CLINICO-PATHOLOGICAL PROFILE OF SINONASAL MASSES IN RWANDA REFERRAL HOSPITALS

By: **Dr Victor NYABYENDA**

Registration number: 213004062

A dissertation submitted in partial fulfillment of the requirements for the degree of MASTER OF Medicine in ENT, Head and Neck Surgery.

In the College of Medicine and Health Sciences

Supervisor: Dr Rajab MUGABO

Co-supervisor: Dr Belson RUGWIZANGOGA

Kigali, June 2016

DECLARATION

I declare that this Dissertation "**Clinico-pathological profile of sinonasal masses in Rwanda referral hospitals**" contains my own work except where specifically acknowledged.

Victor NYABYENDA

Registration number: 213004062

Signature ……..

Date: …….

SUPERVISOR: Dr Rajab MUGABO

CO-SUPERVISOR: Dr Belson RUGWIZANGOGA

ACKNOWLEDGEMENTS

It is with gratitude that I am first and foremost thankful to my supervisors Dr MUGABO Rajab and Dr RUGWIZANGOGA Belson for their acceptance to be involved in this important work. Their contribution and advices contributed to the realization of this work.

I am grateful to all ENT Head and Neck Surgery department staff, your good environment and encouragement helped me to fulfill my daily work in ENT residency. I also thank the American and German ENT surgeons who gave their support during our residency training.

I am thankful to the staff of Histopathology Department at CHUK for their technical support in data collection period.

It is finally of great value to thank my family members and my classmates for their support and continuous encouragement during my residency training at University of Rwanda.

ABSTRACT

Context: A mass in the nose or paranasal sinuses can sometimes be considered as a minor problem by patients. That nasal mass can be an inflammatory polyp, a granuloma, a congenital lesion or benign or malignant tumor. Even if some of these lesions are rare, it is imperative that clinicians should be aware of these uncommon lesions to allow early and appropriate management of received cases.

Objective: The study aimed to identify various types of non neoplastic and neoplastic lesions presenting as sinonasal mass and characterize their clinico-pathological profile in referral hospitals in Rwanda.

Materials and Methods: This cross-sectional, descriptive study was conducted in three referral hospitals in Rwanda (KUTH, BUTH and RMH). Patients attending ENT outpatient department found to have a mass in the sinonasal tract were included in the study. Data were collected using a pre established questionnaire. A diagnosis was made after a detailed history, clinical assessment and radiologic investigations if necessary, but final diagnosis was made after histopathologic examination of the specimen. Data entry was done using Epidata version 3.1 and analysis using Stata version 13. P value ≤ 0.05 was considered as evidence of a statistically significant association.

Results: A total number of 79 patients with sinonasal masses who presented to the hospital from June to September 2015 were studied. The patients were aged between 2 to 79 years with a mean age of 36.5 (±20.15) years. Among them, 35 (44.3%) were males and 44 (55.7%) were females, with a male to female ratio of 1:1.25. Nasal blockage was the most common symptom in 65 (82.28%) patients while nasal mass was the most common physical finding in 76 (96.2%) patients. Of the 79 cases, 36 (45.57%) were non neoplastic, 34 (43.04%) were benign neoplasms and 9 (11.39%) were malignant neoplasms.

Conclusion: Sinonasal masses range from non-neoplastic lesions to benign and malignant neoplasms with different histopathologic types. Though clinical and radiological examinations are important, it is essential to make a final diagnosis after a thorough histopathological examination of all sinonasal masses.

Key words: *clinicopathological profile, sinonasal mass, Rwanda*.

LIST OF ABBREVIATIONS AND ACRONYMS

CMHS: College of Medicine and Health Sciences

CT: Computed Tomography

CHUB: Centre Hospitalier Universitaire de Butare (University Teaching Hospital of Butare)

CHUK: Centre Hospitalier Universitaire de Kigali (University Teaching Hospital of Kigali

DRC: Democratic Republic of Congo

ENT: Ear, Nose and Throat

HPE: Histopathological examination

JNA: Juvenile nasopharyngeal angiofibroma

MRI: Magnetic Resonance Imaging

NK- T: Natural killer-T-cell

OPD: Outpatient department

PNET: Primitive neuroectodermal tumors

PNS: Paranasal sinus

RMH: Rwanda Military Hospital

SNT: Sinonasal tract

SNUC: Sinonasal undifferentiated carcinoma

UR: University of Rwanda

US: United States

WHO: World Health Organisation

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I: INTRODUCTION

1.1. Background

The sinonasal tract (SNT) includes the nasal cavity and paranasal sinuses (maxillary, ethmoid, frontal, and sphenoid) (1). A variety of conditions presenting as masses involving the SNT and nasopharynx are commonly seen in clinical practice (2). Sinonasal masses are divided into two main categories: non-neoplastic and neoplastic including benign and malignant. The SNT is exposed to different infective agents, chemicals, antigens, mechanical and many other influences. These exposures lead to formation of tumour like and neoplastic conditions (3). Malignant neoplasms of the SNT constitute less than 1% of all malignancies and 3% of all head and neck malignancies (4,5). Most of the time, sinonasal neoplasms present in an advanced stage because they do not cause early symptoms (6,7).

A geographic predilection to Africans, Japanese, Arab populations and rarity in Western Europe and America have been documented (8). Most of sinonasal masses have similar main presenting features and symptomatology including nasal obstruction, rhinorrhea, blood stained nasal discharge, epistaxis, oral symptoms, facial swelling, orbital and ear symptoms (5,9,10). Male predilection for SNT lesions has been confirmed by the majority of studies (10–17), however, female preponderance has been found in Nigeria (5,18).

Concerning the age, sinonasal masses have been found predominantly in the second to fourth decades of life (2,19), however, malignant tumors have been mostly reported after the fourth decade (13,20). Nasal polyps were the most common lesions observed among benign sinonasal masses (2,21,22) . Various studies confirmed the predominance of squamous cell carcinoma in adult sinonasal cancers (12,13,22–24).

Sinonasal tumors may mimic a benign nasal mass, and clinical exam alone cannot establish the final diagnosis. Therefore, nasal endoscopy, radiology, and histopathology are used together to establish the diagnosis. However, a thorough and early histopathologic examination of the specimen is advised to determine the nature of a specific lesion, so that, a required and timely intervention can be performed (9,11,25,26). Concerning nasal polyps, different options have

been adopted, in that microscopy is recommended by some authors when polyps are removed for the first time and when they are unilateral (27).

The management of sinonasal neoplasms is difficult because they sometimes invade nearby important anatomical structures such as the orbit, eyes, optic nerves, brain, and brainstem (9,14,23,28,29). The 5-year survival for all paranasal sinus cancers is approximately 30% to 40% (1).The appropriate treatment should be based on the type and extent of the lesion (29).

1.2. Epidemiology

1.2.1. Sinonasal masses worldwide

The incidence of sinonasal malignancies in USA was 0.84 per 100,000 people in 2010 (12). In Jawaharlal Nehru Medical College, India, a hospital incidence of masses in SNT and nasopharynx was 34.3 cases per year, among them 60 % were non-neoplastic lesions (20.7 cases per year) (25). Majumdar A. et al., in their study on sinonasal masses in the rural population in eastern India (January 2010 to October 2013), reported that 68.34% were non neoplastic and 31.65% were neoplastic lesions (16).

In Bangladesh, a study found that about three-quarters of sinonasal masses were non-neoplastic. Squamous cell carcinoma constituted 41.67% of malignant cases, with the average age of 39 years for benign tumors versus 51 years for malignant ones with (20).

A hospital based retrospective study conducted in Beijing, China (1997-2007) on sinonasal malignancies with orbital invasion found that squamous cell carcinoma was predominant (44.1% of 93 patients) (23).

In Nepal, South Asia a retrospective study conducted on 331 benign sinonasal masses over a three year period found that 11.5% were neoplastic whereas 88.5% were non neoplastic. Nasal polyps were the commonest lesions observed (70%), with ethmoidal polyps outnumbering antrochoanal polyps (21).

1.2.2. Sinonasal masses in Africa

In Nigeria, the prevalence of sinonasal malignancies was 1.57% in 2006 (30), an incidence sinoasal malignancies of 0.076% was reported in 2004 in a retrospective study conducted in ENT department over the period 10 years (10). Another retrospective study conducted in a national ear care center of Kaduna, Nigeria over a six years period (2003-2008) on 76 cases found that 77.6%

were benign non neoplastic masses while 2.6% were malignant and 19.7% had no pathologic diagnosis (18).

1.2.3. Sinonasal masses in Rwanda

There is no study conducted in Rwanda to show the prevalence or characteristics of sinonasal masses. Therefore, there is lack of published data to describe these masses of the sinonasal tract in Rwanda.

CHAPTER II. LITERATURE RIVIEW

2.1. Classification of sinonasal masses

Different classifications have been used in various literatures. The nasal mass can be either inflammatory polyp, granuloma or tumor, some of them being common while others are rare (11). Due to close contiguity of the nasal cavities with paranasal sinuses, the specific site of origin of sinonasal tumors is often difficult to identify. Hence, malignant tumors of nasal cavities and those of the paranasal sinuses are often grouped together (31). They are grouped into non-neoplastic and neoplastic tumors, the latter being also grouped into benign and malignant tumors (1). Various characteristics help to differentiate benign from neoplastic diseases, among them symptoms, gross appearance, and radiological findings (32).

2.1.1. Non-neoplastic lesions

Nasal polyps are pedunculated portions of oedematous mucosa of the nose or paranasal sinuses. Sinonasal polyps have a prevalence of 4% in general population, they are frequently allergic or inflammatory in origin (16). They usually result from the prolapsed lining of the ethmoid sinuses into nasal cavity causing nasal blockage to a variable degree depending on their size. Due to poor blood supply, polyps arising from the middle meatus, are pale and relatively insensitive to touch when probed. However, after repeated trauma and inflammation, they may become reddened. They are usually bilateral, and when unilateral they may require histological evaluation to exclude inverted papilloma or malignancy.

Antrochoanal polyp results from prolapsed lining of the maxillary sinus through the middle meatus downwards into nasal cavity and backwards into the post-nasal space, they are usually unilateral. Nasal polyposis is a multifactorial disease with several different etiological factors, however chronic persistent inflammation is one major risk factor (19).

2.1.2. Neoplastic lesions

2.1.2.1. Benign neoplasms

The benign neoplasms of the SNT have different origin: from surface epithelium, from minor salivary glands , and from mesenchymal tissues (1).

Papillomas in SNT are stated to be commonly occurring benign epithelial neoplasm. This group includes squamous papilloma, transitional cell papilloma (exophytic) and the inverted (endophytic) papillomas (33). Inverted papilloma is the most common subtype of sinonasal papillomas (1,11) and malignant transformation can occur in 5-20% of them. They are most commonly diagnosed in white males during the fifth to the seventh decade (31).

Hemangioma may be found anywhere in the nasal cavity. But commonly found on the anterior part of the septum, where they are called bleeding polypus of the septum (20).

2.1.2.2. Malignant neoplasms

Malignant tumors of the sinonasal tract are derived from diverse histologic elements within the nasal cavity and paranasal sinuses (31). Malignant neoplasms of the SNT include: epithelial malignancies, sinonasal undifferentiated carcinoma (SNUC), sarcomas, malignant salivary gland neoplasms, neuroendocrine neoplasms, neuroectodermal neoplasms, and melanocytic neoplasms (1). The majority of malignant tumors in the SNT are of epithelial origin; squamous cell carcinoma being the most frequent type of malignant tumor found in this area, followed by lymphoma, adenocarcinoma, and melanoma (34).

2.1.3. WHO classification

2.1.3.1. WHO classification of benign sinonasal tumors

Table 1: WHO classification of benign sinonasal tumors (35)

Types	**Subtypes**	
Epithelial	Sinonasal gland tumors	Pleomorphic adenoma
		Myoepithelioma
		Oncocytoma
	Schneiderian papilloma	
	Warts	
Neuroectodermal tumors	Paraganglioma	
	Schwannoma	
	Neurofibroma	
Bone and cartilage tumors	Osteoma, Osteoid osteoma, Fibrous dysplasia, Ossifying fibroma, Osteoblastoma, Ameloblastoma, Nasal chondromesenchymal hamartoma, Giant cell lesion, Giant cell tumor, Chondroblastoma, Chondroma	
Displaced neural lesions (ectopic site)	Nasal glioma	
	Pituitary adenoma	
Soft tissue tumors	Vascular	JNA
		Hemangioma
		Hemangiopericytoma
	Fibrous	Nasal fibroma
	Muscle tumors	Leiomyoma
		Rhabdomyoma

2.1.3.2. WHO classification of Cancer of nasal cavity and paranasal sinuses

Table 2: WHO classification of Cancer of nasal cavity and paranasal sinuses (36)

WHO classification	Subtypes
Malignant epithelial tumors	Squamous cell carcinoma
	Adenocarcinoma
Neuroendocrine	Small cell carcinoma
Malignant soft tissue tumors	Rhabdomyosarcoma
	Fibrosarcoma
	Neurofibrosarcoma
	Sarcoma (unspecified)
	Malignant fibrous histiocytoma
	Malignant peripheral nerve sheath tumor
Malignant tumors of bone and cartilage	Chondrosarcoma
	Osteosarcoma
Hematolymphoid tumors	Precursor lymphoblastic leukemia/lymphoma
	Diffuse large B-cell lymphoma
	Peripheral T-cell lymphoma
	Burkitt lymphoma
	Extranodal/NK- T-cell lymphoma
	Non-Hodgkin lymphoma
	Lymphoma (unspecified)
Neuroectodermal tumors	Esthesioneuroblastoma
	Ewing sarcoma/PNET
Germ cell tumors	Yolk sac tumors

2.2. Clinical manifestation

The clinical presentation of tumors in the SNT is typically non-specific. Patients often report mass- related symptoms secondary to obstruction and locoregional extension or invasion, such as congestion, rhinorrhea, pain, epistaxis, or cranial nerve abnormalities (5,35). Tumors of nasal cavities, however, tend to be diagnosed earlier than those of the paranasal sinuses because of the earlier presentation of obstructive symptoms and epistaxis (31).

Different studies found nasal obstruction as the most common symptom of sinonasal masses (6,10,11,13,14,18,20).

Most of these tumors were arising from the nasal cavity followed by the maxillary sinuses. The frontal sinus as a point of origin was found to be uncommon (6,11). However in most of studies, the most common site of origin for malignant masses was the maxillary sinus (4,13). According to some studies, the site of origin of the tumor could not be determined because at presentation, the tumor was involving more than one site of the SNT (30).

Generally, tumors of SNT tend to be more aggressive due to their close proximity to orbital and cerebral regions such that wide resection is usually impossible (34,36). Regional and distant metastases are infrequent even in the presence of advanced stage tumors (31). The presence of nodal involvement drastically reduces the prognosis and 5 years survival rate come down from 27.2% to 6.8% (20).

SNT malignancy in pediatric is found to have different characteristics in clinical presentation, histologic type, and treatment outcome compared with the adult population (37).

2.3. Paraclinical investigations

2.3.1. Histopathological examination (HPE)

Tissue biopsy and histopathologic evaluation for diagnostic purposes has a well established role in medicine. The information from tissue biopsy is needed for treatment planning (38). An intranasal tissue biopsy helps in the investigation and diagnosis of local or systemic diseases affecting the nose. Nasal biopsy can be performed either in an outpatient clinic or in an operating theatre under local or general anesthetic. It is very often performed in patients with nasal cavity masses as it is mainly performed under local anesthesia in the outpatient clinic, and is a minimally invasive procedure (39).

Various protocols have been established by different institutions and schools. Many authors recommend HPE in patients with suspected neoplasms, atypical infections, or inflammatory disorders. However, special considerations have been suggested to the following clinical situations:

- Prior history of neoplasm with abnormal findings on endoscopy or imaging
- New onset sinonasal symptoms at advanced age

- Unilateral or rapidly enlarging sinonasal process
- Erosive or destructive findings
- Clinical features suggestive of locoregional extension (orbital, cranial nerve, intracranial, facial soft tissue, or maxilla involvement) (38).

When a space-occupying lesion of the nasal cavity is suspected, the patient must be carefully evaluated. In such cases, clinical and radiological examinations are recommended to exclude skull base defects like in meningocele or vascular lesions. The latter two conditions contraindicate an ambulatory biopsy (32).

2.3.2. Radiological investigations

Imaging is essential for tumor staging (locally and to rule out the presence of metastases) and for surgical planning. Nowadays, Computer tomography (CT) scan and magnetic resonance imaging (MRI) are the most used imaging modalities instead of plain radiograph because they provide fine anatomical details. However, each of them has its own advantages and limitations.

Computed tomography (CT) is regarded as the "gold standard" in SNT imaging as it offers excellent delineation of bony anatomy and extent of SNT disease, especially prior to surgical procedures (39). It is used with contrast to assess tumor vascularity and its relationship to great vessels especially the carotid artery and its branches. Main disadvantages of CT are the ionizing radiation and inability to differentiate tumor borders from the surrounding soft tissues.

In some cases, it is ideal that both CT and MRI play complementary roles because MRI can give excellent soft tissue details. In fact, with MRI it is possible to differentiate tumor from adjacent soft tissues. It is used also to differentiate tumor from secretions in an opacified sinus. It is useful to demonstrate perineural spread (especially for adenoid cystic carcinoma), and to demonstrate dural, orbital, or brain parenchyma invasion. In addition, MRI is less affected by the artifact effect associated with dental fillings and it requires no exposure to ionizing radiation. However, MRI, is more expensive than CT scan and most of patients cannot afford it especially in non developed countries (31).

In some cases, angiography with carotid flow study can be performed, especially for patients presenting with tumors that surround the carotid artery when sacrifice of the vessel is anticipated preoperatively to obtain clear margins (31).

2.4. Problem statement

In developing countries, the poor outcome in the management of patients with head and neck malignant tumors is due to many factors, among them late presentation of patients and inaccessible or limited health facilities (40). Sinonasal masses, especially neoplastic lesions constitute a significant cause of ENT morbidity among Africans (30). However, they are still considered as a simple problem by the population and by some of the health personnel, reason of late consultation of health services and late diagnosis or even misdiagnosis (7). Delay in the initial diagnosis and therapy may be attributed to the lack of differentiation of benign and malignant disorders at initial presentation (3). Therefore, advocacy for early detection of sinonasal masses by primary care physicians and referral to the ENT surgeon is advised. In addition, there is a need to improve public awareness of ENT diseases.

2.5. Justification of the Study

The prevalence of sinonasal masses in general population is not known (41). Nevertheless, the prevalence of nasal polyp has been found in literature. This prevalence in general population is 4% in Finland (15), 2.7% in Swedish population (41) and 0.74% in Nigeria (42). These nasal polyps have been found to constitute a big proportion of sinonasal masses by different studies (20,21,25). Unfortunately, there is small data in Africa regarding this important clinical entity (30). In addition, there is no precise data on prevalence of these conditions in patients attending ENT clinic of Rwanda referral hospitals. The purpose of this study was to provide a clinicopathological profile of various types of these lesions presenting as sinonasal masses in order to encourage better management at early stage of patients at all health care levels in Rwanda.

2.6. Research Question

This study is designed to respond to this question: What are the clinico-pathological profiles of different types of sinonasal masses in Rwanda?

2.7. Objectives

2.7.1. General Objective

The overall objective of this study is to determine the clinical profile and pathological types of sinonasal masses in Rwanda.

2.7.2. Specific objectives

- To identify the clinical presentations of sinonasal masses in ENT patients in Rwanda
- To describe the physical examination findings in patients with sinonasal masses in Rwanda
- To study the histopathological types of sinonasal masses in Rwanda.

CHAPTER III: METHODOLOGY

3.1. Study design and setting

3.1.1. Study design

This study is a cross-sectional hospital based descriptive study.

3.1.2. Study setting

The study has been conducted in ENT department in three referral hospitals in Rwanda: University Teaching Hospital of Kigali (CHUK), University Teaching Hospital of Butare (CHUB), and Rwanda Military Hospital (RMH). Two of these hospitals are located in city of Kigali (CHUK in Nyarugenge District, RMH in Kicukiro district), the third one is located in Southern Province (Huye District).

Each of the above referral hospitals has a department of histopathology for analysis of the biopsy specimens.

3.2. Study population

This consists of all patients with sinonasal mass attending ENT clinic at CHUK, CHUB and RMH.

3.3. Inclusion criteria and Exclusion criteria

3.3.1. Inclusion criteria

The following patients were included in the study:

- Patients presenting with sinonasal masses who attended ENT clinic at CHUK, CHUB and RMH during the study period.
- Patients operated for sinonasal masses at CHUK, CHUB and RMH during the study period.

3.3.2. Exclusion criteria

1. Patients without histopathological results
2. Patients with recurrence previously treated for sinonasal masses during the study period
3. Patients not consenting for the study.

3.4. Sample size calculation

Tumors of the nose and paranasal sinuses constituted 0.076% of the cases over the period 10 years in Nigeria (10). According to data found in OPD/ENT department at CHUK in 2013, 117 patients consulted for sinonasal masses in a total population of 8528 cases, giving a prevalence of 1.37%. Based on these data, an estimated prevalence of 2% was used to calculate the sample size using Fisher's formula:

$$n = \frac{\alpha^2 \cdot P \cdot Q}{E^2} = \frac{(1.96)^2 \cdot 0.02 \cdot (1 - 0.02)}{(0.05)^2} = 30 \text{ patients}$$

Therefore, a minimum of thirty (30) cases was included in our study.

3.5. Sampling procedure

All patients meeting the inclusion criteria have been enrolled into the study.

3.6. Data collection

A pre established questionnaire was distributed to ENT departments of concerned referral hospitals. During the study period, consecutive outpatients presenting with sinonasal masses were recruited. For each patient a questionnaire was filled by an ENT head and neck surgeon or by a senior ENT resident during and after consultation. Physical examination was done according to standard clinical practice of inspection, anterior rhinoscopy using a nasal speculum and head light, gentle palpation and probing of mass, test for nasal patency followed by nasal endoscopy. Finally the neck was examined to rule out any palpable lymph nodes.

The biopsy was taken from the mass at ENT clinic under local anesthesia, or in operating room under general anesthesia if indicated. For patients booked for surgical procedure, the specimen was sent to laboratory for histopathological examination. The histopathological examination was done by a qualified anatomopathologist at the respective referral hospital, and results were documented on the data collection sheet. For patients for whom a CT scan of paranasal sinuses was indicated and requested, the results were also documented.

3.7. Data analysis

The data entry and the validation were done using the Epi-data version 3.1 and thereafter data were analyzed with Stata version 13. For comparison of variables, P values were derived from Chi-square tests and P value of ≤ 0.05 was considered as evidence of a significant difference. Graphics and tables were drawn using Microsoft Excel.

3.8. Ethical considerations

1. The study has been carried out after approval by the Department of ENT, Head and Neck Surgery and ethical clearance by the Institutional Review Board /CMHS at the University of Rwanda.

2. Patients have been included after informed verbal and written consent and there was no additional cost for participants.

3. For patients who could not pay for histopathological examination it has been covered by the principal investigator.

4. Patients' personal identity and records have been treated with confidence.

5. The results of the study shall be presented to the Department of Otorhinolaryngology and to the School of Medicine, University of Rwanda. They shall be published with aim to improve patient care, and public awareness.

CHAPTER IV: RESULTS

This study was conducted over a 7 month period (from June to December 2015). A total number of 83 patients from three referral hospitals of Rwanda were recruited. Four of them were excluded - one of them was absent for biopsy, three others refused to consent for the study. We included 79 (seventy nine) patients with sinonasal masses in the study.

4.1. General characteristics

Out of 79 patients, from three referral hospitals of Rwanda, 44 (55.70%) were consulted at CHUK, 24 (30.38%) at CHUB, and 11 (13.92%) were consulted at RMH.

4.1.1 Age and gender

Among these patients, there were 35 (44.3%) males and 44 (55.7%) females giving a male to female ratio of 1:1.25. The age ranged from 2 to 79 years (mean age of 36.5 years ± 20.15 SD), the highest frequency was noted in third decade of life with 17 (21.52%) patients.

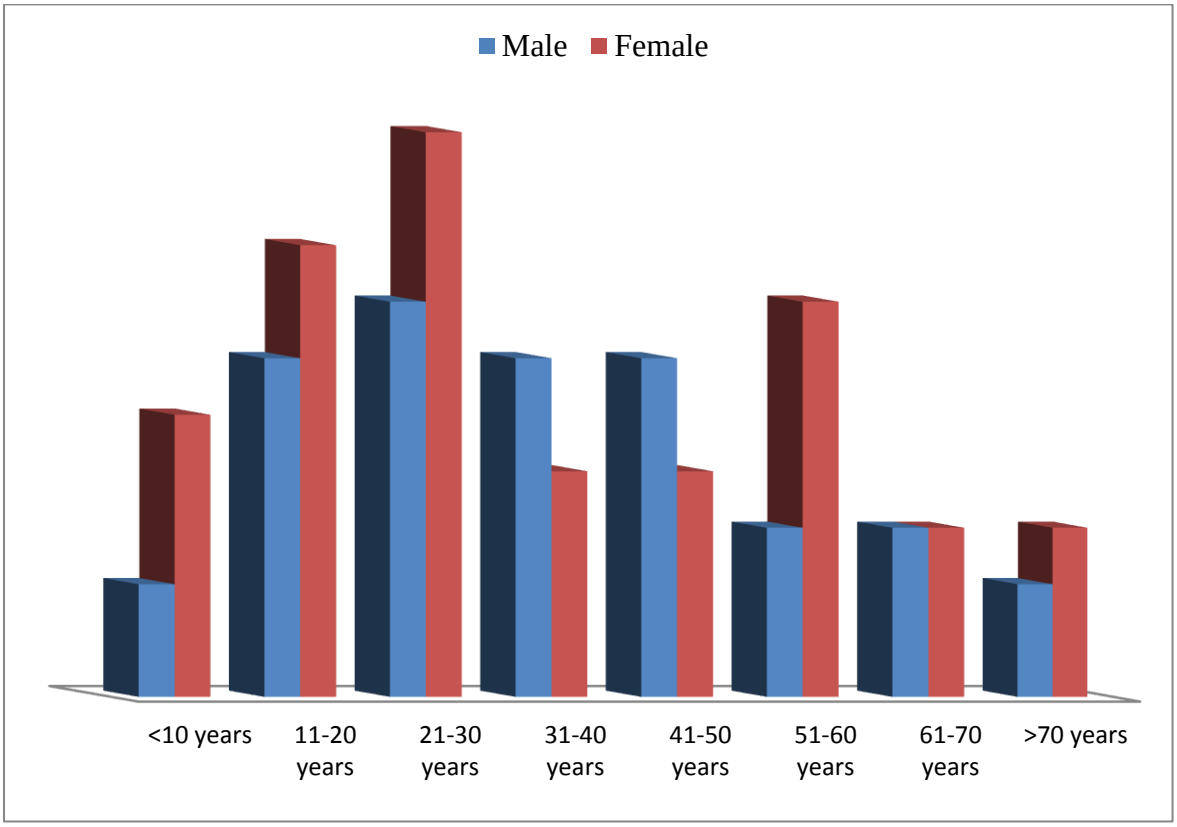

Figure 1: Age and sex distribution

4.1.2. Province of residency

Southern Province was the most represented province in the country in terms of patients with sinonasal masses who consulted, followed by Eastern Province. Northern Province was less represented. It is only one foreigner (from DRC) who consulted with sinonasal mass.

Table 3: Distribution of patients per hospital by province of residency

Province of origin	Frequency of patients per Hospital			Total
	CHUK	CHUB	RMH	
City of Kigali	9	0	5	14 (17.72%)
Eastern province	12	1	3	16 (20.25)
Western province	5	9	0	14 (17.72%)
Northern province	10	0	0	10 (12.66%)
Southern province	7	14	3	24 (30.38%)
Foreigners	1	0	0	1 (1.27%)
Total	44	24	11	79 (100%)

4.2. Clinical presentation

4.2.1. Chief complaints

Majority of the patients presented with more than one symptom and nasal blockage was the commonest complaint noted in 65 patients (82.28%), followed by sensation of a mass in nose in 56 patients (70.89%). Teeth symptoms were less frequent. Other patients' complaints include: difficulty in breathing, halitosis, hyponasal speech, itching and sneezing.

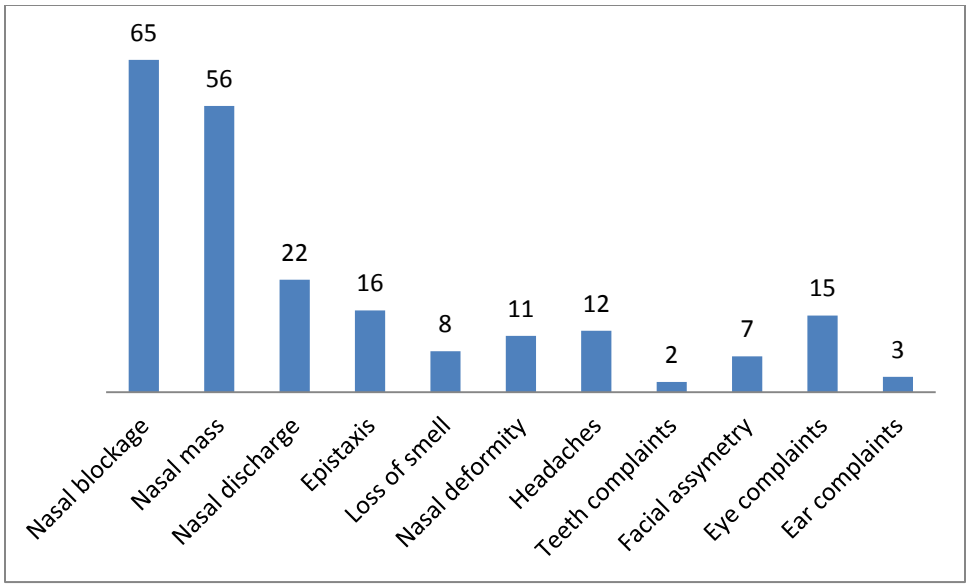

Figure 2: Distribution of patients' chief complaints

4.2.2. Duration of symptoms

The first visit to consultation in ENT department was done after a period range of 1 to 240 months with a mean duration of 44.35 (±59.595 SD) months. Most of patients consulted 2 years after the first ENT symptom in most of patients (30, 38%). Only16 (20.25%) patients consulted within 6 months or less.

Table 4: Distribution of patients by duration of first symptoms

Duration of symptoms	Frequency	%
≤6 months	16	20.25
7-12 months	19	24.05
13-18 months	3	3.80
19-24 months	11	13.92
>24 months	30	37.97
Total	79	100.00

4.3. Physical examination findings

4.3.1. Frequency of physical findings

A nasal mass was found during the first physical examination in 76 patients (96.2%). In most patients (60/76) there were unilateral, only 16 patients had bilateral nasal masses. A single mass was found in 58 patients while in 18 patients there were multiple nasal masses.

The second physical finding was nasal discharge found in 31 patients. The nasal discharge was clear in 15 patients; and yellowish in 16 patients. However, palpable cervical lymphadenopathy was found only in 3 patients (3.8%). Physical findings of local extension were oropharyngeal extension (4 patients), proptosis (2 patients), and facial asymmetry (1 patient).

Table 5: Distribution of physical findings and their frequency

Physical finding	Frequency	%
Nasal mass	76	96.2
Nasal discharge	31	39.2
Nasal bleeding	4	5.1
Postnasal drip	15	19
Facial swelling	10	12.7
Cervical lymph node	3	3.8

4.3.2. Paraclinical investigations

a. Radiological evaluation and findings

Out of 79 patients, CT scan was done in only 49 patients and the majority of them were seen at CHUK (38 patients). Concerning CT scan findings, in majority of patients radiological abnormalities were localised in more than one region of the SNT.

Table 6: Distribution of requested CT scans by hospital

Hospital	CT scan performed		Total
	Yes	No	
CHUK	38	6	44 (55.7 %)
CHUB	6	18	24 (30.4 %)
RMH	5	6	11 (13.9 %)
Total	49 (62 %)	30 (38 %)	79 (100 %)

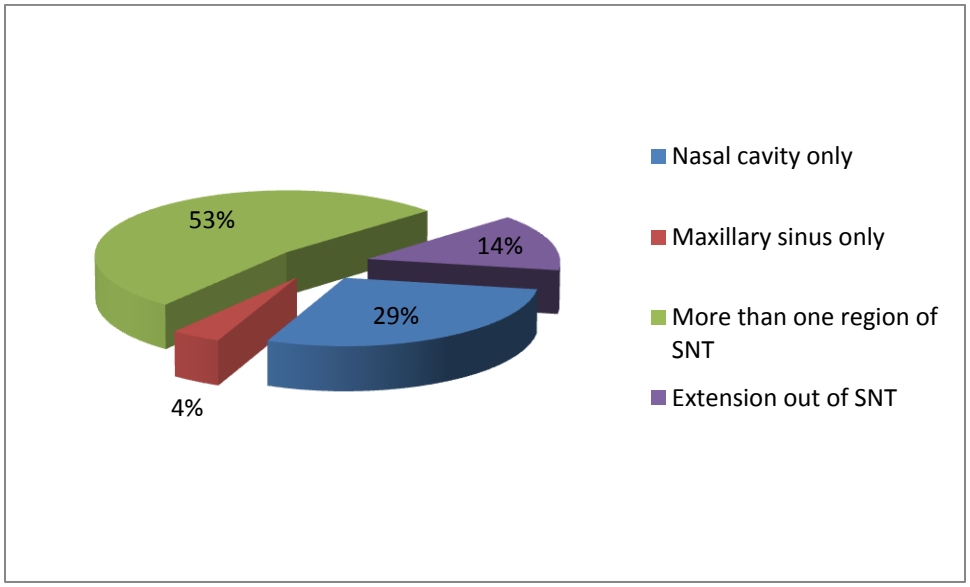

Figure 3: Location of sinonasal abnormality on CT scan

b. Biopsy for histopathology

Punch biopsy was the most common mode of biopsy done in 45 (56.96 %), followed by excision and open biopsy in 23 (29.11 %). In most of patients biopsy was taken from the nose (71 patients), only 8 histological specimens were taken from PNS. The following table shows the mode of biopsy by area where the biopsy was taken from.

Table 7: Distribution of mode of biopsy by region of SNT

Mode of biopsy	Region where biopsy taken from		Total
	Nose	PNS	
Punch biopsy	45	0	45 (56.96%)
FESS	9	2	11 (13.92%)
Open/excision biopsy	17	6	23 (29.11%)
Total	71(89.9 %)	8 (10.1 %)	79 (100%)

4.4. Histopathology

4.4.1. Histopathology results by duration of symptoms

Non-neoplastic lesions were predominant with 38 patients. Most patients with no-neoplastic masses presented to ENT specialist more than 2 years after onset of symptoms. Most patients with malignant neoplasms consulted less than 6 months after the first symptom.

Table 8: Histopathology results by duration of symptoms

Duration	Histopathology result			Total
	Non neoplasm	Benign neoplasm	Malignant neoplasm	
≤ 6 months	5	5	6	16 (20.3%)
7-12 months	11	8	0	19 (24.1%)
13-18 months	1	2	0	3 (3.8 %)
19-24 months	5	6	0	11 (13.9 %)
>24 months	16	11	3	30 (38 %)
Total	38 (48.1%)	32 (40.5%)	9 (11.4%)	79 (100 %)

4.4.2. Histopathology results by age

Considering all sinonasal masses, the third decade of life was the most affected (17, 21.5 %) followed by the second decade (14, 17.7 %). Only 4 patients (5.1 %) presented in the eighth decade and all of them were having neoplastic masses, 2 of them having squamous cell carcinoma.

Table 9: Distribution of histopathology results in various age groups

Age groups (years)	Histopathology result			Total
	Non neoplasm	Benign neoplasm	Malignant neoplasm	
0-10	3	2	**2**	7 (8.9 %)
11-20	8	6	0	14 (17.7 %)
21-30	**8**	**8**	1	17 (21.5 %)
31-40	6	3	0	9 (11.4 %)
41-50	6	4	1	11 (13.9 %)
51-60	4	5	1	10 (12.7 %)
61-70	3	2	**2**	7 (8.9 %)
71-80	0	2	**2**	4 (5.1 %)
Total	38 (48.1%)	32 (40.5%)	9 (11.4%)	79 (100 %)

4.4.3. Non neoplastic lesions

Among non neoplastic lesions, the most common were inflammatory polyps (36 cases). Benign cyst and rhinoscleroma were found in 2 patients each. Inflammatory polyps were most common in second and third decades (8 patients each).

Table 10: Distribution of Non-neoplastic lesions in the various age groups (years)

Non-neplastic lesions	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	Total no.
Inflammatory polyp	3	8	8	4	5	3	3	0	34
Benign cyst	0	0	0	2	0	0	0	0	2
Rhinoscleroma	0	0	0	0	1	1	0	0	2
Total	3	8	8	6	6	4	3	0	38

Table 11: Distribution of Non-neoplastic lesions by gender of patients

Non-neoplastic lesions	Male	Female	Total no.
Inflammatory polyp	14	20	34
Benign cyst	1	1	2
Rhinoscleroma	1	1	2
Total	16	22	38

4.4.4. Neoplastic lesions

The most common benign neoplastic masses found were lobular capillary hemangioma (9 cases), followed by inverted papilloma (8 cases) and squamous papilloma (7 cases). Capillary hemangioma was most common in females of the third decade while inverted papilloma was prevalent in males of the sixth decade.

Among malignant tumors, squamous cell carcinoma was the most common (4 patients) and was prevalent in the eighth decade of life (2 patients), followed by fifth and sixth decades (1 patient each) with equal sex distribution. Other types were in decreasing order: adenoid cystic

carcinoma (2 patients in the seventh decade), olfactory neuroblastoma (2 patients in the first decade) and rhabdomyosarcoma (1 patient in the third decade).

Table 12: Distribution of Neoplastic lesions in the various age groups (years)

Tumor	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	Total no.
Benign tumors									
Angiofibroma	0	0	1	0	0	0	0	1	2
Capillary hemangioma	1	1	4	1	2	0	0	0	9
Cavernous hemangioma	0	1	0	0	0	0	0	0	1
Fibrous dysplasia	0	1	0	0	0	0	0	0	1
Hamartoma	1	0	0	0	0	0	0	0	1
Inverted papilloma	0	0	1	0	2	4	0	1	8
Meningioma	0	1	0	0	0	0	0	0	1
Myofibroblastic pseudotumor	0	0	0	1	0	0	0	0	1
Ossifying fibroma	0	1	0	0	0	0	0	0	1
Squamous papilloma	0	1	2	1	0	1	2	0	7
Total	2	6	8	3	4	5	2	2	32
Malignant tumors									
Adenoid cystic carcinoma	0	0	0	0	0	0	2	0	2
Embryonal rhabdomyosarcoma	0	0	1	0	0	0	0	0	1
Olfactory neuroblastoma	2	0	0	0	0	0	0	0	2
Squamous cell carcinoma	0	0	0	0	1	1	0	2	4
Total	2	0	1	0	1	1	2	2	9

Table 13: Distribution of Neoplastic lesions by gender of patients

Tumour	Male	Female	Total no.
Benign neoplasms			
Angiofibroma	1	1	2
Capillary hemangioma	2	7	9
Cavernous hemangioma	0	1	1
Fibrous dysplasia	1	0	1
Hamartoma	0	1	1
Inverted papilloma	7	1	8
Meningioma	1	0	1
Myofibroblastic pseudotumor	1	0	1
Ossifying fibroma	1	0	1
Squamous papilloma	1	6	7
Total	15	17	32
Malignant neoplasms			
Adenoid cystic carcinoma	1	1	2
Embryonal rhabdomyosarcoma	0	1	1
Olfactory neuroblastoma	1	1	2
Squamous cell carcinoma	2	2	4
Total	4	5	9

4.4.5. Bivariate analysis on histopathological results

There is no statistical association between histopathological results and socio-demographic or clinical symptoms and findings, as p-value is less than 0.05 for all these variables.

Table 14: Bivariate analysis of histological results in relation to socio-demographic and clinical variables

Variables	Groups	Frequency (prevalence)	Odds ratio	95% CI	P- value
Hospital	CHUK	44 (55.7 %)	1		0.705
	Other hospitals	35 (44.3 %)	1.187	[0.488-2.891]	
Age	≤ 40 years	48 (60.8 %)	1		0.181
	> 40 years	31 (39.2 %)	1.871	[0.746-4.691]	
Gender	Male	35 (44.3 %)	1		0.705
	Female	44 (55.7 %)	0.842	[0.346-2.050]	
Residency	Kigali City	14 (17.7 %)	1		0.666
	Other provinces	65 (82.3 %)	0.773	[0.241-2.479]	
Duration	≤ 24 months	49 (62 %)	1		0.467
	> 24 months	30 (38 %)	0.713	[0.286-1.774]	
Nasal blockage as complaint	Yes	65 (82.3 %)	0.365	[0.104-1.283]	0.116
	No	14 (17.7 %)	1		
Nasal mass on physical exam	Yes	76 (96.2 %)	0.450	[0.039-5.175]	0.522
	No	3 (3.8 %)	1		

CHAPTER V: DISCUSSION

The age of the patients with sinonasal masses varies between 2 and 79 years. This is almost similar to other studies' results. Vijay V.P and colleagues (43) reported the range of 5 to 72 years while Lathi and colleagues (13) reported a range of 8 to 70 years. The mean age is 36.5 years , which is similar to 37.3 years reported by Vijay and colleagues (43). In a study conducted in Nigeria on 76 patients, Bakari A. and colleagues (18) reported 5 to 64 years as age range, with a mean age of 33.3 years, results comparable to our findings.

In this study, most patients presented to ENT in their third decade of life. This is not similar to most of studies where the majority of patients presented in their second decade. According to a study done in Bangladesh by Humayun A. and colleagues, this was attributed to increased incidence of inflammatory disease in that group (20).

Most studies have reported a male preponderance of sinonasal masses (17,20). However, in this study, the male to female ratio was 1:1.25 and is different from those findings. This could be due to the limited number of the study population and to the preponderance of females in population of Rwanda. Female preponderance has also been reported in Kaduna, Nigeria by Bakari A. and colleagues (18) and by Fasunla and colleagues (5) in Ibadan, Nigeria with M:F ratio of 1:1.2.

Southern Province was more represented with 24 (30.38 %) patients followed by Eastern Province. This could be due to the fact that these provinces are the most populated in the country (44). In addition, the geographic location of Southern Province has an influence, the latter including some districts located in the central part of the country.

Nasal obstruction is the most common symptom in patients with sinonasal masses leading them to seek medical consultation. This was with delay because like other symptoms of sinonasal tumors, it is also a symptom of chronic rhinosinusitis. This is similar to findings reported in other studies among them J. Sivalingam et al. (45), Lathi and colleagues (13) in India, R. Sharma and colleagues (14) in India. The second common symptom is sensation of a nasal mass like in other studies (13,45).

The earliest ENT consultation was within one month, the latest one is 240 months (20 years) with an average of 44.35 months. This long duration of symptoms before presentation to hospital was also reported by two studies in Nigeria: 1 month to 4 years with mean duration of 9 months by Fasunla, A. J. and Ogunkeyede, S (5), and 1 month to 360 months with mean duration of 40 months by Bakari A. and colleagues (18).This delayed ENT consultation may be attributed to the nonspecific symptoms of the lesion at an early stage as reported in the literature (30). On the other hand, it may be due to patient's visit to health center nurses and to general practitioners who have been treating conservatively for long time and are referred after treatment failure. The same finding was from a study by Bakari A. and colleagues (18).

In this study nasal mass was the main physical finding (in 76 patients), followed by nasal discharge (in 58 patients). This is similar to with other authors' findings (14,18). Among nasal masses, 60 (78.95 %) were unilateral while 16 (21.05 %) were bilateral. Single mass was found in 58 (76.32 %) patients, they were multiple in 18 (23.68 %) patients. Almost similar findings have been reported by Majumjar and colleagues (16) who found 76.97 % versus 23.03 % (unilateral versus bilateral) and 62.58 % versus 37.41 % (single versus multiple). Physical findings in favor of loco-regional extension were found in this study, among them proptosis, extension to soft or hard palate and facial asymmetry. These findings show an advanced stage of the disease that may require extensive surgical procedures or even may become inoperable. Cervical lymph nodes were found in 3 (3.8 %) patients only. One of them was reported as a metastatic lymph node in a patient with squamous cell carcinoma. For 2 others the lymph nodes were not investigated, one patient had inverted papilloma, another had adenoid cystic carcinoma. This rarity is compatible with the literature (20).

Considering radiological investigations, CT scan was the only requested imaging exam in this study. The majority of sinonasal masses were found to involve more than one region of SNT on CT scan. This could be attributed to different sites of origin of sinonasal masses, delay in ENT consultation in some cases, and to rapidly growing lesions like some malignant tumors in others. In addition, a sinonasal lesion is often difficult to differentiate from long standing thick mucus secretions on CT, but can be well differentiated on MRI that in not available in concerned referral hospitals.

In the present study of 79 cases of sinonasal masses inflammatory and tumor like lesions were 48.1 % (38 cases), benign tumors were 40.5 % (34 cases) and malignant tumors were 11.4% (9 cases). These findings were a bit lower than those from other studies. Rawat D J. and colleagues (9) reported a big number of non-neoplastic masses (68.56 %, 22.72 % and 8.71% respectively); Vijay Peruvaje and colleagues (43) found 72.6 %, 19.9 % and 8.2 %. Kalpana Kumari M.K and colleagues (46) in Sri Lanka reported 66%, 17%, 17 % respectively.

Among non-neoplastic masses, simple nasal polyps are the most prevalent (34 patients); finding similar to those from almost all studies on sinonasal masses. Rhinoscleroma was found in 2 patients, it has also reported by Lathi and colleagues (13) in India and by Khan, N. Zafar, U and colleagues (25) as second most common non-neoplastic lesion.

Among 32 benign neoplastic lesions, hemangioma was the most common (n = 9) followed by inverted papilloma (n = 8), results similar to those reported by Lathi and colleagues of 9 and 7 respectively out of 19 cases. Kalpana K. and colleagues reported the same findings (46); Majumjar and colleagues (16) were concordant for prevalence of hemangioma that was followed by angiofibroma in their study.

The proportion of inverted papilloma in our series was 8/32 (25%) higher than that reported by Bakari et al.(18), Hamayun et al.(20) , Lathi et al. (13) and Majumdar A. et al. (16). Inverted papilloma was prevalent in males, findings similar to the previously cited authors. This large proportion of inverted papilloma needs attention because of its potential bony erosion, high recurrence rate and malignant transformation (47,48). As this was found in a population with delayed presentation to ENT specialist, it can lead to difficult surgery even to poor prognosis after treatment.

Among malignant tumors, squamous cell carcinoma is the most common and is found in fifth decade and above with equal sex distribution. Similar observation was made in other studies except for sex distribution where male preponderance was noted (13,16,43,45,46). Dasgupta A. and colleagues (33) also found preponderance of squamous cell carcinoma followed by adenocarcinomas. The same preponderance was reported by Fasunla and Ogunkeyede (5) in Nigeria with 63.9 %.

Most patients with non-neoplastic masses presented to ENT specialist more than 2 years after onset of symptoms while most patients with malignant neoplasms presented within a six month period following the first symptom. This may be due to the fact that these high growing tumors are aggressive and to the asymptomatic characteristics of cancers of the SNT.

Olfactory neuroblastoma was prevalent in patients less than 10 years old while embryonal rhabdomyosarcoma was prevalent in those of the third decade. These findings are similar to those from a study by Humayun, A and colleagues (20) reporting a mean age of 17 and 3 years respectively. This is also consistent with the literature as neuroectodermal tumors are the most common malignant tumors in pediatric population. In addition, these tumors are locally aggressive and tend to present at an advanced stage (37).

At bivariate analysis, this study didn't find any significant statistical association between histological results and socio-demographic or clinical variables. This may be attributed to a small number of patients in this study, sinonasal masses being rare a big sample size could be needed to establish this association.

CHAPTER VI: CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

This descriptive study aimed to study the clinicopathological profile of sinonasal masses in Rwanda referral hospitals.

At the end of this study the following conclusion is made:

- Sinonasal tumors are not uncommon in Rwanda even if non-neoplastic masses outnumber neoplastic ones. Among non neoplastic lesions, inflammatory polyps are the most common. Benign neoplasms outnumber the malignant neoplasms with hemangioma and squamous cell carcinoma as the most frequent histological types, respectively.
- Nasal obstruction is the most common symptom in sinonasal masses in Rwanda.
- Late presentation to ENT specialist was found in patients with sinonasal masses in Rwanda referral hospitals. This may lead to delay diagnosis and this has a negative impact on the treatment success and prognosis.
- Imaging is important for the diagnosis of sinonasal masses and planning of surgery especially for patients with long standing nasal obstruction.
- Histopathological examination is mandatory for final diagnosis in patients with sinonasal masses.

6.2. Recommendations

Based on the results obtained from this study, we recommend the following:

- General population and health personnel should be educated to create awareness on sinonasal masses especially on their symptoms and encourage patients to present early in hospitals.
- CT scan should be requested for patients presenting the most common symptoms, especially when there is no response to medical treatment.

- Histopathological examination of sinonasal masses should be done for definitive pathologic diagnosis.
- More studies should be conducted to determine factors that influence late presentation of patients with sinonasal masses to ENT specialists and look for risk factors of these sinonasal masses in Rwanda.

6.3. Study limitations

The systematic investigation of cervical lymph nodes was not considered in our study protocol. This led us to miss histological examination in two patients where it was needed.

MRI was not considered in this study even if it gives important details in patients with sinonasal masses. This imaging study was not available in the concerned referral hospitals.

CHAPTER VII: REFERENCES

1. García JJ, Wenig BM. Select Neoplasms of the Sinonasal Tract. Surg Pathol Clin [Internet]. Elsevier Inc; 2011;4(4):1093–125. Available from: http://dx.doi.org/10.1016/j.path.2011.08.015
2. Zafar U, Khan N, Afroz N, Hasan S. Clinicopathological study of non-neoplastic lesions of nasal cavity and paranasal sinuses. Indian J Pathol Microbiol [Internet]. Medknow Publications; 2008 Jan 1 [cited 2015 Jul 5];51(1):26. Available from: http://www.ijpmonline.org/article.asp?issn=0377-4929;year=2008;volume=51;issue=1;spage=26;epage=29;aulast=Zafar
3. Garg D, Mathur K. Clinico-pathological Study of Space Occupying Lesions of Nasal Cavity, Paranasal Sinuses and Nasopharynx. J Clin Diagn Res [Internet]. 2014 Nov [cited 2015 Dec 13];8(11):FC04–7. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4290245
4. Bhattacharyya N. Survival and staging characteristics for non-squamous cell malignancies of the maxillary sinus. Arch Otolaryngol Head Neck Surg. 2003;129(3):334–7.
5. Fasunla a J, Ogunkeyede S a. Factors contributing to poor management outcome of sinonasal malignancies in South-west Nigeria. Ghana Med J [Internet]. 2013;47(1):10–5. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3645191&tool=pmcentrez&rendertype=abstract
6. Haerle SK, Gullane PJ, Witterick IJ, Zweifel C, Gentili F. Sinonasal Carcinomas. Epidemiology, Pathology, and Management. Neurosurg Clin N Am [Internet]. Elsevier Inc; 2013;24(1):39–49. Available from: http://dx.doi.org/10.1016/j.nec.2012.08.004
7. Goy J, Hall SF, Feldman-Stewart D, Groome P a. Diagnostic delay and disease stage in head and neck cancer: a systematic review. Laryngoscope. 2009;119(5):889–98.
8. Settipane GA. Epidemiology of nasal polyps. Allergy Asthma Proc [Internet]. Jan [cited 2015 Jul 5];17(5):231–6. Available from: http://www.ncbi.nlm.nih.gov/pubmed/8922141
9. Rawat DS, Chadha V, Grover M, Ojha T, Verma PC. Clinico-pathological Profile and Management of Sino-nasal Masses: A Prospective Study. Indian J Otolaryngol Head Neck Surg [Internet]. 2013 Aug [cited 2015 Jul 5];65(Suppl 2):388–93. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3738813
10. Chukuezi AB, Nwosu JN. Pattern of nasal and paranasal sinus tumours in Owerri, Nigeria. Research Journal of Medical Sciences. 2010. p. 11–4.
11. Narayana Swamy, K.V, Chandre Gowtla B. A clinical study of benign tumours of nose and paranasal sinuses. Indian J Otolaryngol Head Neck Surg. 2004;Vol. 56(No. 4).
12. Dubal P, Sanghvi BAS, Raikundalia M, Kanumuri BSV V, Svider PF, Baredes S, et al. Sinonasal Malignancies : Site-Specific Incidence and Survival in 12 , 582 Patients. 2013;8100.
13. Lathi a, Syed MM a, Kalakoti P, Qutub D, Kishve SP. Clinico-pathological profile of sinonasal masses : a study from a tertiary care hospital of India. Acta Otorhinolaryngol Ital. 2011;31:372–7.
14. Sharma R, Sharma VK, Madhok R, Agarwal T, Mehrotra A, A. K. Uncommon and atypical sinonasal masses: Diagnostic and therapeutic challenges. Clin Rhinol [Internet]. 2012;5(3):114–7. Available from: http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L36924

1937\nhttp://dx.doi.org/10.5005/jp-journals-10013-1130\nhttp://sfx.library.uu.nl/utrecht?sid=EMBASE&issn=09744630&id=doi:10.5005/jp-journals-10013-1130
15. Hedman J, Kaprio J, Poussa T, Nieminen MM. Prevalence of asthma, aspirin intolerance, nasal polyposis and chronic obstructive pulmonary disease in a population-based study. Int J Epidemiol. 1999;28(4):717–22.
16. Majumdar AB, Sarker G, Biswas D, Dey S, Prasad A, Bihar RP. Case study Clinicopathological study of sino-nasal masses. Natl J Otorhinolaryngol Head Neck Surg. 2014;2(1):19–22.
17. Rahman M, Siddique MA, Ali MI, Rahman T, Choudhury AA, Khan JA. Study of Commonest Variety of Sinonasal Malignancy and Its Sex Wise Distribution. Mymensingh Med J [Internet]. 2015 Oct [cited 2015 Dec 13];24(4):832–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/26620027
18. Bakari A, Afolabi O a, Adoga A a, Kodiya AM, Ahmad BM. Clinico-pathological profile of sinonasal masses: an experience in national ear care center Kaduna, Nigeria. BMC Res Notes. 2010;3:186.
19. Ogunleye A, Fasunla A. Nasal polyps - clinical profile and management in Ibadan, Nigeria. Niger J Surg Res. 2006;7(1):164–7.
20. Humayun AHP, Huq AZ, Ahmed ST, Kamal MS, U KK, Bhattacharjee N. Clinicopathological study of sinonasal masses. Bangladesh J Otorhinolaryngol. 2010;16(1):15–22.
21. A, Nepal; St, Chettri; RR J, ; S K. Benign Sinonasal Masses : A Clinicopathological and Radiological Profile. Kathmandu Univ Med J. 2013;41(1):4–8.
22. Dasgupta A, Ghosh RN, Mukherjee C. Nasal polyps - histopathologic spectrum. Indian J Otolaryngol Head Neck Surg [Internet]. 1997 Jan [cited 2015 Jul 5];49(1):32–7. Available from: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3450740&tool=pmcentrez&rendertype=abstract
23. Chu Y, Liu HG, Yu ZK. Patterns and incidence of sinonasal malignancy with orbital invasion. Chin Med J (Engl). 2012;125(9):1638–42.
24. Bist SS, Varshney S, Baunthiyal V, Bhagat S, Kusum A. Clinico-pathological profile of sinonasal masses : An experience in tertiary care hospital of Uttarakhand. 2012;3(2):180–6.
25. Khan N, Zafar U, Afroz N, Ahmad SS, Hasan S a. Masses of nasal cavity, paranasal sinuses and nasopharynx: a clinicopathological study. 2006;58(3).
26. Zafar U, Khan N, Afroz N HSA. Clinicopathological study of non-neoplastic lesions of nasal cavity and paranasal sinuses. Indian J Pathol Microbiol [serial online]. 2008;51(1):26–9.
27. Niels Mygind VJL. Scott Brown's Otorhinolaryngology and Head and Neck Surgery, 7th ed. 2008. 1549-1556 p.
28. K. Thomas Robbins, Alfio Ferlito et al. Contemporary management of sinonasal cancer. Head Neck. 2015;55(7):691–6.
29. Mendenhall WM, Amdur RJ, Morris CG, Kirwan J, Malyapa RS, Vaysberg M, et al. Carcinoma of the nasal cavity and paranasal sinuses. Laryngoscope. 2009;119(5):899–906.
30. Fasunla AJ, Lasisi AO. Sinonasal malignancies: a 10-year review in a tertiary health

institution. J Natl Med Assoc. 2007;99(12):1407–10.
31. Ricardo L Carrau ADM. Malignant tumors of the nasal Cavity [Internet]. [cited 2016 Jan 1]. Available from: http://emedicine.medscape.com/article/846995
32. Segal N, Gluck O, Bavnik Y, Plakht Y, Yakirevitch A. The usefulness of preoperative biopsy in unilateral nasal masses. Allergy Rhinol [Internet]. 2014;5(2):53–5. Available from: http://openurl.ingenta.com/content/xref?genre=article&issn=2152-6575&volume=5&issue=2&spage=53
33. Dasgupta A, Ghosh RN, Mukherjee C, Bengal W. Nasal polyps - Histopathological analysis. 1997;49(1):32–7.
34. Szablewski V, Neuville A, Terrier P, Laé M, Schaub R, Garrel R, et al. Adult sinonasal soft tissue sarcoma: Analysis of 48 cases from the French Sarcoma Group database. Laryngoscope [Internet]. 2015;125(3):615–23. Available from: http://www.scopus.com/inward/record.url?eid=2-s2.0-84923350176&partnerID=tZOtx3y1
35. Johncilla M, Jo VY. Soft tissue tumors of the sinonasal tract. Semin Diagn Pathol [Internet]. 2015 Sep 9 [cited 2015 Dec 13]; Available from: http://www.ncbi.nlm.nih.gov/pubmed/26472693
36. Zevallos JP, Jain KS, Roberts D, El-Naggar A, Hanna EY, Kupferman ME. Sinonasal malignancies in children: a 10-year, single-institutional review. Laryngoscope [Internet]. 2011;121(9):2001–3. Available from: http://www.ncbi.nlm.nih.gov/pubmed/21739433
37. Yi JS, Cho GS, Shim MJ, Min J-Y, Chung Y-S, Lee B-J. Malignant tumors of the sinonasal tract in the pediatric population. Acta Otolaryngol. 2012;132 Suppl (December):S21–6.
38. Tabaee A, Hsu AK, Kacker A. Indications, technique, safety, and accuracy of office-based nasal endoscopy with biopsy for sinonasal neoplasm. Int Forum Allergy Rhinol [Internet]. 2011 Jan 1 [cited 2016 Jan 3];1(3):225–8. Available from: https://www.researchgate.net/publication/221788999
39. Han MW, Lee B-J, Jang YJ, Chung Y-S. Clinical value of office-based endoscopic incisional biopsy in diagnosis of nasal cavity masses. Otolaryngol Head Neck Surg [Internet]. Elsevier Inc.; 2010;143(3):341–7. Available from: http://dx.doi.org/10.1016/j.otohns.2010.05.019
40. Adoga Adeyi SO. The challenges of managing malignant head and neck tumors in a tropical tertiary health center in Nigeria. PanaAfrican Med J. 2011;8688:2–6.
41. L, Johansson; A A Al. Prevalence of nasal polyps in adults: the Skövde population-based study. Ann Otol Rhinol Laryngol [Internet]. 2003 [cited 2015 Jul 5];112(7):625–9. Available from: http://www.unboundmedicine.com/medline/citation/12903683
42. Chukuezi AB. Nasal polyposis in a Nigerian district hospital. West Afr J Med [Internet]. Jan [cited 2015 Jul 5];13(4):231–3. Available from: http://www.ncbi.nlm.nih.gov/pubmed/7756190
43. Vijay Peruvaje, Praveen Kumar B. Y V m. Polypoidal masses in the nose : A Clinico-Pathological correlation study. J Evid Based Med Healthc. 2015;2(4):313–20.
44. National Institute of Statistics of Rwanda. Fourth population and housing Census, Rwanda, 2012: Population size , structure and distribution. 2012.
45. Sivalingam J, Sarawagi R, Raghuwanshi S, Yadav PK. Sinonasal Neoplasia - Clinicopathological Profile And Importance of Computed Tomography. J Clin Diagn Res [Internet]. Journal of Clinical and Diagnostic Research; 2015 Jun [cited 2015 Dec

13];9(6):TC01–4. Available from: http://www.scopus.com/inward/record.url?eid=2-s2.0-84930635096&partnerID=tZOtx3y1
46. Kalpana KMK, Mahadeva KC. Polypoidal lesions in the nasal cavity. J Clin Diagnostic Res. 2013;7(6):1040–2.
47. Ridder GJ, Behringer S, Kayser G, Pfeiffer J. [Malignancies arising in sinonasal inverted papillomas]. Laryngorhinootologie [Internet]. 2008 Nov [cited 2015 Dec 13];87(11):783–90. Available from: http://www.ncbi.nlm.nih.gov/pubmed/18633858
48. Sadeghi Nader; Meyers A D. Sinonasal Papillomas [Internet]. 2015 [cited 2016 Jan 26]. Available from: http://emedicine.medscape.com/article/862677

APPENDICES

DATA COLLECTION FORM

No.	Question and filters	Coding categories	Skip to
A01	Patient's Code (ID)	……..	
A02	Hospital	1. CHUK 2. CHUB 3. RMH	
A03	Age (years)	……..	
A04	Gender	Male Female	
A05	Province of residency	……..	
A06	Chief complaints	o Nasal mass o Nasal blockage: unilateral bilateral o Nasal discharge o Epistaxis o Loss of smell o Deformity of nasal pyramid o Headaches o Tooth pain o Facial asymmetry o Eye problem: - diplopia - proptosis - excessive tearing o Throat complaints o Ear symptoms (otalgia, hearing loss, fullness) o Others: ……..……	
A07	Duration of symptoms (months)	……. o less than 6 months o 1-12 months o 12-18 months	

		○ 18-24 months ○ more than 24 months	
A08	Findings on physical examination:	○ Mass in nose: unilateral bilateral ○ Number of masses: single multiple ○ Nasal discharge: Yes No If yes: what color? Clear Yellowish ○ Nasal bleeding: Yes No ○ Nasal deformity: Yes No ○ Post nasal drip: Yes No ○ Facial swelling: Yes No ○ Cervical lymph node: Yes No ○ Other: ……	
A09	Radiological investigations done (CT Scan)?	○ Yes ○ No	If no A11
A10	If yes, in which anatomical region is the mass found?	1. Nasal cavity only 2. Maxillary sinus only 3. Ethmoid sinuses only 4. Sphenoid sinuses only 5. Frontal sinuses only 6. More than one region of sinonasal tract 7. Extension out of the sinonasal tract	
A11	Clinical diagnosis:	……	
A12	Where was the biopsy taken from?	○ Nose ○ PNS	
A13	How was biopsy taken?	○ Punch biopsy ○ During FESS ○ During open surgery	
A14	Histopathology results	○ Non neoplastic: (specify)……. ○ Benign neoplasm: (specify)……	

		○ Malignant neoplasm: (specify) ……..	
A15	Pathological diagnosis:	……	

INFORMED CONSENT (English version)

Title of the study: Clinico-pathological profile of sinonasal masses in Rwanda referral hospitals.

Explanation to the patient

I am Dr Victor NYABYENDA, a resident in ENT- Head and Neck Surgery at School of Medicine and health sciences in Univesity of Rwanda. I am conducting a study in Rwanda Referral Hospitals for the degree of Master of Medicine in ENT-Head and Neck Surgery. My study is aimed to evaluate clinicopathological profile of masses in nose and paranasal sinuses in four Rwanda referral Hospitals.

During the study, the patient found to present a mass in nose or PNS will sign the consent form before any data collection or biopsy for histology examination. The questionnaire will be filled by one of the ENT staff at the Hospitals where the study will be conducted. This will be done after initial assessment and after histology results.

No direct benefit and no risks for the participant but the result of this study may be used to benefit other patients in future.

All information obtained from this study will be handled in a confidential manner and be used for only research purposes.

If you have question about the study, please feel free to contact:

- Dr Victor NYABYENDA, cell: 0788888298; E-mail: **vinyaby@yahoo.fr**

-The supervisor: Dr Rajab MUGABO, ENT head and neck surgeon, 250 (0) 788300993

The CMHS/ IRB contact in case the need arises is the following e-mail: researchcenter@ur.ac.rw

Tel: +250 (0)788563312

If you agree to be included in this study, please sign the section below.

CONSENT FORM

I……confirm that the purpose of this study and my role have been well explained to me by Dr……..... I agree to the conditions explained and give consent to be included or for……. who is my dependant by virtue of being a minor or unable to consent.

Names of the participant/attendant……

Signature…… Date……/……./…..…….

Name of the Witness…….....

Signature…….. …….Date……/……/……...

Researcher's names……

Researcher's signature…… Date…../……. /……..

IBISOBANURO NO KWEMERA UBUSHAKASHATSI (Kinyarwanda version)

Umutwe w'ubushakashatsi

"Clinico-pathological profile of sinonasal masses in Rwanda referral hospitals"

Ibisobanuro

Victor NYABYENDA, ukora ubu bushakashatsi, ni umuganga wiga muri Kaminuza y'u Rwanda ishami ry'Ubuvuzi, aho ategurirwa kuba inzobere mukuvura no kubaga Amatwi, Amazuru, Umuhogo, umutwe n'ijosi (ENT, Head & Neck Surgery).

Arakora ubu bushakashatsi ku birebana n'ibimenyetso by'ibibyimba mu mazuru no mu ma sinusi mu bitaro bikuru byo mu Rwanda. Ubushakashatsi ni kimwe mu bisabwa ngo urangiza amasomo ahabwe impamyabushobozi y'inzobere mu kuvura no kubaga Amatwi, Amazuru, Umuhogo, umutwe n'ijosi (Mmed in ENT, Head and Neck Surgery).

Muri ubu bushakashatsi, umurwayi uje kwisuzumisha afite ibimenyetso by'ikibyimba mu mazuru no ma sinusi asobanurirwa iby'ubu bushakashatsi hanyuma agasinya urupapuro rwemeza ko yinjiye mu bushakashatsi ku bushake. Urupapuro ruriho ibizibandwaho mu bushakashatsi (questionnaire) ruruzuzwa mbere yo gusuzumwa, n'igihe ibisubizo by'ikizamini cyafashwe bije. Mu kujya muri ubu bushakashatsi nta kiguzi cyangwa inyungu yihariye umuntu ku giti cye akuramo; ariko ibizavamo bizifashishwa mu kuvura barwayi mu gihe kizaza. Hakoreshwa inomero mu mwanya w'amazina y'umurwayi; kandi amakuru yose avuye ku murwayi akabikanwa ibanga.

Ibizava muri ubu bushakashatsi ntibizakoreshwa ku zindi nyungu zitari iz'ubushakashatsi kandi mu kubitangaza nta na hamwe hazagaragazwa amazina y'ababukoreweho.

Inyigo y'ubu bushakashatsi yasuzumwe inemezwa n' Ikigo cy'ubushakashatsi cya Kaminuza y'u Rwanda (CMHS/ IRB).

Ku bibazo cyangwa ibindi bisobanuro, baza:
-Victor NYABYENDA, telephone; 0788888298 E-mail: **vinyaby@yahoo.fr**

-Unyunganira muri ubu bushakashatsi: Dr Rajab MUGABO, inzobere mu kubaga indwara zo mu matwi, amazuru, umuhogo no mu ijosi, 250 (0) 788300993

-Ikigo cy'ubushakashatsi cya kaminuza CMHS/ IRB, e-mail: researchcenter@ur.ac.rw

Tel: +250 (0)788563312

Niba wemeye kwinjira mu bushakashatsi dusinyire ku rupapuro rukurikira.

Kwemera kwinjira mu bushakashatsi ku bushake

Njyewe ……, (imyaka……) nemeye ko nahawe ibisobanuro birambuye na Dr……kuri ubu bushakashatsi mpabwa n'umwanya wo gusobanuza. Mu gusinya, nemeye ku bushake bwanjye nta gahato ko ubu bushakashatsi bunkorerwaho/bukorerwa kuri…..……..... (imyaka……) mpagarariye. (Isano……..)

Amazina y'utanze uburenganzira/Umuhagarariye……
Umukono……..……itariki……/……/……..

Amazina y'ukora ubushakashatsi/Umuhagarariye…….
Umukono……..……itariki……/……/…….

Amazina y'undi wabibonye: ……
Umukono…… itariki……/……/……

ASSENT FORM FOR A CHILD AGED 8 YEARS AND ABOVE

I, ---------- hereby, fully assent to participate in this study on **"Clinico-pathological profile of sinonasal masses in Rwanda referral hospitals"**

I agree to participate in this study and that any information obtained from me or from my medical file will be analyzed and used to improve the medical care given to patients with sinonasal masses.

I understand that I will incur no additional medical costs as a result of participation in this study. I have been fully informed about the purposes, benefices and the risks of this study. My questions have been answered with satisfaction. I also understand that I may withdraw from the study at any time with no adverse consequences to my medical care.

For the further queries and clarification, the person to contact is Dr NYABYENDA Victor on telephone number: 250 (0) 788888298.

The supervisor: Dr Rajab MUGABO, ENT head and neck surgeon, 250 (0) 788300993

The CMHS/ IRB contact in case the need arises is the following e-mail: researchcenter@ur.ac.rw

Tel: +250 (0)788563312

……..	……..	…../…./……
Name of the participant	Signature of participant	Date
……..	……..	…../…./……
Name of the researcher	Signature of the researcher	Date

AMASEZERANO YO KWEMERA KUJYA MU BUSHAKASHATSI (Abana barengeje imyaka 8)

Jyewe, ……... nemeye kujya mu bushakashatsi bwitwa "**Clinico-pathological profile of sinonasal masses in Rwanda referral hospitals**". Bugamije kumenya ibirebana n'ibimenyetso ku burwayi bw'ibibyimba byo mu mazuru no mu ma sinusi mu bitaro bikuru byo mu Rwanda. .

Nemeye kwinjira muri ubu bushakashatsi ko ko amakuru yose azatangwa mo azafasha kuvura ubu burwayi mu gihe gitaha. Nasobanuriwe ko nta kiguzi nzahabwa ku bwo kwinjira muri ubu bushakashakatsi. Nasobanuriwe kandi impamvu n'ingaruka z'ubu bushakashatsi. Nasubijwe ibibazo nabajije kandi igihe cyose mfite uburenganzira bwo kuva muri ubu bushakashatsi nta ngaruka ku buvuzi mpabwa.

Ku bindi bisobanuro wahamagara Dr NYABYENDA Victor kuri telefoni: 250 (0) 788888298.

Unyunganira muri ubu bushakashatsi: Dr Rajab MUGABO, inzobere mu kubaga indwara zo mu matwi, amazuru, umuhogo no mu ijosi, 250 (0) 788300993

Ikigo cy'ubushakashatsi cya kaminuza CMHS/ IRB, e-mail: researchcenter@ur.ac.rw

Tel: +250 (0)788563312

…… ……..

Amazina n'umukono by` ukorerwaho ubushakashatsi Italiki

……..... …….

Amazina n`umukono by'umushakashatsi Italiki

ETHICAL CLEARANCE LETTER

UNIVERSITY OF RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 08/10/2015
Ref: CMHS/IRB/**316**/2015

Dr NYABYENDA Victor
School of Medicine and Pharmacy, CMH, UR

Dear Dr NYABYENDA Victor

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled **"Clinico-pathological profile of sinonasal masses in Rwanda referral hospital".**

Having reviewed your application and been satisfied with your revised version incorporating the comments from IRB, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Professor Kato J. NJUNWA
Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:
- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR