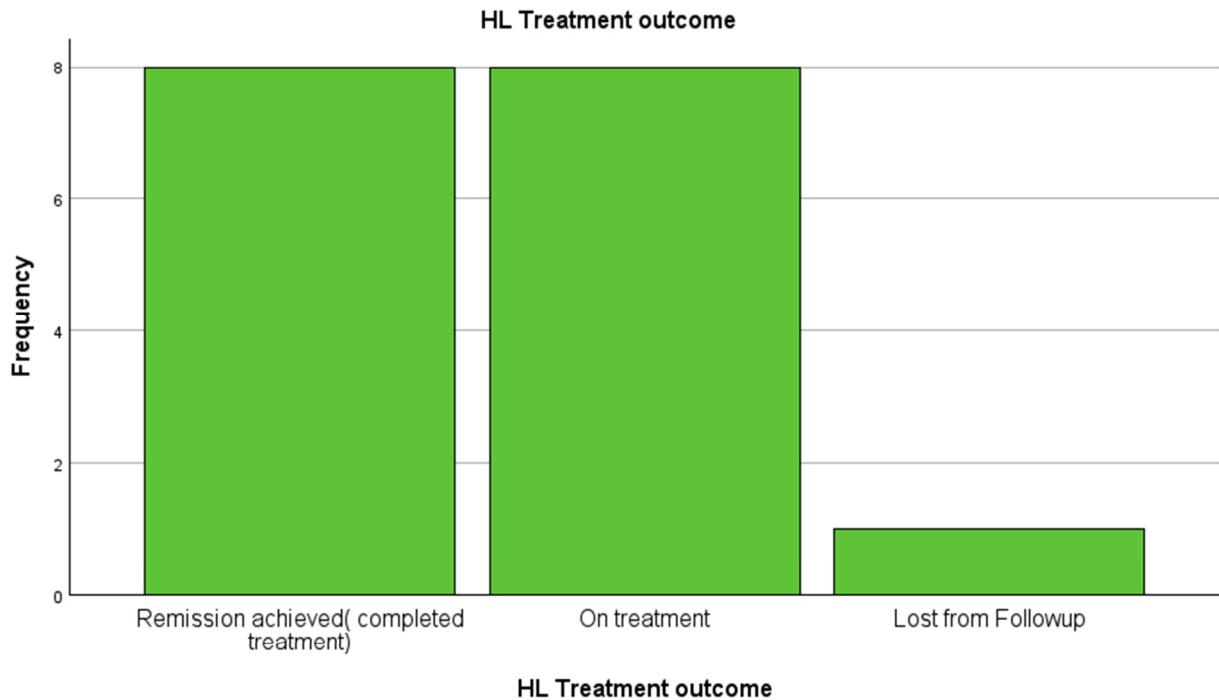


Figure 24 – HL treatment Outcome

Germ Cell Tumor

There are a total of 12 GCT patients. They were more common in males (75%) and mostly presented in children in the age group of 5-10 years (41%) followed by above 10 years (34%), 1-5 years (25%) and none in the infancy age group. The commonest presenting feature is abdominal mass 11(91.7%) and other symptoms like testicular enlargement, back pain etc 1(8.3%) [Fig 24]. The Majority of duration of presenting illness is within 1- 6 months 11 (91.7%), 6-12 months 1 (8.3%) [Fig 25]. There are 7 teratoma patients (58.3%), 2 Yolk sac (16.7%), 2 Ovarian tumor (16.7%), 1 other (8.3%) [Fig 26].

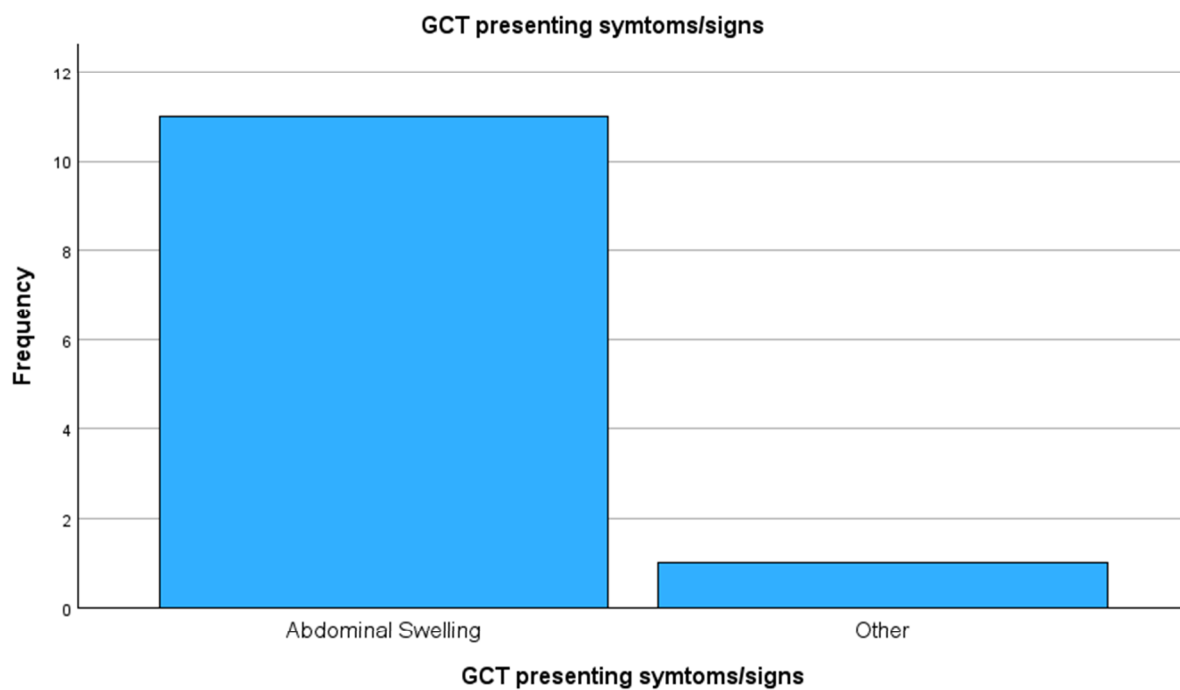


Figure 25 – GCT Presenting Symptom/sign

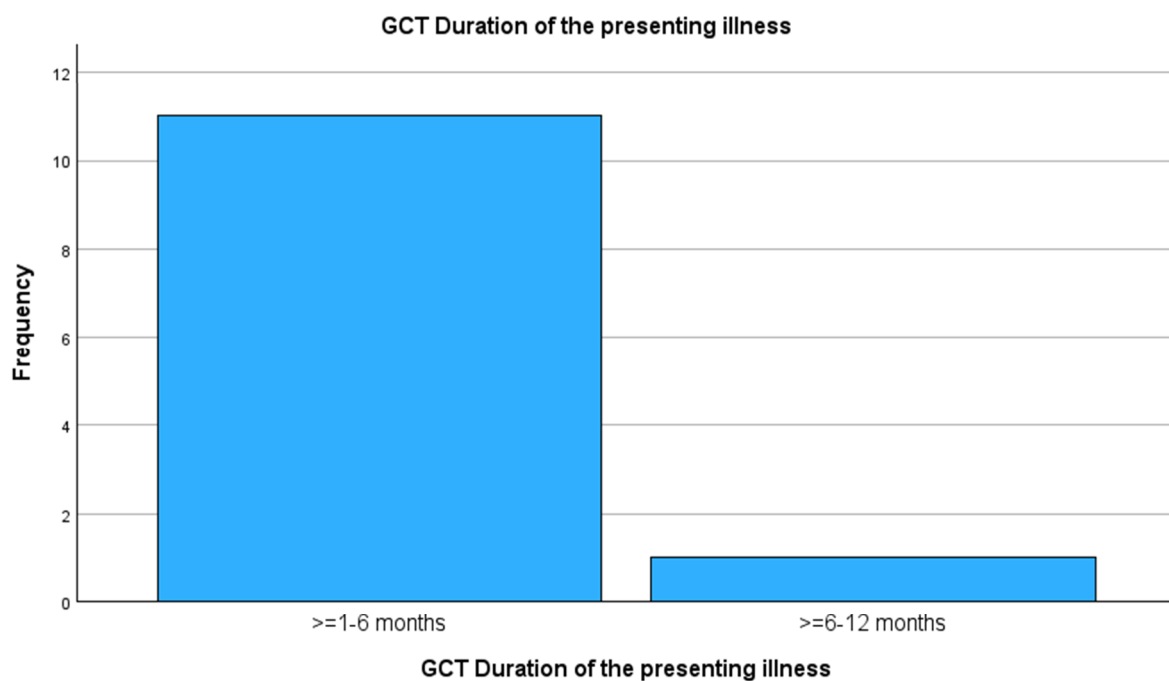


Figure 26 – GCT duration of the presenting illness

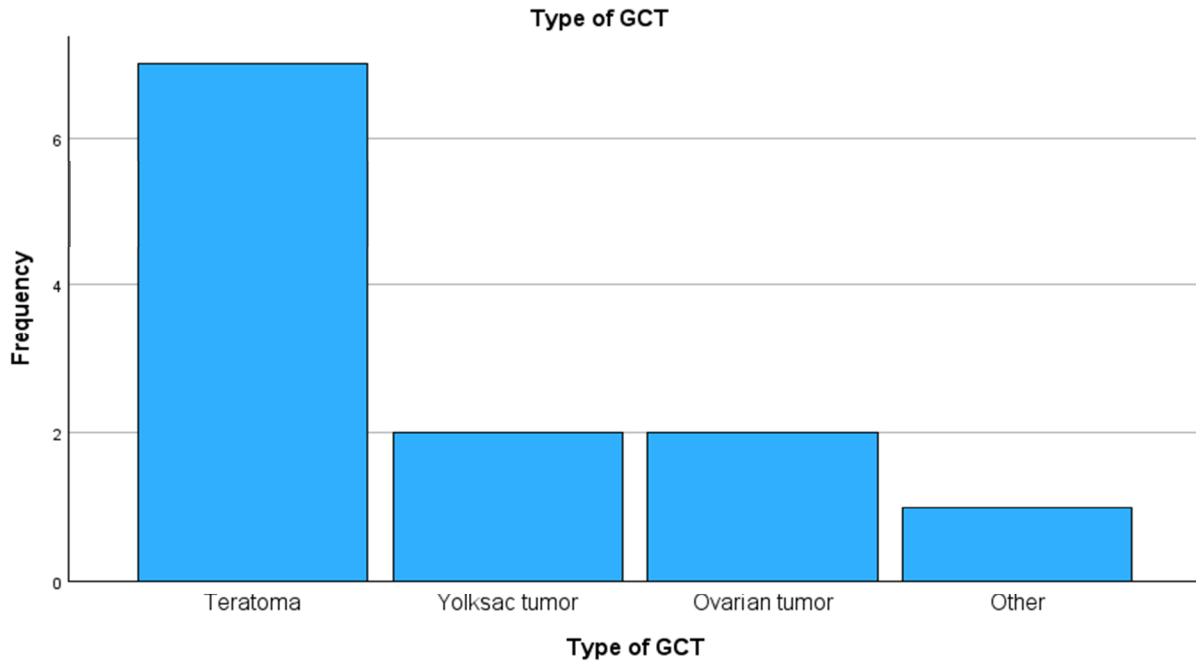


Figure 27 – Type of GCT

7 patients were treated with chemotherapy and surgery both (58.3%), 3 patients with chemotherapy (25%) and 2 patients with surgery alone (16.7 %) [Fig 27]. 9 patients are on treatment (75 %), 1 lost from follow up (8.3%), 1 left against medical advice (8.3%) and 1 died (8.3%) [Fig 28]. 10 Patients have Immunohistochemistry markers(83%).

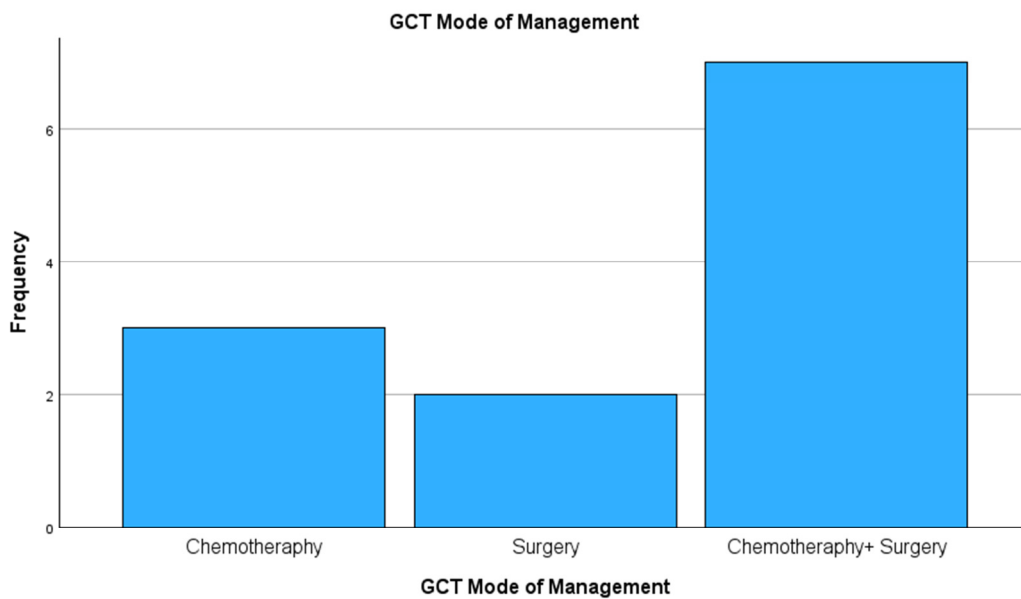


Figure 28 – GCT Mode of management

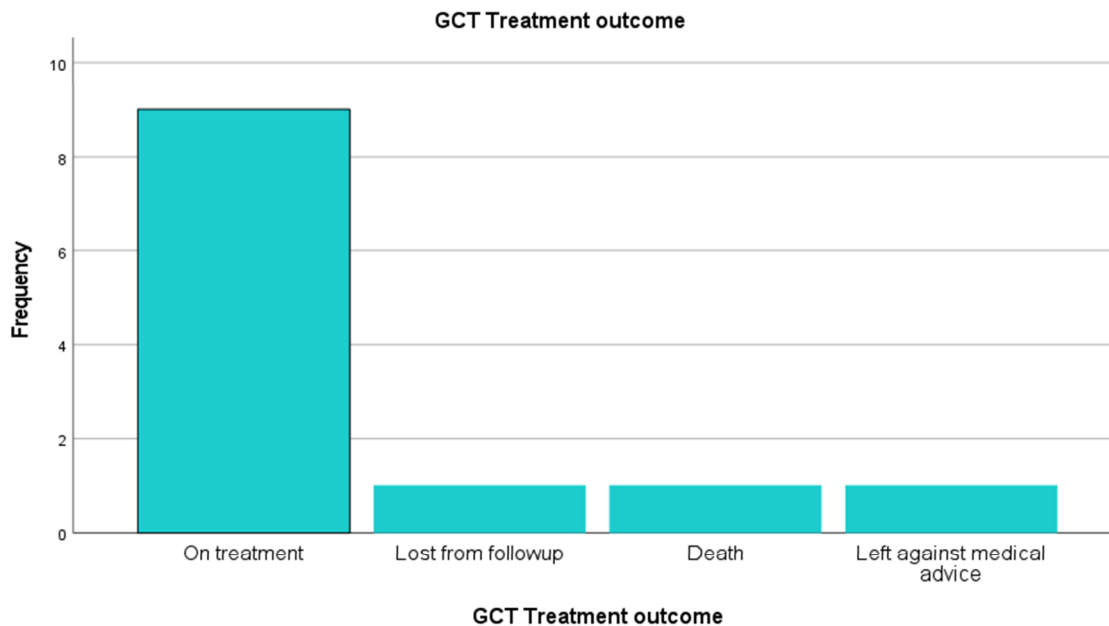


Figure 29 – GCT treatment outcome

Non- Hodgkin's Lymphoma

There are a total of 6 Non- Hodgkin Lymphoma patients. They were more common in females (83%) and mostly presented in children in the age group of 5-10 years (83%) followed by 1-5 years (17%) and none in infancy and above 10 years age group. The commonest presenting feature is Abdominal mass (hepatic and splenic enlargements) 5(83.3%) and all of them present within 1-6 months. Predominant histology was Burkitt lymphoma (75%), the rest is Diffuse large B cell lymphoma (25%) [Fig 29]. Most of the patients were diagnosed in stage II and IV (40%) and (40%) respectively followed by stage III (20%) [Fig 30]. Majority of the patients were stratified as Intermediate risk (66.7%), High risk (33.3%) and no low-risk patient [Fig 31].

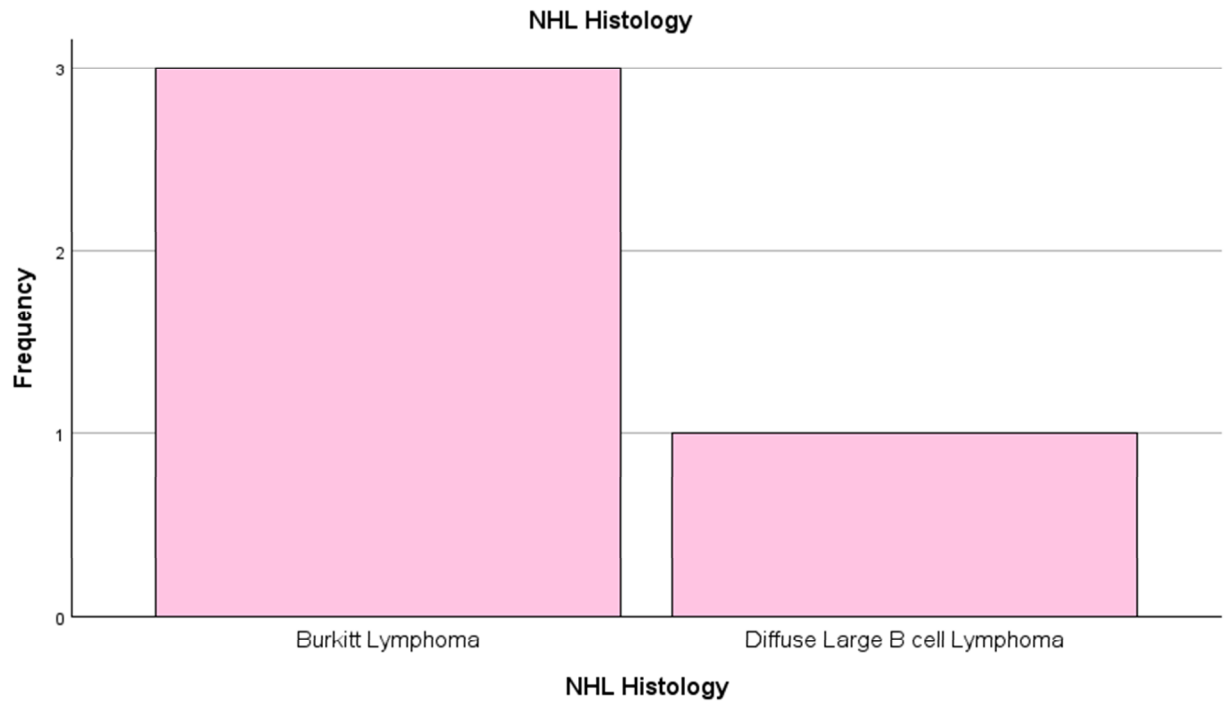


Figure 30 – NHL Histology

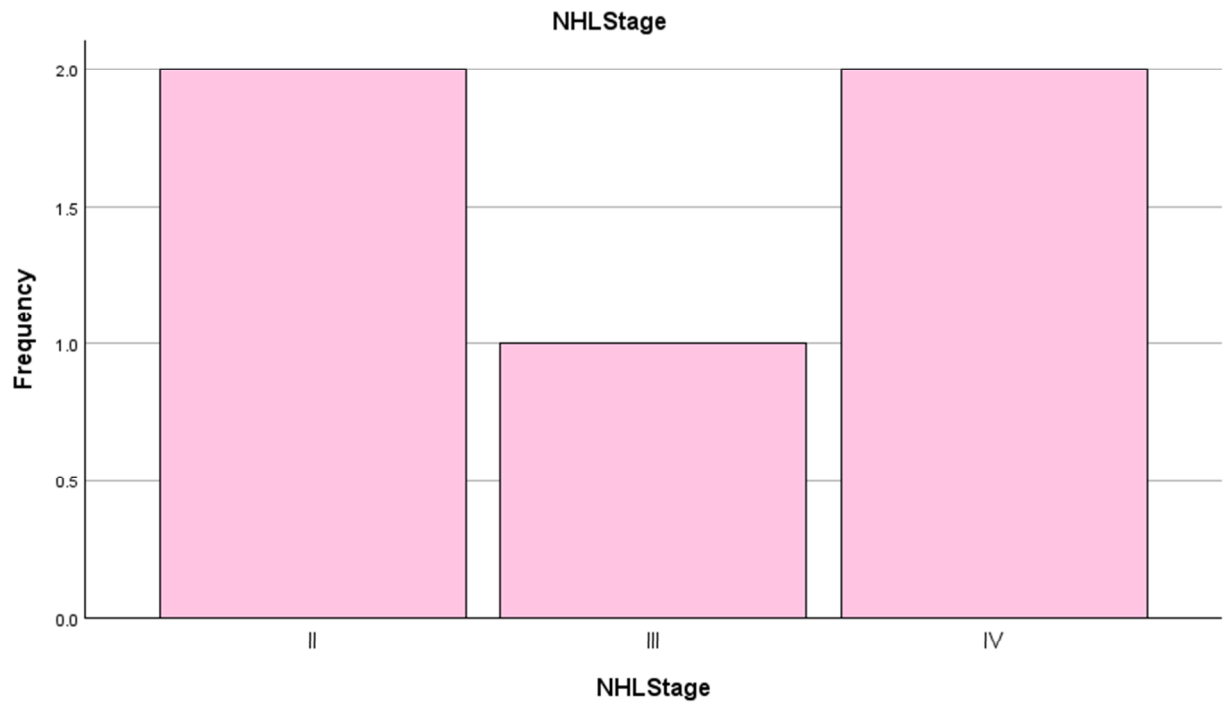


Figure 31 – NHL stage

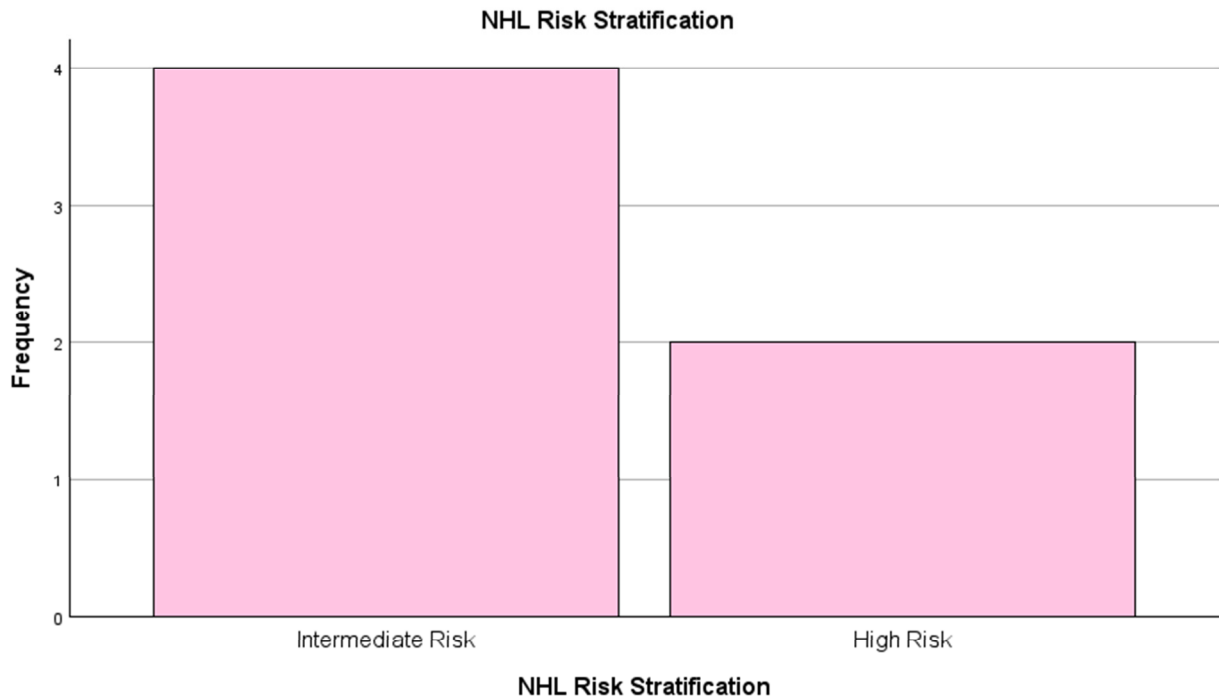


Figure 32-NHL stratification

5 patients were treated with chemotherapy (83.3%) and 1 patient with chemotherapy and surgery (16.7%) [fig 32]. Most patients were on treatment 4 (66.7%), 1 patient referred to other set up (16.7%) and 1 patient died (16.7%) [Fig 33]. None of the patients had immunohistochemistry markers.

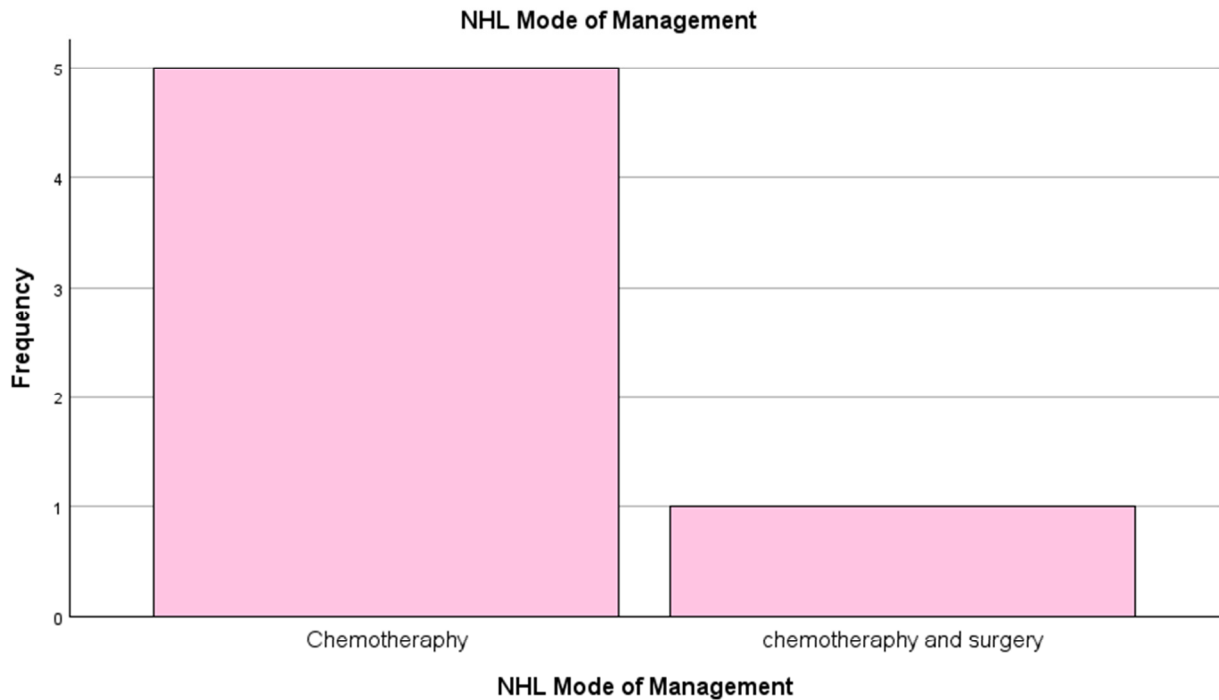


Figure 33 – NHL mode of management

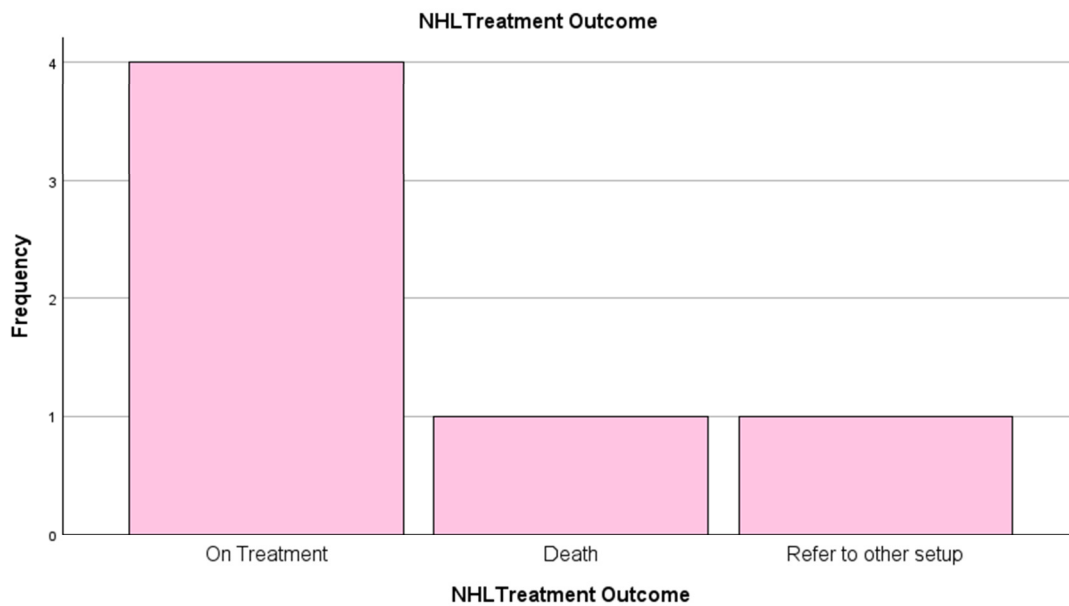


Figure 34 – NHL treatment outcome

Nasopharyngeal ca

There are a total of 5 Nasopharyngeal ca patients. They were more common in males (60%) and mostly presented in children in the age group of >10 years (60%) followed by 5-10 years and 1-5 years (20%) each and none in infants. The commonest presenting feature is Neck swelling

(100%) and duration of illness is between 1-6 month (80%) and 6-12 months (20%) [Fig 34]. Most of the patients were diagnosed in stage IV (80%) and stage III (20%) [fig 35].

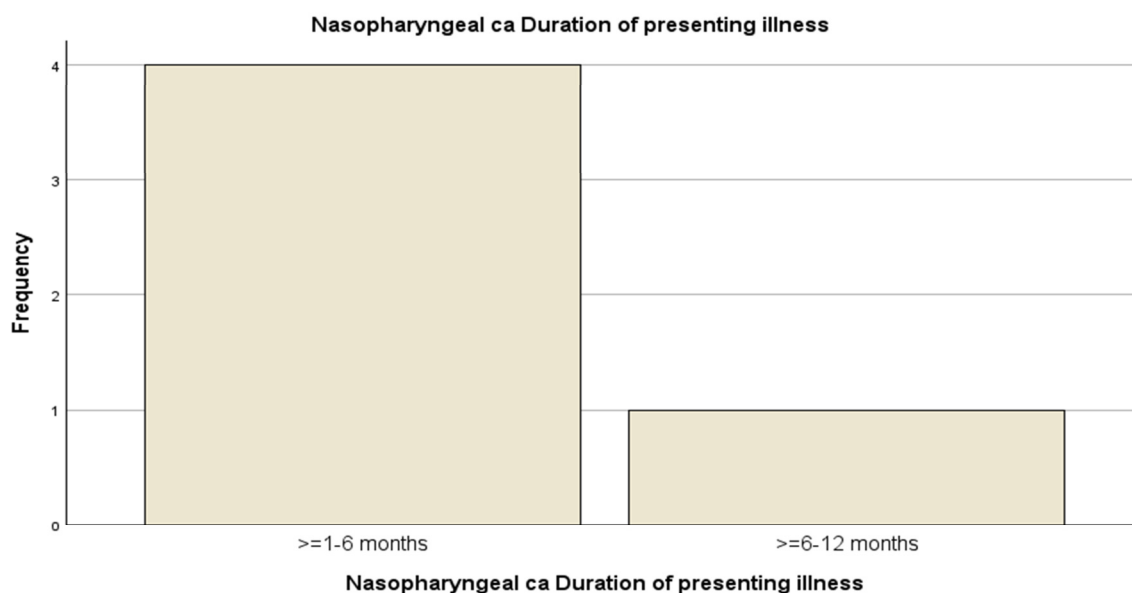


Figure 35- Nasopharyngeal Ca duration of presenting illness

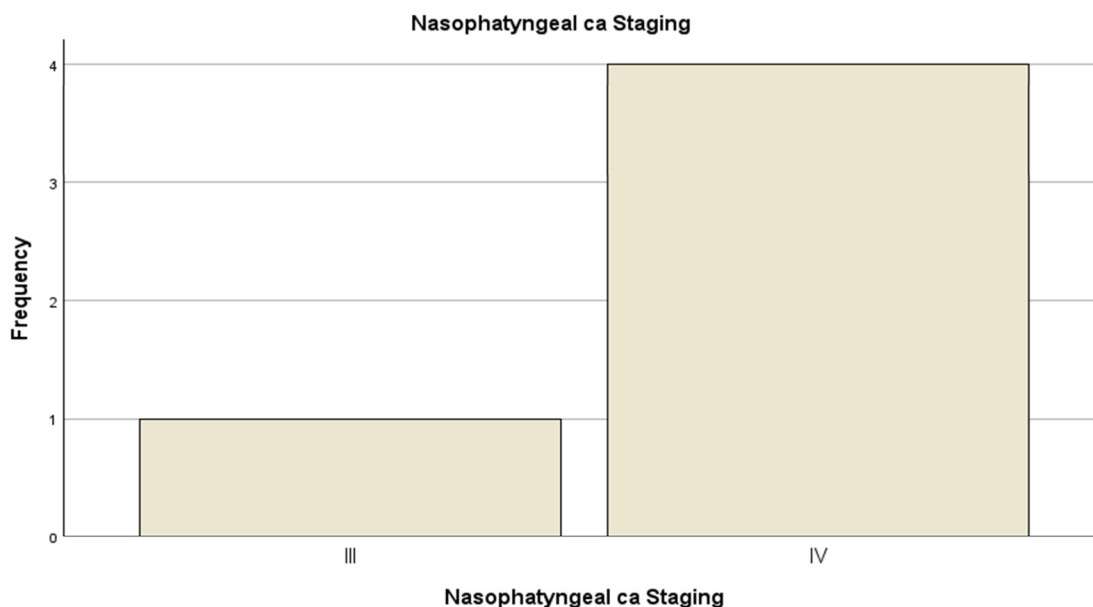


Figure 36 – Nasopharyngeal ca staging

All of the patients were treated with chemotherapy and 4 patients are on treatment (80%) and 1 patient died (20%).

Ewing Sarcoma

There are a total of 5 Ewing sarcoma patients. They were more common in males (60%) and mostly presented in children in the age group of 5-10 years (60%) followed by 1-5 years and > 10 years (20 %) each and infants. The commonest presenting feature is swelling (80%) and duration of illness is between 1-6 month (40%), 6-12 months (40%) and >12 months (20%) [Fig 36]. It occurs over the skull 2 (40%), spine 2 (40%), long bones (femur, tibia and humerus) 1 (20%) [Fig 37]. Most of the patients were diagnosed in stage IV (50%), stage II (25 %) and stage III (25%) [fig 38].

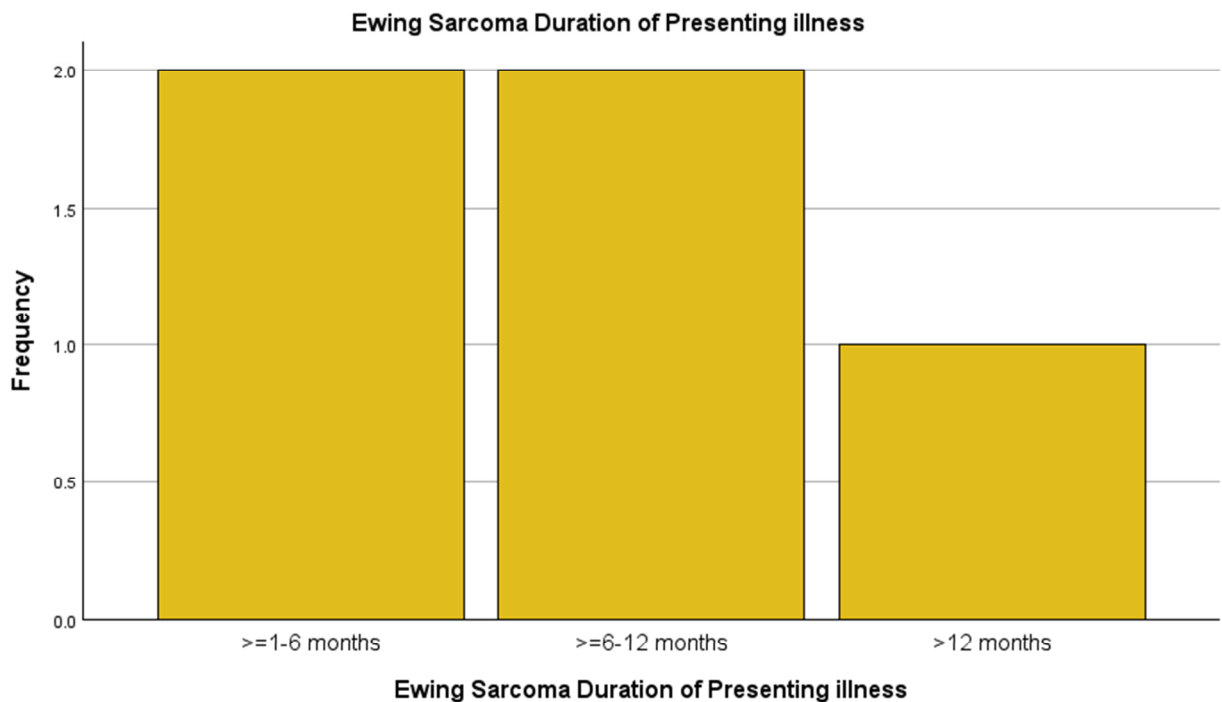


Figure 37 - Ewing Sarcoma duration of presenting illness

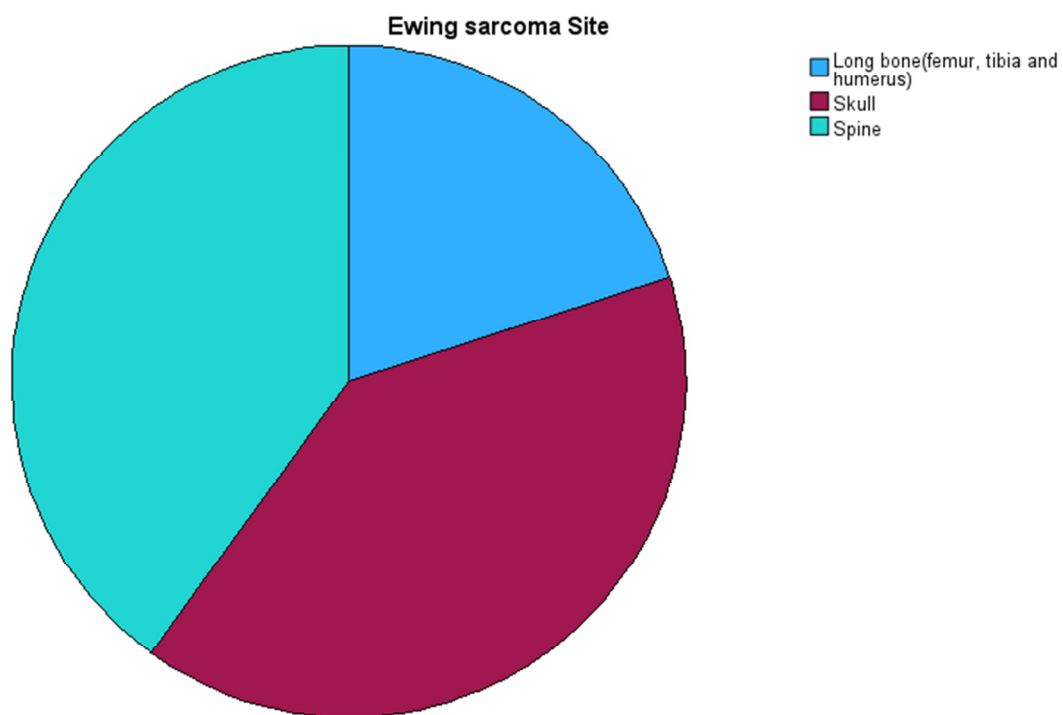


Figure 38 – Ewing Sarcoma Site

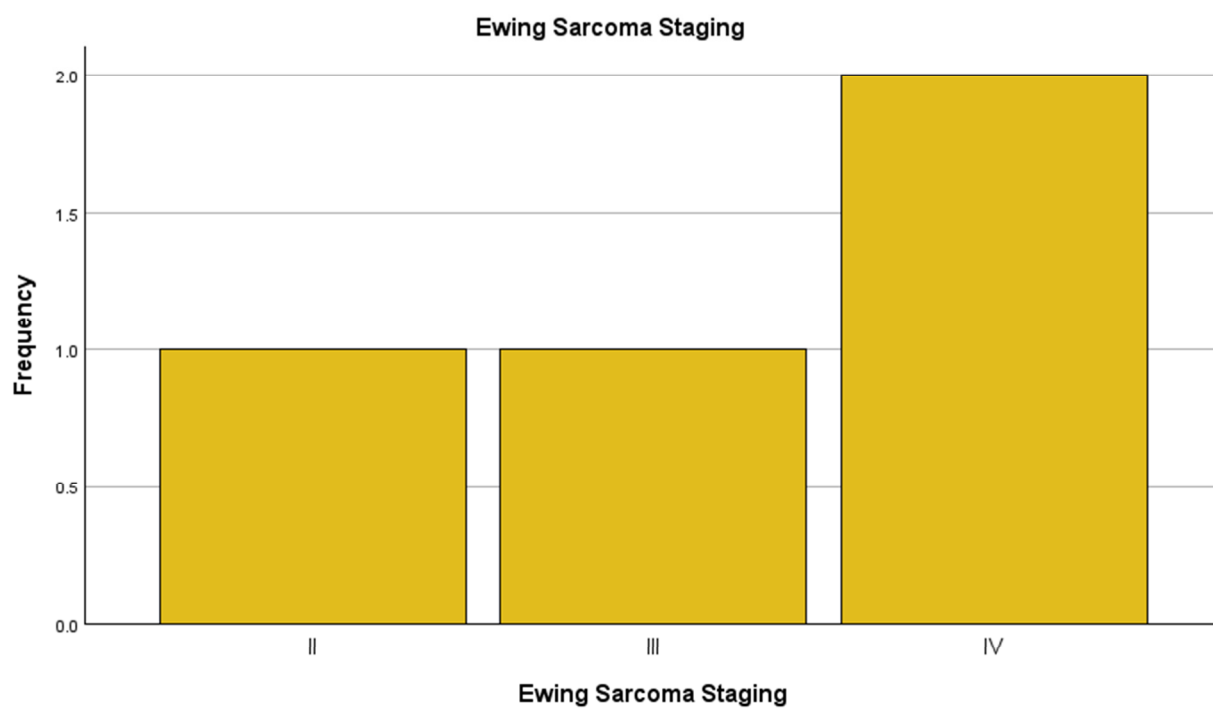


Figure 39 – Ewing Sarcoma Staging

Majority of the patients were treated with chemotherapy 4 (80%) and 1 patient with chemotherapy and surgery (20%) [Fig 39]. 3 patients were on treatment (60 %), 1 patient relapsed 1 (20%) and 1 patient died (20 %) [Fig 40].

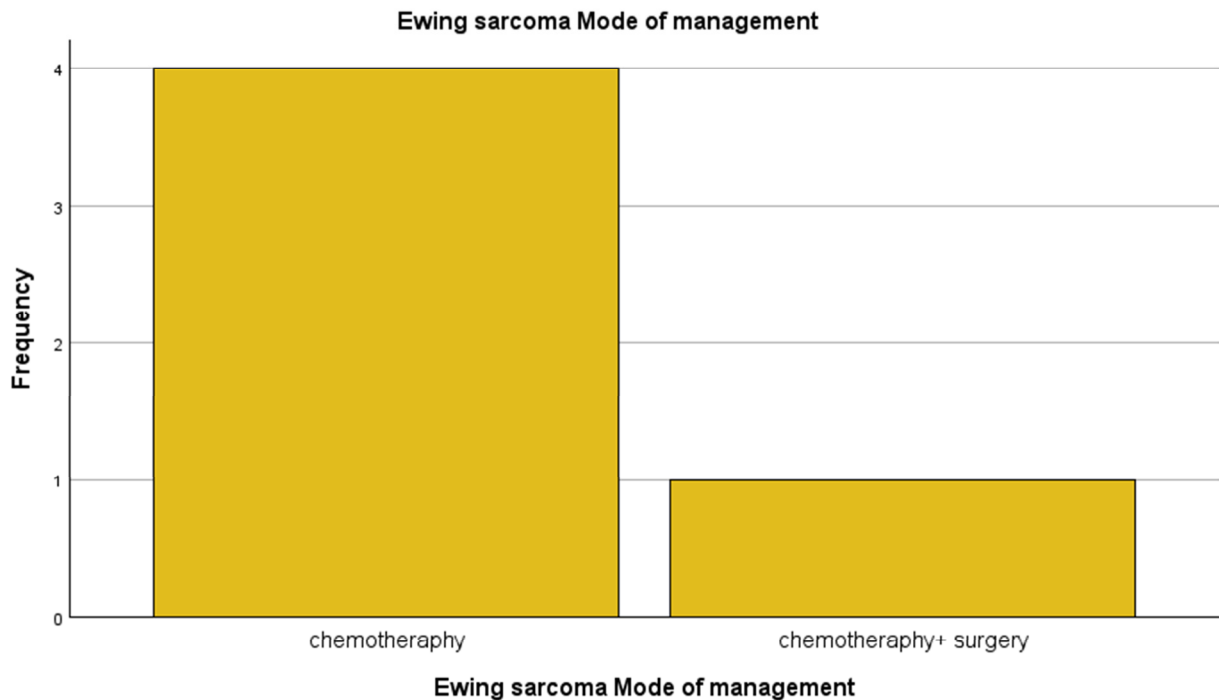


Figure 40 – Ewing sarcoma Mode of management

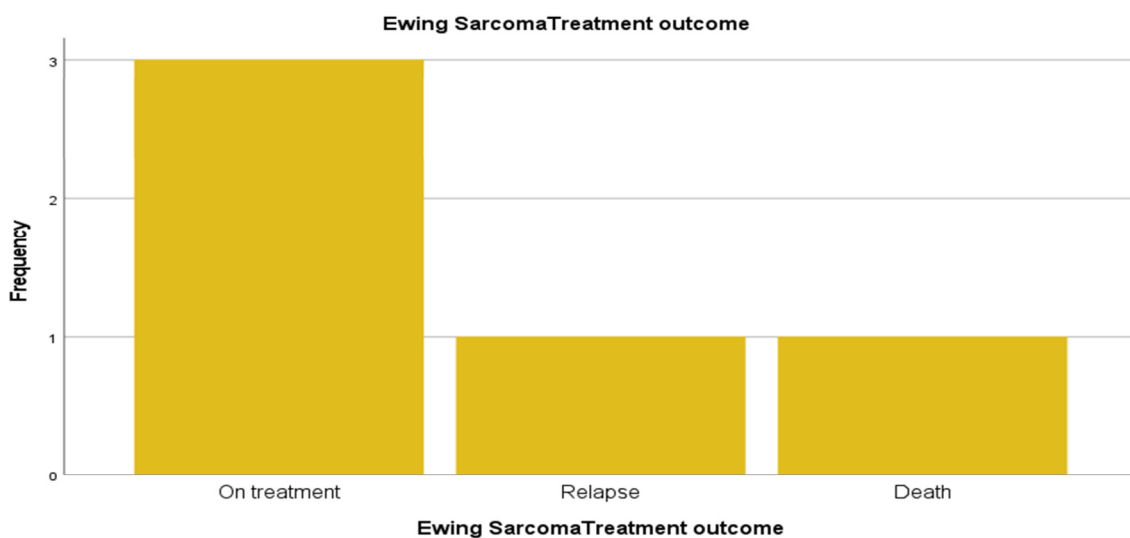


Figure 41 – Ewing sarcoma Treatment outcome

Neuroblastoma

There are a total of 3 Neuroblastoma patients. They were more common in females (66%) and mostly presented in children in the age group of 5-10 years (66%) followed by 1-5 years (33%) and none in infants up to 12 months and above 10 years age group. The commonest presenting feature is Abdominal mass (66.7%) and abdominal pain (33.3%) [Fig 41]. The duration of illness for 2 patients is between 6-12 months (66.7%), followed by 1 patient presented with in 1 month (33.3%) [Fig 42].

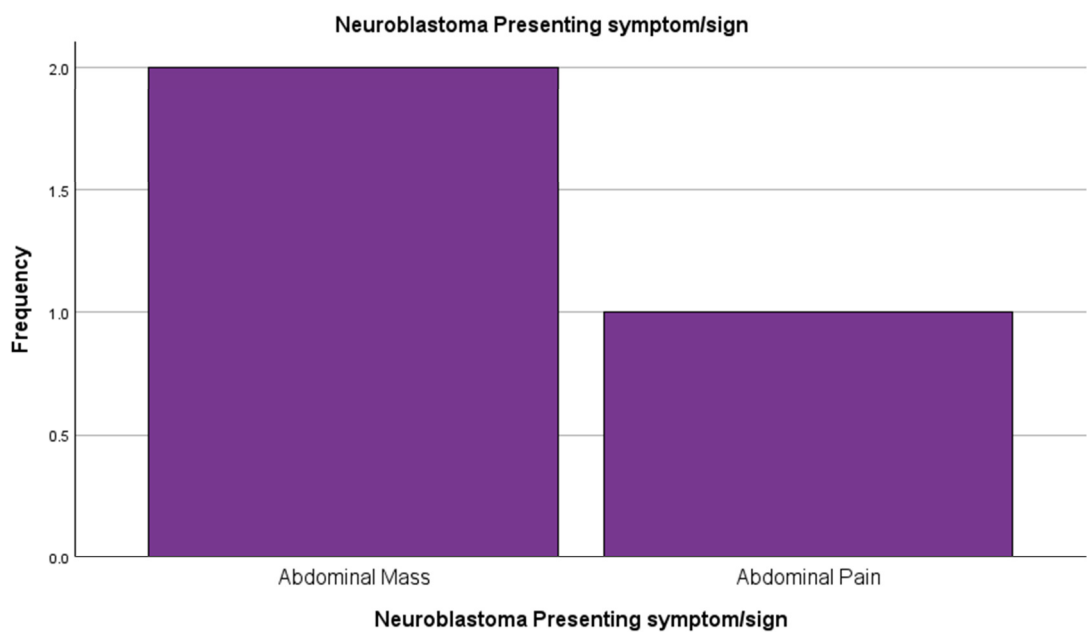


Figure 42 - Neuroblastoma Presenting symptoms/signs

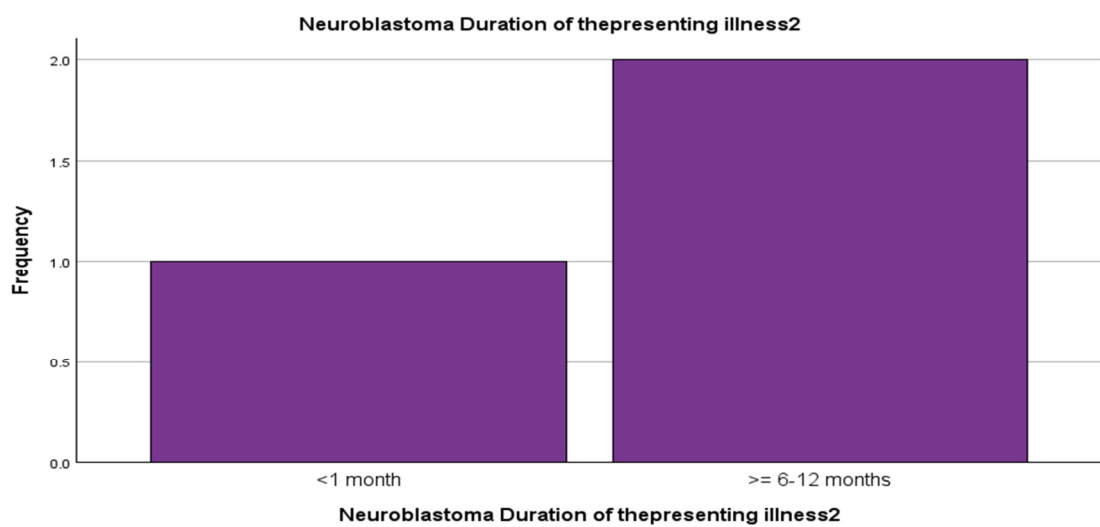


Figure 43 – Neuroblastoma Duration of the presenting illness.

Two of the patients were treated with chemotherapy (66.7%) and 1 patient with chemotherapy and surgery (25%). Two of the patients were on treatment (66.7 %), 1 patient left against medical advice (33.3%) [Fig 42].

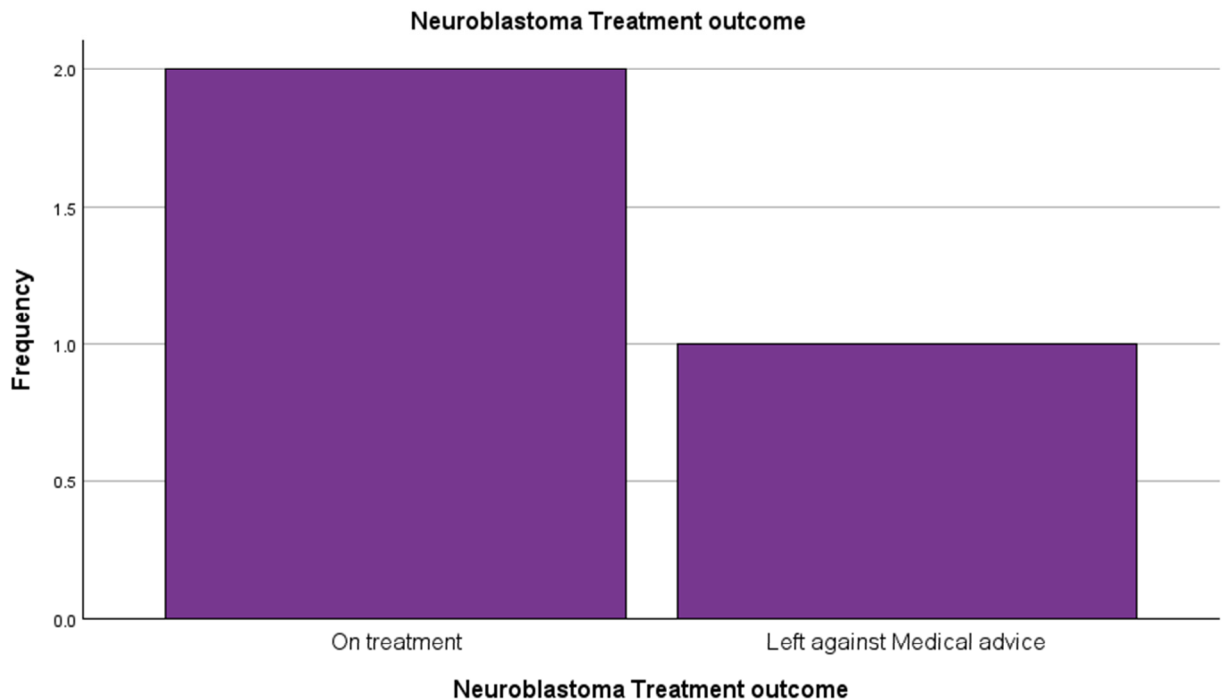


Figure 44 – Neuroblastoma treatment outcome

Hepatoblastoma

There are a total of 2 hepatoblastoma patients. All of were males and mostly presented in children in the age group of 1-5 years (50%) and in infants up to 12 months (50%) and none in the 5-10 years age and above 10 years of age group. The commonest presenting feature is abdominal swellings and the duration of illness is between 6-12 months (50%), and <1 month(50%) [Fig 44].

Two of the patients were treated with chemotherapy alone and 1 patient was on treatment (50%) and 1 patient lost from follow up (5%) [Fig 45].

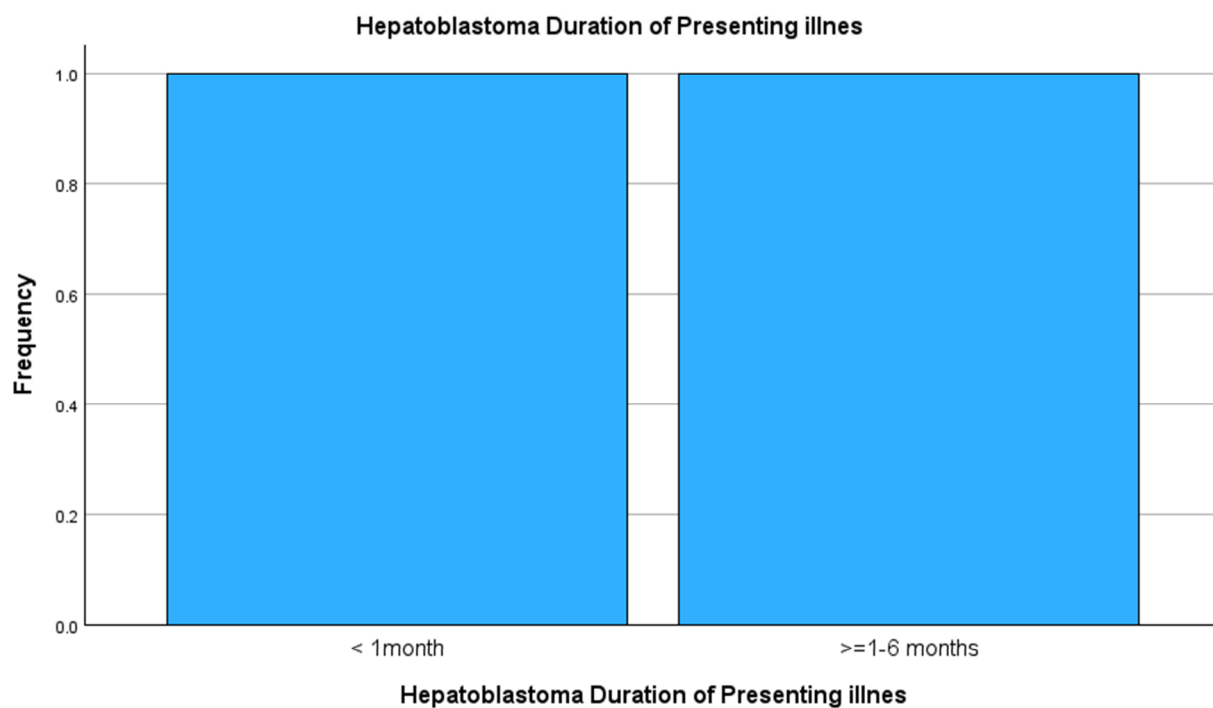


Figure 45 – Hepatoblastoma duration of illness

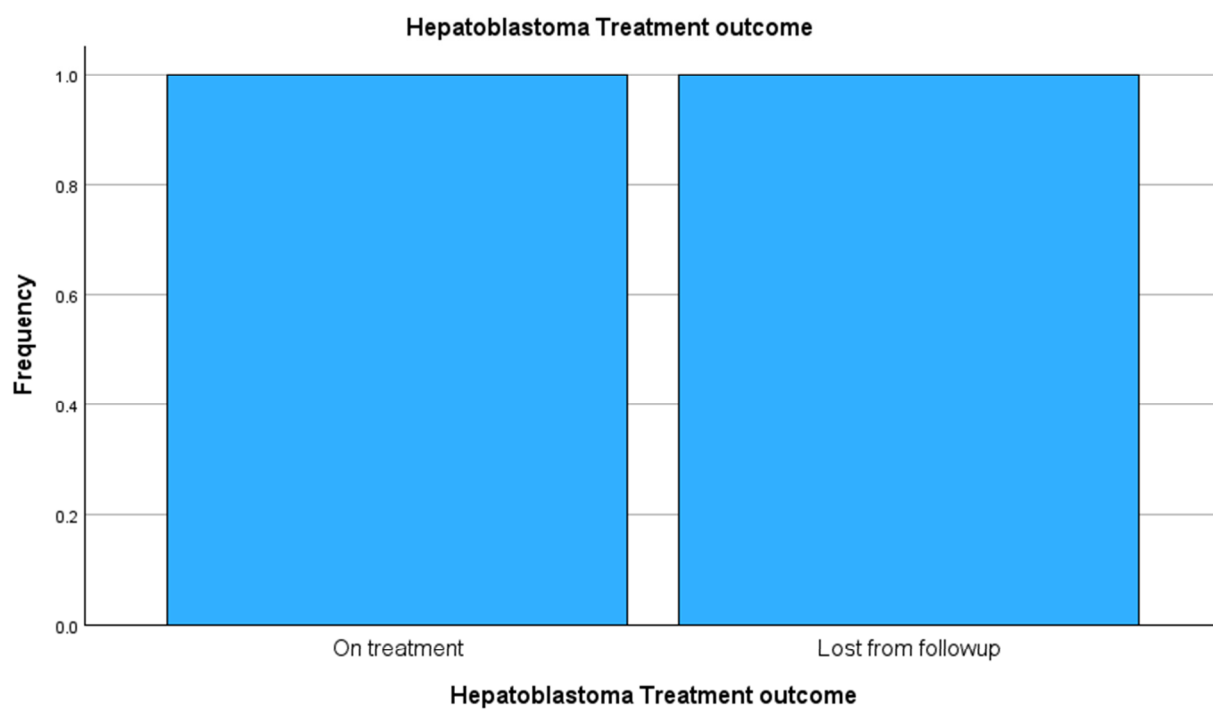


Figure 46 – Hepatoblastoma treatment outcome

Other tumors

There are a total of 16 other tumor patients. These are 2 adrenocortical tumor, 2 craniopharyngioma, 1 glioma, 2 Astrocytoma, 1 medulloblastoma, 1 osteosarcoma, 1 gastric lymphoma, 1 liver mass 20 to sucapsular hamartoma, 1 orbital lymphoma, 3 hemangioma, 1 lymphangioma.

5.3 Treatment Outcome

Among the studied patients, 23 patients went into remission(14.7%), 86 patients are still on treatment (55.1%), 4 relapse (2.56%), 2 were defaulters (1.28 %), 5 lost from follow- up (3.2%), 21 died (13.4%), 5 referred to other hospital (3.2 %), 10 left against medical advice (6.56%)[Table 5].

5.4 Factors Associated with Treatment Outcome

Retinoblastoma: Correlation analysis done to see if there is any correlation exists between duration of the presenting illness, Group of the disease and treatment outcome. Duration of the presenting illness has little correlation (Pearson correlation coefficient of 0.135) and group of the disease has no correlation (Pearson correlation coefficient of 0.059) with the treatment outcome.

Using Multivariate logistic regression model, it showed the stage of the disease tend to affect the treatment outcome[P- value < 0.05] than the duration of the presenting illness affects the treatment outcome [p -value > 0.05]. [Table 5].

Likelihood Ratio Tests				
Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	3.112 ^a	.000	0	.
Retinoblastoma Staging	11.797	8.685	2	.013
RetinoDuratinPresAnal	6.252	3.140	6	.791

Table 6 – Likelihood ratio test for retinoblastoma

But the detailed analysis doesn't show whether which stage of the disease is highly associated with the treatment outcome on the multi variate logistic regression for which each stage of the disease having a P value of >0.05.

RetinotrOutcomeAnal ^a		B	Std. Error	Wald	df	Sig.
Remission achieved	Intercept	1.386	15954.468	.000	1	1.000
	[Retinoblastoma Staging=2]	53.060	10872.270	.000	1	.996
	[Retinoblastoma Staging=3]	0 ^c	.	.	0	.
	[RetinoDuratinPresAnal=.00]	.000	.000	.	1	.
	[RetinoDuratinPresAnal=1.00]	-35.544	17855.376	.000	1	.998
	[RetinoDuratinPresAnal=2.00]	-.788	18365.386	.000	1	1.000
	[RetinoDuratinPresAnal=3.00]	0 ^c	.	.	0	.
on treatment	Intercept	19.825	15632.123	.000	1	.999
	[Retinoblastoma Staging=2]	17.803	7344.171	.000	1	.998
	[Retinoblastoma Staging=3]	0 ^c	.	.	0	.
	[RetinoDuratinPresAnal=.00]	.000	12763.574	.000	1	1.000
	[RetinoDuratinPresAnal=1.00]	-19.825	15632.123	.000	1	.999
	[RetinoDuratinPresAnal=2.00]	-1.339	17255.288	.000	1	1.000
	[RetinoDuratinPresAnal=3.00]	0 ^c	.	.	0	.

a. The reference category is: Died.

b. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

c. This parameter is set to zero because it is redundant.

Table 7 – Parameter estimate of treatment outcome of retinoblastoma

Wilm's Tumor: Duration of the presenting symptom has no correlation with the treatment outcome (Pearson correlation coefficient of -0.22) and Stage of the disease has no correlation (Pearson correlation coefficient of 0.05) with treatment outcome.

In Multivariate logistic regression, the stage of the disease tend to affect the treatment outcome [p- value< 0.05] as compared to the duration of the presenting illness affects the treatment outcome[p – value>0.05]. [Table 8]

Likelihood Ratio Tests

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	df	Sig.
Intercept	3.756 ^a	.000	0	.
Wilms Tumor Duration of the presenting illness	10.938	7.182	4	.127
Wilms Tumor Staging	22.255	18.499	8	.018

Table 8 – Likelihood ratio test for wilm's tumor

But the detailed analysis whether which stage of the disease is highly associated with the treatment outcome is not revealed on the multi variate logistic regression for which each stage of the disease having a p value of >0.05.

WilmstrtoutcomeAnal ^a		B	Std. Error	Wald	df	Sig.
Achieved Remission	Intercept	-3.903	242.990	.000	1	.987
	[Wilms Tumor Duration of the presenting illness=0]	-16.507	279.272	.003	1	.953
	[Wilms Tumor Duration of the presenting illness=1]	-7.333	145.464	.003	1	.960
	[Wilms Tumor Duration of the presenting illness=2]	0 ^b	.	.	0	.
	[Wilms Tumor Staging=0]	30.306	201.988	.023	1	.881
	[Wilms Tumor Staging=1]	18.302	320.122	.003	1	.954
	[Wilms Tumor Staging=2]	8.966	219.890	.002	1	.967
	[Wilms Tumor Staging=3]	2.111	206.091	.000	1	.992
	[Wilms Tumor Staging=4]	0 ^b	.	.	0	.
On treatment	Intercept	-.613	72.685	.000	1	.993
	[Wilms Tumor Duration of the presenting illness=0]	-23.351	66.855	.122	1	.727
	[Wilms Tumor Duration of the presenting illness=1]	-8.057	48.668	.027	1	.869

[Wilms Tumor Duration of the presenting illness=2]	0 ^b	.	.	0	.
[Wilms Tumor Staging=0]	28.434	.000	.	1	.
[Wilms Tumor Staging=1]	31.808	76.591	.172	1	.678
[Wilms Tumor Staging=2]	16.252	62.424	.068	1	.795
[Wilms Tumor Staging=3]	9.076	53.995	.028	1	.867
[Wilms Tumor Staging=4]	0 ^b	.	.	0	.

a. The reference category is: Died.

b. This parameter is set to zero because it is redundant.

Table – 9 Parameter estimate of treatment outcome of Wilm’s Tumor

Rhabdomyosarcoma: Tumor site has no correlation with the treatment outcome (Pearson correlation coefficient of 0.078), risk stratification has no correlation (Pearson correlation coefficient of -0.25) with treatment outcome, staging has no correlation (Pearson correlation coefficient of -0.43) with treatment outcome.

Using Multivariate regression model, the duration of presenting illness, risk stratification , stage of the disease has not affected the treatment outcome. [Table 10]

RMStrtoutcomeANal ^a		B	Std. Error	Wald	df	Sig.
Achived Remission	Intercept	21.454	21067.217	.000	1	.999
	[RMS Duration of the presenting illness=1]	-14.500	6502.164	.000	1	.998
	[RMS Duration of the presenting illness=2]	-2.535	21067.217	.000	1	1.000
	[RMS Duration of the presenting illness=3]	0 ^c	.	.	0	.
	[RMSstagingAnal=.00]	-24.580	21238.994	.000	1	.999
	[RMSstagingAnal=1.00]	-34.359	2662.923	.000	1	.990
	[RMSstagingAnal=2.00]	-34.694	3359.562	.000	1	.992
	[RMSstagingAnal=3.00]	0 ^c	.	.	0	.
	[RMSRISKAnal=.00]	0 ^c	.	.	0	.
	[RMSRISKAnal=1.00]	11.631	20042.905	.000	1	1.000
	[RMSRISKAnal=2.00]	0 ^c	.	.	0	.

On treatment	Intercept	19.067	2989.565	.000	1	.995
	[RMS Duration of the presenting illness=1]	-15.753	2477.673	.000	1	.995
	[RMS Duration of the presenting illness=2]	-.147	2989.565	.000	1	1.000
	[RMS Duration of the presenting illness=3]	0 ^c	.	.	0	.
	[RMSstagingAnal=.00]	-18.994	3041.879	.000	1	.995
	[RMSstagingAnal=1.00]	-18.053	1.727	109.326	1	.000
	[RMSstagingAnal=2.00]	-18.548	.000	.	1	.
	[RMSstagingAnal=3.00]	0 ^c	.	.	0	.
	[RMSRISKAnal=.00]	0 ^c	.	.	0	.
	[RMSRISKAnal=1.00]	15.111	1672.913	.000	1	.993
	[RMSRISKAnal=2.00]	0 ^c	.	.	0	.

a. The reference category is: Died.

b. Floating point overflow occurred while computing this statistic. Its value is therefore set to system missing.

c. This parameter is set to zero because it is redundant.

Table – 10 Parameter estimate of treatment outcome of Rhabdomyosarcoma

Treatment Outcome	Retinoblastoma	Wilm's Tumor	Rhabdomyosarcoma	Hodgkin Lymphoma	Neuroblastoma	Ewing Sarcoma	GCT	NHL	Nasopharyngeal Ca	Hepatoblastoma	TOTAL	PERCENTAGE
Achieved Remission/ completed treatment	13	1	1	8	0	0	0	0	0	0	23	14.7%
On Treatment	30	13	12	8	2	3	9	4	4	1	86	55.1%
Relapse	0	2	1	0	0	1	0	0	0	0	4	2.56%
Defaulter (>1 month)	0	0	2	0	0	0	0	0	0	0	2	1.28%
Lost from follow-up	2	0	0	1	0	0	1	0	0	1	5	3.2 %
Death	6	6	5	0	0	1	1	1	1	0	21	13.4 %
Refer to other Hospitals	1	1	2	0	0	0	0	1	0	0	5	3.2 %
Left against Medical advice	1	7	0	0	1	0	1	0	0	0	10	6.4 %

Table 11 – Treatment outcome of pediatric solid Tumors

6. Discussion

6.1 Demographic Characteristics and Admission Patterns

Understanding the demographic characteristics and admission patterns of pediatric oncology patients is essential for tailoring healthcare services to meet their specific needs. The incidence of childhood cancer has shown a concerning rise over the years in this study. This trend may be attributed to heightened public awareness, enhanced referral linkage system and improved health-seeking behavior within the community.

In general, childhood cancer exhibits a higher incidence among males compared to females, with the male-to-female ratio typically hovering around 1.2:1 in the most affluent nations (13). The overall observed slight male predominance in our study is consistent with some previous reports in pediatric oncology literatures (11,12,3). Nevertheless, certain cancers like retinoblastoma, Wilms' tumor, osteosarcoma, and germ cell tumors demonstrate a slight preference towards females (13). Additionally, the high number of patients coming from the Oromia region and seeking care at St. Paul Hospital can be attributed to a combination of factors. While the hospital's geographical proximity offers convenience for patients residing in Oromia, its role as a referral center for oncology care across a wide catchment area, including Oromia, underscores its capacity to provide specialized cancer services. This suggests that patients may choose St. Paul Hospital not only for its proximity but also for it is one of the two tertiary public hospital providing advanced pediatric oncology services with specialized expertise in Addis Ababa.

The age distribution of patients, with a notable concentration in the 1-5 years age group, while other studies reported among 5–10 age groups (12). This age distribution reflects both the vulnerability of young children to malignancies and the challenges in diagnosing and managing cancer in this age group. Early detection strategies and community-based awareness programs aimed at promoting early presentation to healthcare facilities could potentially improve outcomes by facilitating timely diagnosis and intervention.

6.2 Tumor Distribution and Characteristics:

The tumor distribution observed in this study mirrors some established patterns in pediatric oncology, with retinoblastoma, Wilm's tumor, and rhabdomyosarcoma emerging as the most prevalent malignancies (11). The higher number of retinoblastoma patients in our setup (30.6%), as compared to Gondar university's retinoblastoma patients (1.4 %) with relatively half sample size of us, shows the ongoing commitment of our cancer center with dedicated team involving pediatric oncology and ophthalmology departments (7). The high incidence of retinoblastoma, characterized by leukocoria and other ocular symptoms, underscores the importance of ophthalmologic screening programs for early detection and intervention. Similarly, the predominance of Wilm's tumor, often presenting with abdominal mass, highlights the need for vigilant clinical evaluation and imaging modalities for prompt diagnosis.

The observed variations in tumor characteristics, such as staging and histological subtypes, have implications for treatment planning and prognostication. For instance, the predominance of advanced-stage disease in certain tumor types underscores the importance of strategies to improve early detection and referral pathways. In our case of retinoblastoma most of them were diagnosed in Group E, followed by Group C as opposed to one study done in Kashmir, India where most of the tumors were diagnosed in Group B, followed by Group D. In Wilm's tumor most of them were diagnosed in stage IV followed by stage II while the same study from Kashmir indicated most of the patients were diagnosed in Stage III, followed by Stage I. In case of Rhabdomyosarcoma most of the patients were diagnosed in stage III followed by stage IV. This can show that there is still limited awareness about the clinical presentation and poor health seeking behaviors observed among our community.

Furthermore, the distribution of tumors across different anatomical sites underscores the heterogeneity of pediatric oncology and the need for tailored therapeutic approaches based on tumor location and biology.

6.3 Treatment Outcomes:

The treatment outcomes reported in this study reflect the complex interplay of various factors, including tumor biology, treatment modalities, and patient-specific factors. While a notable proportion of patients (14.7%) achieved remission, indicating successful treatment responses, the majority (55.1%) are still undergoing treatment/ on follow-up, underscoring the prolonged nature of therapeutic interventions for pediatric solid tumors. However, the presence of relapse in a small percentage of patients (2.56%) highlights the need for vigilant monitoring and follow-up care to detect and manage disease recurrence promptly. Additionally, the low rates of defaulters (1.28%) and loss to follow-up (3.2%) suggest relatively good adherence to treatment regimens and follow-up appointments. Nevertheless, the mortality rate (13.4%) emphasizes the severity and potential lethality of pediatric solid tumors, necessitating ongoing efforts to improve treatment efficacy and outcomes. Strategies to address treatment-related barriers, such as financial constraints, transportation issues, and psychosocial support needs, are imperative to optimize treatment adherence and overall outcomes.

Furthermore, the lack of radiotherapy services at our hospital has posed a significant hurdle in providing comprehensive cancer care . This deficiency may contribute to the rates of mortality and some patients opting to leave against medical advice and also defaulting out of treatment.

The identification of relapsed cases underscores the need for robust surveillance protocols and long-term follow-up strategies to monitor disease recurrence and late treatment effects.

6.4 Implications for Clinical Practice:

There is a need for interdisciplinary collaboration among healthcare providers to ensure holistic care delivery for pediatric oncology patients. This includes coordinated efforts in diagnosis, treatment planning, psychosocial support, and survivorship care. Healthcare policymakers should prioritize investments in pediatric oncology infrastructure, including specialized training programs for healthcare professionals and access to essential diagnostic and treatment resources at regional level. Community engagement and awareness campaigns can play a pivotal role in promoting early detection, reducing treatment delays, and addressing misconceptions about cancer care.

6.5 Factors associated with treatment outcome

Delving into factors associated with treatment outcomes of the top three tumours provide valuable insights into the prognostic indicators for these conditions. For retinoblastoma, the study examined the duration of presenting illness and the group of the disease in relation to treatment outcomes. The findings revealed a negligible correlation between the duration of presenting illness and treatment outcome, suggesting that this factor may have limited predictive value in determining treatment success. Similarly, the group of the disease showed no significant correlation with treatment outcome. On multivariate logistic regression analysis for retinoblastoma, it showed the stage of the disease tend to affect the treatment outcome [P-value < 0.05] than the duration of the presenting illness affects the treatment outcome [p-value > 0.05]. But which specific disease group affects the treatment outcome is not well established. In other studies reported advanced clinical stage and late diagnosis was associated with poor treatment outcome (14,15,16).

Another study showed most significant determinants of a good outcome among patients with wilm's tumour in a developing country like ours is early stage at presentation (17). But the analysis of our study found that the duration of presenting symptoms had no discernible correlation with the treatment outcome. Similarly, the stage of the disease tend to affect the treatment outcome [p-value < 0.05] as compared to the duration of the presenting illness affects the treatment outcome [p-value > 0.05].

In the case of rhabdomyosarcoma, the analysis explored the correlation between tumor site, risk stratification, staging, and treatment outcome. Interestingly, none of these factors demonstrated a significant correlation with treatment outcome, as evidenced by Pearson correlation coefficients close to zero. This suggests that other variables not considered in this study may influence treatment response in rhabdomyosarcoma cases, deserving further investigation into additional prognostic indicators for this particular paediatric solid tumour.

Overall, these findings highlight the complexity of factors influencing treatment outcomes in top three paediatrics solid tumours at our hospital. Continued research into the complex determinants of treatment response with a larger sample size is essential for refining treatment strategies and improving outcomes for affected patients.

7 Strength and Limitations of the study

To the best of our knowledge this is the first study of its kind which was done regarding the profile of pediatric solid tumor since the establishment of hemato - oncology unit in the department of pediatrics and child health. This study tried to include all solid tumor patients and explored into their sociodemographic background, clinical features and their treatment outcome.

While this study provides valuable insights into pediatric oncology care at St. Paul Hospital, several limitations need to be acknowledged. The retrospective nature of the study and reliance on medical record data may have introduced biases and limitations in data completeness and accuracy. Additionally, the single-center design limits the generalizability of findings to other healthcare settings. The individual tumor sample size is too small to analyze their prognostic variables. Therefore future research endeavors could focus on prospective, multicenter studies with larger sample sizes to validate the findings of this study and explore additional factors influencing treatment outcomes, such as genetic markers, treatment toxicity profiles, and quality of life measures.

Furthermore, qualitative research methodologies, including patient and caregiver interviews, can provide insights into the psychosocial and cultural dimensions of pediatric oncology care, explore into reasons for treatment abandonment and informing the development of patient-centered interventions and support services.

8 Conclusion

The study revealed a diverse patient population in terms of age, gender, geographic distribution, and tumour types. Most patients were diagnosed with tumours such as retinoblastoma, Wilm's tumour, and rhabdomyosarcoma. Chemotherapy is the primary treatment modality, often combined with surgery or other adjunctive therapies depending on the tumour type and stage. However, variations in treatment approaches were observed across different tumour types.

A notable proportion of patients achieved remission, majority are still undergoing treatment/ on follow-up , a small percentage of patients relapsed , low rates of defaulters and loss to follow-up with a mortality rates were observed.

Our study on the top three solid tumours in our hospital—retinoblastoma, Wilms' tumor, and rhabdomyosarcoma—has provided valuable insights into the factors associated with treatment outcomes for these conditions, stressing the complexity of determinants influencing treatment responses in paediatric solid tumours.

9 Recommendations:

Implementation strategies for earlier detection of solid tumor cases should be planned. This can be achieved through training health professionals and health extension workers on early features of cancer, how to diagnose & when/where to refer. And also community awareness creation through media, paper and health education programs can enhance the outcome of pediatric solid tumor.

Enhancing multiple infrastructural aspects such as specified treatment wards, training health professionals, initiation of radiation therapy services will benefit the growing number of patients with curable solid tumours. This also includes providing education and resources to caregivers to promote treatment adherence and mitigate treatment-related toxicities.

Further wider scale studies with larger sample size and multicenter studies are recommended in order to establish concrete evidences on the factors affecting the treatment outcome for solid tumours.

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Annex 1 – Study Tool

Title	Clinical profile of pediatric solid tumors at SPHMMC	
	Variables	Categories
Ser. No.	Part I: Socio-demographic characteristics	
1.	Date of enrollment to Hospital	
2.	MRN	
3.	Age in years	A.<1yr B.1-5 yrs C.5-10 yrs D. >10 yrs
4.	Sex	A. Female B. Male
5.	Address	A. Oromia B. Amhara C . SNNP D. Sidama E. Tigray F. Gambella G. Benshangul H. Addis Ababa I. Dire Dawa J. Harar
6.	Religion	A. Orthodox B. Muslim C. Protestant D. Catholic E. Waqefana F. Other (Specify):_____
Part II: Baseline clinical characteristics		
7.	Histopathological diagnosis	A. Retinoblastoma B. Wilm's Tumor C. Rhabdomyosarcoma D. Hodgkin's lymphoma E. Neuroblastoma F. Ewing Sarcoma G. GCT H. NHL I. Nasopharyngeal ca J. Hepatoblastoma K. Others
Retinoblastoma		
8.	Presenting symptoms	A. Leukocoria B. Red eye C. Strabismus D. Nystagmus E. Buphtalmos
9.	Duration of presenting illness	A. < 1 month B. >= 1-6 month C. >= 6- 12 month D. >=12 months
10.	Laterality	A. Right side B. Left side C. Bilateral
11.	Stage	A. I B. II C. III D. IV
12.	Group	A B C D E
13.	Mode of Management	A. Chemotherapy B. Radiotherapy C. Enucleation D. Laser E. Chemo +Radiotherapy F. Chemo + Enucleation G. Radio + Enucleation H. Chemo + Radio + Enucleation

		I. All
14.	Treatment Outcome at the end of 2 years	A. Remission achieved(completed treatment) B. On treatment C. Relapse D. Defaulter(>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice
Wilm's Tumor		
15.	Presenting Symptoms	A. Abdominal mass B. Abdominal Pain C. Hematuria D. Fever E. Hypertension
16.	Duration of presenting illness	A. < 1 month B. >= 1-6 month C. >= 6- 12 month D. >=12 months
17.	Laterality	A. Right side B. Left side C. Bilateral
18.	Stage	A. I B. II C. III D. IV E. V
19.	Does the patient has Immunohistochemistry marker	A. Yes B. No
20.	Mode of Management	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery E. Chemotherapy and surgery F. All
21.	Treatment outcome at the end of 2 years	A. Remission achieved(completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice
Rhabdomyosarcoma		
22.	Presenting site	A. Head and Neck (orbit and parameningeal) B. Extremities C. Genitourinary D. Gastrointestinal E. Other
23.	Duration of presenting symptoms	A.< 1 month B. >= 1-6 month

		C. $\geq 6-12$ month D. ≥ 12 months
24.	Histology	A. Embryonal RMS B. Alveolar RMS C. Anaplastic RMS D. Spindle RMS
25.	Staging	A. I B. II C. III D. IV
26.	Risk Stratification	A. Low Risk B. Intermediate Risk C. High Risk
27.	Does the patient has immunochemistry markers?	A. Yes B. NO
28.	Mode of Management	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery E. Chemotherapy and surgery F. All
29.	Treatment outcome at 2 years	A. Remission achieved(completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice
Hodgkins Lymphoma		
30.	Presenting Symptoms	A. LAP B. Mediastinal Mass C. B symptoms (fever, weight loss and night sweat) D. All
31.	Duration of presenting symptoms	A. < 1 month B. $\geq 1-6$ month C. $\geq 6-12$ month D. ≥ 12 months
32.	Histology	A. Classic HL B. B. Nodular lymphocyte Predominant HL
33.	Does the patient has immunohistochemistry markers	A. Yes B. NO
34.	Staging	A. I B. II C. III D. IV
35.	Risk Stratification	A. Low Risk B. Intermediate Risk B. High Risk
36.	Mode of Management	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery

		E. Chemotherapy and surgery F. All
37.	Treatment outcome at 2 years	A. Remission achieved(completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice
Neuroblastoma		
38.	Presenting Symptom	A. Abdominal mass B. Abdominal pain C. Hypertension D. All
39.	Duration of the presenting illness	A.< 1 month B. >= 1-6 month C. >= 6- 12 month D. >=12 months
40.	Does the patient has immunohistochemistry markers?	A. Yes B. NO
41.	Stage	A. L1 B. L2 C. M D. MS
42.	Mode of management	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery E. Chemotherapy and surgery F. All
43.	Treatment outcome at 2 yrs	A. Remission achieved(completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice
Ewing Sarcoma		
44.	Presenting symptoms	A. Swelling B. Pain C. Constitutional symptoms D. All
45.	Duration of presenting illness	A.< 1 month B. >= 1-6 month C. >= 6- 12 month D. >=12 months
46.	Site	A. Long Bone (femur, tibia, fibula, humerus) B. Flat bone (ilium)

		C. Skull D. Spine E. Hands and feet
47.	Staging	I II III IV
48.	Does the patient has immunohistochemistry markers	A. Yes B. No
49.	Mode of management	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery E. Chemotherapy and surgery F. All
50.	Treatment outcome at 2 yr	A. Remission achieved (completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice
Germ Cell Tumor		
51.	Presenting signs	A. Abdominal Swelling B. Abdominal Pain C. Precocious puberty D. other
52.	Duration of the presenting illness	A.< 1 month B. >= 1-6 month C. >= 6- 12 month D. >=12 months
53.	Types of GCT	A. Teratoma B. Dysgerminoma C. Yolk sac tumor D. Ovarian tumor E. Other
54.	Does the patient have immunohistochemistry markers?	A. Yes B. NO
55.	Mode of Management	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery E. Chemotherapy and surgery F. All
56.	Treatment outcome at 2 years	A. Remission achieved (completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month)

		E. Lost from Follow up F. Death G. Referral to other Hospital A. Left against Medical Advice
NHL		
57.	Presenting symptoms	A. LAP B. Compression Symptoms C. Hepatic and splenic enlargements D. All
58.	Duration of presenting illness	A.< 1 month B. >= 1-6 month C. >= 6- 12 month D . >=12 months
59.	Histology	A. Burkitt lymphoma B. Diffuse large B cell lymphoma C. T cell lymphoblastic lymphoma D. Anaplastic large B cell lymphoma
60.	Stage	I II III IV
61.	Risk Stratification	A. Low Risk B. Intermediate Risk C. High Risk
62.	Does the patient have immunochemistry markers	A. Yes B. No
63.	Mode of management	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery E. Chemotherapy and surgery F. All
64.	Treatment outcome at 2 years	A. Remission achieved (completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice
Nasopharyngeal Ca		
65.	Presenting Symptoms	A. Neck mass B. Nasal Obstruction with epistaxis C. Otitis media D. All
66.	Duration of the presenting illness	A.< 1 month B. >= 1-6 month C. >= 6- 12 month D . >=12 months
67.	Histology	A. Keratinizing SCC B. Non Keratinizing carcinoma C. Basaloid squamous cell carcinoma

68.	Stage	I II III IV
69.	Risk stratification	A. Low risk B. Intermediate risk C. High risk
70.	Does the patient had immunohistochemistry markers?	A. Yes B. NO
71.	Mode of management?	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery E. Chemotherapy and surgery F. All
72.	Treatment outcome at 2 year	A. Remission achieved (completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice
Hepatoblastoma		
73.	Presenting symptoms	A. Abdominal pain B. Nausea and vomiting C. Abdominal swelling D. All
74.	Duration of presenting illness	A. < 1 month B. >= 1-6 month C. >= 6- 12 month D. >=12 months
75.	Does the patient has immunohistochemistry markers?	A. Yes B. NO
76.	Mode of Management?	A. Chemotherapy B. Surgery C. Radiotherapy D. Radiotherapy and surgery E. Chemotherapy and surgery F. All
77.	Treatment outcome at 2 year	A. Remission achieved (completed treatment) B. On treatment C. Relapse D. Defaulter (>1 month) E. Lost from Follow up F. Death G. Referral to other Hospital H. Left against Medical Advice

DECLARATION

I would like to declare that, this research proposal is my own work and it has not been presented to any institution either partially or in total for any academic award or for publication. The works here are original, where the works of others appropriately referenced. This research proposal is for partial fulfillment of my specialty program on department of pediatric and child health, SPHMMC.

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